

A large, vibrant green tree stands as the central focus, its canopy reaching towards the top of the frame. The background is a dramatic split: the left side is dark and smoky, suggesting a city in flames or a post-apocalyptic scene, while the right side is bright and sunny, with a clear blue sky and a city skyline visible. The tree's trunk is dark and textured, and its leaves are a rich, varied green. The overall composition suggests a theme of environmental transformation or the resilience of nature in the face of urban challenges.

# *Roots of Change*

*Creating a Sustainable  
and Just Future for All*





*Dear Reader,*

*It is my honor to present the fourth edition of the MESH (Master's in Science in Engineering, Sustainability, and Health) Magazine. The MESH program is a higher education, online program offered at the University of San Diego. Students of this program embark on a 20-month journey that utilizes a transdisciplinary and systems-thinking approach to examine today's issues affecting humankind and the environment. Students gain awareness, knowledge, and experience on topics such as the built environment, food, water, and energy sustainability, waste, environmental justice, and just transitions.*

*Those who have walked the path of the MESH program know their lives are forever changed. We see the world with new eyes and new possibilities. We see where change needs to take place and how we can help make those changes. Each subject we moved through left seeds, or revelations, that with each of our actions can grow to create a sustainable future where all living things can flourish.*

*The final result of each MESH student's journey culminated in a final capstone article of which is included in this edition. This magazine contains articles examining topics such as communication, green urban development, human resiliency, effects of human activity on the environment, waste in an urban city, and the future possibilities of engineering. We all come from different locations and bring with us different backgrounds and experiences. Completing this journey in collaboration has bonded us to the same purpose: laying roots of change so that all can thrive.*

*It is with great appreciation that I share with you the fourth cohort of MESH students' capstone articles. May they be an inspiration during your MESH journey.*

*Tina Altis*

*MESH Volume IV Editor*

*"The earth is calling and I must go."*

# *Messages from Master's in Engineering, Sustainability and Health (MESH) Leadership*



*Dr. Willy Oppenheim  
MESH Capstone Lead  
Instructor and Omprakash Executive  
Director*

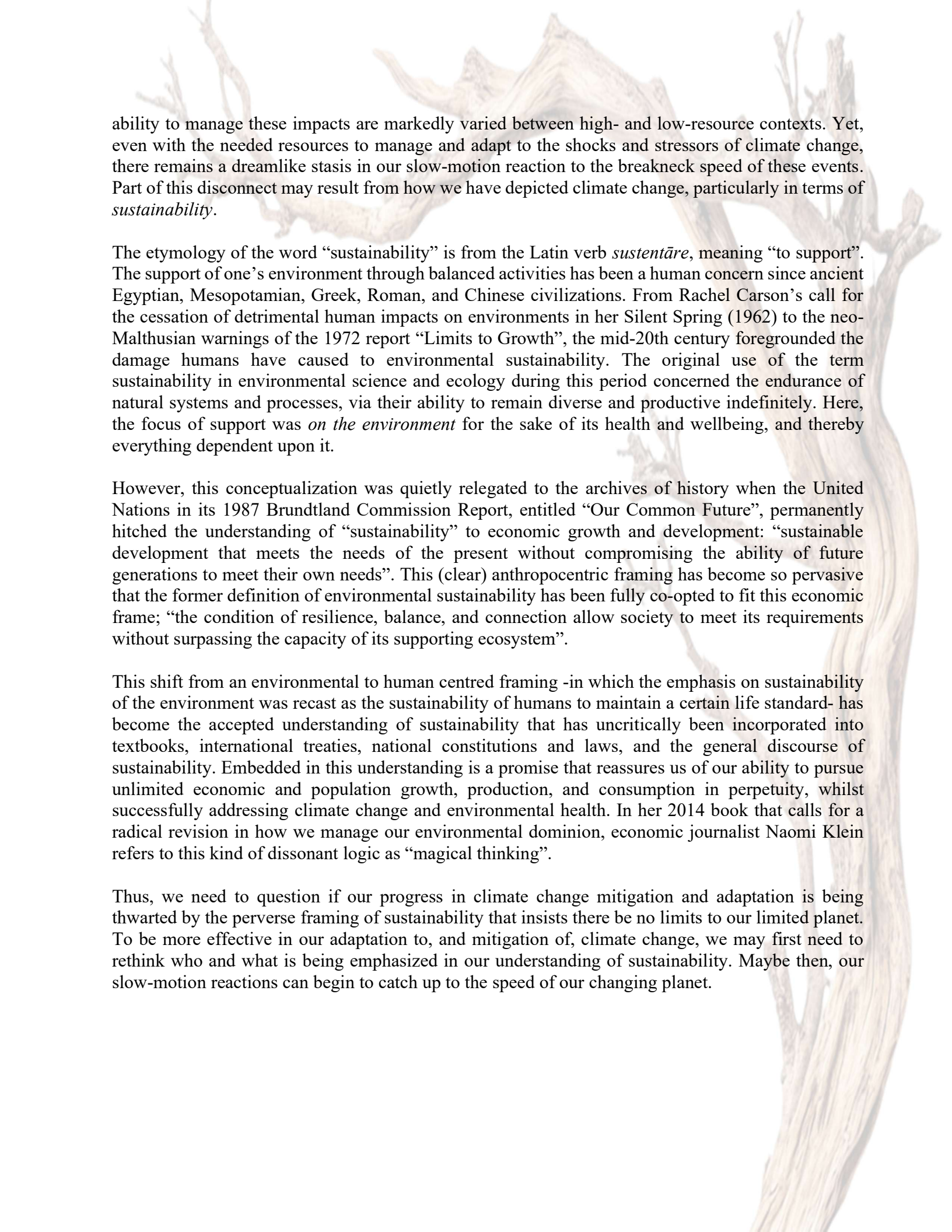
I am grateful and honored to present the fourth edition of our MESH Magazine! The articles in this edition took form between the months of January and April, 2025 — a period of significant disruption and uncertainty in the United States and across the world. Our hope is that these MESH Capstone Projects offer a sort of response to this moment: an invitation to look more closely at ourselves and the complex worlds we inhabit, and to imagine alternative futures. I am grateful to the students for their dedication to their projects, to the EdGE Mentor team for nourishing these students and their projects with so much care and attention, to Tina Altis for her extraordinary efforts as the sole editor of this edition, and to the USD MESH administrators for making this program possible. Thank you all!

*Dr. Paul Kadetz  
Founding Co-Director of MESH  
Professor of Practice in the Shiley-Marcos  
School of Engineering*

*Fostering a Climate of Change: Reassessing  
“Sustainability”*

As climate events are increasing with ever greater frequency across the globe, it has become clear that climate change is no longer just happening “over there”. Although the impacts of climate change are global, the





ability to manage these impacts are markedly varied between high- and low-resource contexts. Yet, even with the needed resources to manage and adapt to the shocks and stressors of climate change, there remains a dreamlike stasis in our slow-motion reaction to the breakneck speed of these events. Part of this disconnect may result from how we have depicted climate change, particularly in terms of *sustainability*.

The etymology of the word “sustainability” is from the Latin verb *sustentāre*, meaning “to support”. The support of one’s environment through balanced activities has been a human concern since ancient Egyptian, Mesopotamian, Greek, Roman, and Chinese civilizations. From Rachel Carson’s call for the cessation of detrimental human impacts on environments in her *Silent Spring* (1962) to the neo-Malthusian warnings of the 1972 report “Limits to Growth”, the mid-20th century foregrounded the damage humans have caused to environmental sustainability. The original use of the term sustainability in environmental science and ecology during this period concerned the endurance of natural systems and processes, via their ability to remain diverse and productive indefinitely. Here, the focus of support was *on the environment* for the sake of its health and wellbeing, and thereby everything dependent upon it.

However, this conceptualization was quietly relegated to the archives of history when the United Nations in its 1987 Brundtland Commission Report, entitled “Our Common Future”, permanently hitched the understanding of “sustainability” to economic growth and development: “sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. This (clear) anthropocentric framing has become so pervasive that the former definition of environmental sustainability has been fully co-opted to fit this economic frame; “the condition of resilience, balance, and connection allow society to meet its requirements without surpassing the capacity of its supporting ecosystem”.

This shift from an environmental to human centred framing -in which the emphasis on sustainability of the environment was recast as the sustainability of humans to maintain a certain life standard- has become the accepted understanding of sustainability that has uncritically been incorporated into textbooks, international treaties, national constitutions and laws, and the general discourse of sustainability. Embedded in this understanding is a promise that reassures us of our ability to pursue unlimited economic and population growth, production, and consumption in perpetuity, whilst successfully addressing climate change and environmental health. In her 2014 book that calls for a radical revision in how we manage our environmental dominion, economic journalist Naomi Klein refers to this kind of dissonant logic as “magical thinking”.

Thus, we need to question if our progress in climate change mitigation and adaptation is being thwarted by the perverse framing of sustainability that insists there be no limits to our limited planet. To be more effective in our adaptation to, and mitigation of, climate change, we may first need to rethink who and what is being emphasized in our understanding of sustainability. Maybe then, our slow-motion reactions can begin to catch up to the speed of our changing planet.



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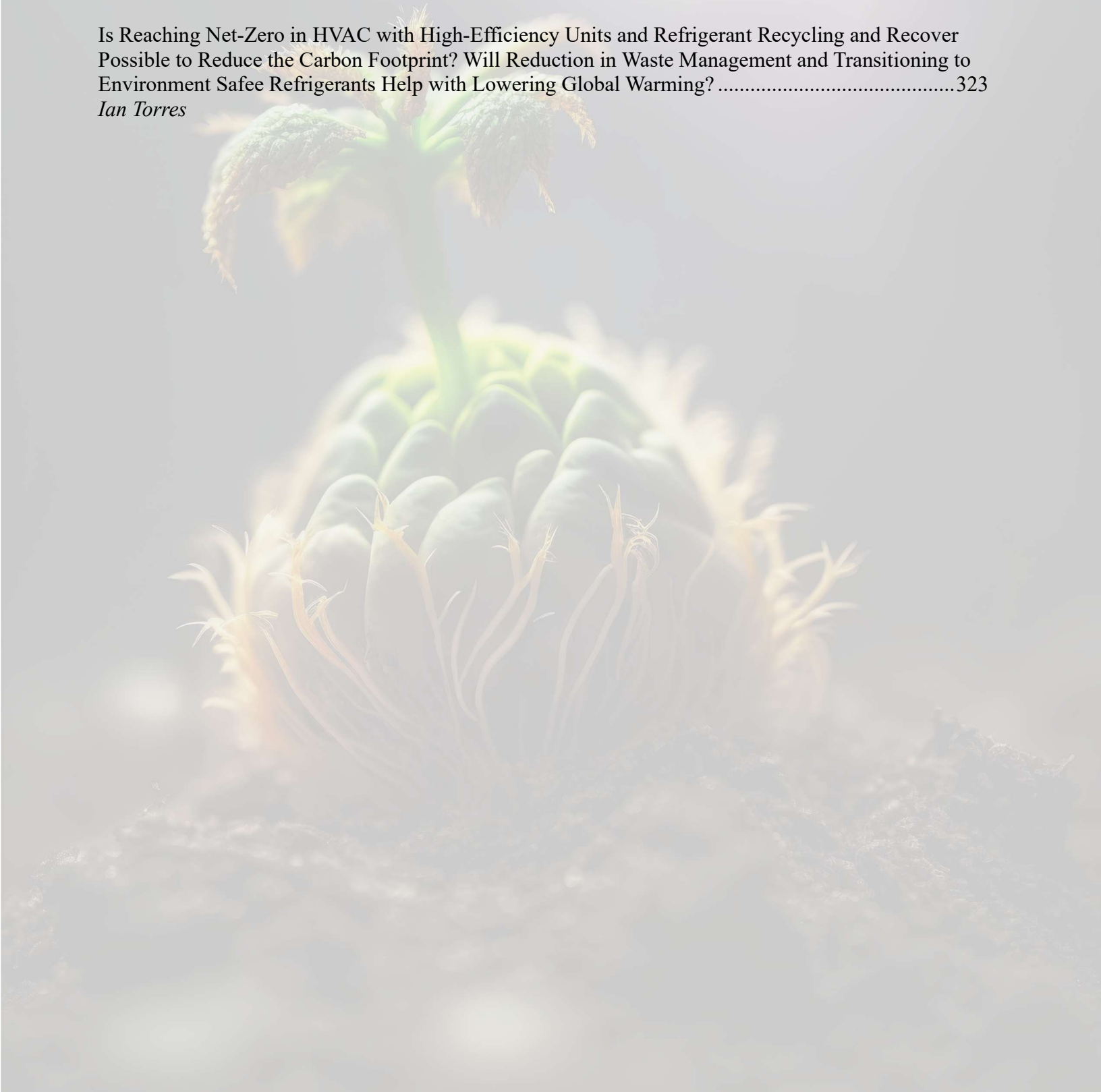
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***Engaging Our Common Story:***

***A Dialogical Approach to Cultivating More Just Ways of Living on a Shared Planet –***

***A Pilgrimage in Right Relationship with Earth***

Cathy Manderfield

April 2025



Painting entitled "Table of Mercy" by Anne Reddington, rsm

## Abstract

This project, *Engaging Our Common Story: A Dialogical Approach to Cultivating More Just Ways of Living on a Shared Planet – A Pilgrimage in Right Relationship with Earth*, explores how one religious community might critically reflect upon and deepen its engagement with environmental justice through sustained dialogue. Rooted in the frameworks of eco-theology, ecofeminism, narrative inquiry, critical pedagogy, and participatory action research, the study weaves together personal story, communal reflection and critical dialogue, as well as spiritual discernment. Five dialogue sessions served as waypoints along a collective journey of uncovering assumptions, surfacing critical questions, examining values, and envisioning new patterns of relationship with Earth and neighbor. Themes of awareness, relationality and interconnectedness, proximity, time, and evolving community roles emerged as central to reimagining how we might live more justly. This pilgrimage invites a framing of justice as organically relational—grounded in place, shaped by story, and sustained through communal consciousness and care.

## Preparing for Way

I grew up on a quiet street with a home that was nestled among trees and set back along a stretch of river that flows into the Chesapeake Bay. I spent as much time as I could exploring the wonders just outside my childhood home. Nature was, and continues to be, a place of comfort and companionship for me. For much of my life, caring for the natural world meant yardwork, navigating complex recycling protocols, leave-no-trace camping etiquette, preventing forest fires, and trying not to be a litterbug. I became connected in my late 20's to an international religious community of Roman Catholic women (nuns) who dedicate their lives and resources to serve and advocate for those in need around the world. Eventual membership with the community would broaden my exposure to the realities contributing to the struggles of those who experience poverty and marginalization, as well as to the struggles of the environment, and these experiences and relationships offered a closer proximity to the systemic realities involved. In the years that I have been journeying with the religious order, as incidents of natural disaster began to increase and the science has grown clearer and more vocal regarding the struggles of our planet ([NOAA, 2025](#)), the community has added pledges of commitment concerning the care of the environment into our mission statements and we have tried to become more environmentally conscious and Earth friendly in our life style.

There is strong agreement in the scientific community that the global climate change effects we are experiencing are the result of human activity. The UN, EPA, IPCC, WMO and so many more have been encouraging us to act, and to act quickly, for quite some time now. I propose in this paper that the religious community to which I belong could be significant agents of change on behalf of the environment. I believe that in order to achieve sustainable positive change, the community would be more impactful if we explored how the principles of integral ecology can be a transformative guide influencing our response to climate change. Integral ecology emphasizes the interconnectedness of all creation—environmental, social, and spiritual—and challenges us to live in harmony with the Earth while advocating for the poor and marginalized, who are most affected by the impacts of climate change.



The question guiding my project is: *How might my community collectively examine and critically reflect upon our engagement with the environment via dialogue and work to integrate concern for the natural world and environmental justice more fully.*

I have chosen to focus the nature of this qualitative study on engaging a subset of the community in a process that includes elements of education, reflection, examine, and dialogue influenced by Catholic Social Teaching, integral ecology, ecofeminism, and critical pedagogy.

At the core of this project is ecological conversion, a process that calls us to a transformation of heart, mind, and action in response to the cry of the earth and the cry of the poor. We will engage the process using critical pedagogy, which emphasizes participation, dialogue, and a shared learning process. We will explore the material in ways that encourage honest and open reflection, both individually and communally. By sharing our thoughts, experiences, and insights, we aim to co-create a space for mutual growth, fostering integration of ecological awareness into our spirituality, ministries, and everyday actions.

Consciousness raising and change are at the very heart of exploring my religious community's relationship with the environment. Setting out on this reflective journey reminds ourselves, and communicates to others, that we are all connected and that everyone and everything matters. It both acknowledges and builds upon the web of interconnection. Sustainability and justice, though worthy of our deepest commitment, are not fixed destinations but ongoing processes—journeys that call for attentive listening, critical dialogue, and a continual willingness to adapt to the evolving nature of life.

With community wide replication, this integrated social and environmental critical reflection and dialogue could not only encourage a shift towards greater interconnectedness to the environment but also inform the development of plans for taking communal action, as well as advocacy for systemic action and change on both local and global levels.

## Exploring the Landscape

Our mission, animated by the Gospel imperative to love<sup>1</sup>, impels us to stand with and advocate for those experiencing great vulnerability. Our world view is inclusive. Through increased access to global news, amplified by the realities impacting our sisters living in South and Central America as well as the Philippines, my religious community has grown in our awareness of how those most on the margins of society and who lack resources are disproportionately surrounded by environmental hazards and degradation ([Kemp, S. P., & Palinkas, L. A., 2015, p. 9](#)). We have engaged in the discourse concerning care for the environment and yet continue to grow in our individual and collective understanding of just how interconnected human beings are to the rest of the natural world. In the Spring of 2023, my religious community gathered for a reoccurring process of dialogue and discernment to elect new leadership as well as set priorities of focus for the community for the next 6 years. Although care for Earth is mentioned in the emergent materials, it seems evident from the language and commitments articulated in the documents, and the silences too, that our care for the environment lacks significant integration with other critical concerns. "It cannot be emphasized enough how everything is interconnected" Pope Francis writes in an [encyclical](#) written in 2015 entitled *Laudato Si': On Care for Our Common Home* (art. 138). The Pope is writing to all of humanity with an urgent call for dialogue concerning humanity's care for creation in the face of the climate crisis. In

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<sup>1</sup> For the Gospel imperative to love from Christian Scripture see the Gospel according to John chapter 13 verse 34

light of the human tendency to prioritize itself over creation, the Pope invokes all who will listen into an awareness that “Many things have to change course, but it is we human beings above all who need to change ([Francis, 2015, art. 202](#)). The cries of humanity and the cries of the planet are intermingled ([Francis, 2015, art. 49](#), Boff, 1997). From my place in the world, and in the company of my religious congregation, I question if our collective world view is inclusive enough?

In addition to sacred scripture, the religious community participating in this study, are guided by a set of principals known as Catholic Social Teaching ([CST](#)) that invite Catholics to be (some might say ~ to love) more like Jesus, who is the central focus for all Christians. Based in a message delivered again and again by Hebrew prophets who tirelessly proclaimed God’s preferential love for the poor and to express God’s desire and commitment to be in a covenantal (sacred contract or agreement) relationship with the people that was grounded in love and justice. Catholics believe that God sent a child into the world who would fulfill God’s promise to send a savior into the world to restore communion between God and humanity. For Christians, the person of Jesus was that long-awaited savior. CST has developed through the centuries as various Popes have added or changed elements to meet the signs of the times. According to the United States Conference of Catholic Bishops, CST is based in the understanding and belief that “every person, from the moment of conception to natural death, has inherent dignity and a right to life consistent with that dignity. Human dignity comes from God, not from any human quality or accomplishment” ([USCCB, 2024](#)). Elements of CST were first articulated in the late 1800’s around the time of the Industrial Revolution and were initiated by Pope Leo in 1891 by an encyclical (public letter to the church community from its leadership) titled *Rerum Novarum: Rights and Duties of Capital and Labor* that was promulgated as a response to the poor working conditions in the industries that were developing. Through the centuries that followed, additional elements of Catholic Social Teaching would develop as the Church has sought to provide understanding and guidance in areas or social and moral values that are consistent with the gospel message of love and justice. Today, CST consists of the following principals and understandings:

- ✳ Life and Dignity of the Human Person
- ✳ Call to Family, Community, and Participation
- ✳ (Protected) Rights with (Personal and Social) Responsibilities
- ✳ Option (Priority) for the Poor and Vulnerable
- ✳ The Dignity of Work and the Rights of Workers
- ✳ Solidarity (One human family)
- ✳ Stewardship for God's Creation

“These moral values and others outlined in various papal and episcopal (church) documents are part of a systematic moral framework and a precious intellectual heritage that we call Catholic social teaching” ([USCCB, 2024](#)). These principals guide the Catholic community (and anyone welcomed to adopt or adhere to them) in living in right relationship with all of life, and for believers, as a way of maintaining the sacred covenant of radical and unconditional love between a God of Creation and a beloved community. As a community of women religious dedicated to a life of service, these principals have a particular significance in where and how our service is lived out. The history of CST, while just briefly mentioned here, of how these principals developed provides important context for how we might develop and articulate future critical concerns. In exploring environmental justice, one might find particular relevance in the value of *Stewardship of God’s Creation*, the most recently articulated



principal to be incorporated into CST. While caring for our common home is certainly applicable and primary to this particular principal of CST, it is important to acknowledge the nonlinear and interconnected nature of the principals that continually invite participants to engage them as a holistic community of diverse values working cooperatively to stabilize a type of relational web or scaffolding, designed with the hope of ensuring a more just and inclusive societal structure.

Because we are impelled by a desire for greater equity, relationality and sustainable change, the problem of human induced climate change compels my community to examine our impact and deconstruct the issues. The Pope writes: “Human beings, while capable of the worst, are also capable of rising above themselves, choosing again what is good, and making a new start” ([2015, art. 205](#)). The immense systems change that is needed, cannot sustain or shift significantly enough without a more profound sense of being deeply interconnected to the reality being transformed. “A great cultural, spiritual and educational challenge stands before us, and it will demand that we set out on the long path of renewal.” ([Francis 2015, art.202](#))

The path of renewal Pope Francis calls the world to is a journey in integral ecology. Ecology, as defined by the Ecological Society of America ([2025](#)), is “the study of the relationships between living organisms, including humans, and their physical environment; it seeks to understand the vital connections between plants and animals and the world around them.” Integral ecology brings together multiple perspectives to understand the connections found in creation. Esbjörn-Hargens and Zimmerman describe it as “a framework: a way of integrating multiple approaches to ecology and environmental studies into a complex, multidimensional meta-disciplinary approach to the natural world and our embeddedness within it” ([2009, pp. 1–2](#)).

Throughout *Laudato Si'*, Pope Francis reminds us of our interconnectedness with all creation: “We have forgotten that we ourselves are dust of the Earth (cf. Gen 2:7); our very bodies are made up of her elements, we breathe her air and we receive life and refreshment from her waters” ([Francis, 2015, art. 2](#)). While *Laudato Si'* renewed ecological discourse by speaking publicly from a religious perspective, the concept of integral ecology has long been evolving.

Mickey et al. ([2013](#)) trace its origins to early cooperative human activities like controlling fire and cultivating plants—life-sustaining practices made possible by integrating diverse realities in relationship. Integral ecology, they write, is “the quest for knowledge, theoretical and practical, of the depth and complexity of relationships between beings” ([pp. 11–12](#)). They note that the integration of ecologies emerged across disciplines as individuals recognized intersections, tensions, and possibilities in the relationships among them. The term “integral ecology” was first used in the 1950s by Hilary Moore in a marine ecology textbook, describing an approach combining autecology and synecology. It would reemerge four decades later in the work of Thomas Berry, Leonardo Boff, and Ken Wilber, who independently explored interconnections among ecologies in the 1990s ([Mickey et al., p. 16](#)).

Ken Wilber developed a framework for Integral Theory focused on the human element within the natural world, exploring how human knowledge and experience relate to it. “Wilber’s Integral vision was brought into a more explicitly ecological context by leading Integral theorist Sean Esbjörn-Hargens and the environmental philosopher Michael E. Zimmerman” ([Mickey et al., 2013, pp. 16–17](#)).

From a Catholic theological perspective, Thomas Berry and Leonardo Boff have significantly shaped the development of integral ecology. Berry, a U.S.-born priest and cultural historian well-versed in world religions, Earth history, and evolution, ushered in a new way of understanding humanity’s relationship to the natural world. In partnership with physicist Brian Swimme, Berry offered [The](#)

[Universe Story](#) in 1992: “a scientifically informed mythic narrative of the origin and integration of the universe, stars, solar systems, the earth and life itself” ([Scharper, 1993, p. 117](#)). Rather than viewing life as a series of isolated encounters with humanity at the center, Berry and Swimme’s narrative shifted the worldview: humanity is not the culmination of evolution, but one participant among many. “In this ‘new story’ about the universe, all matter, all reality, is not only interconnected, it is ‘bonded,’ suggesting an affective dimension to interrelationships within the cosmos” ([Scharper, 1993, p. 117](#)). For Berry, the unfolding of the cosmos is a sacred journey. Disturbed by Western disregard for the Earth, he wrote, “we need an ecological spirituality with an integral ecologist as spiritual guide” (2009, p. 135).

Leonardo Boff’s integral ecology is deeply shaped by his earlier work in liberation theology, rooted in his time living among the people of the Amazon. Twice silenced by the Catholic Church for his writings on poverty and theology, Boff left the Franciscan order after the second censure and turned his attention toward ecological theology. For Boff, “ecological discourse is structured around the web of relationships, interdependencies, and inclusions that sustain and constitute our universe” (1997, p. 155). Working from a cosmological paradigm akin to Berry’s, Boff describes life with Earth as “a huge synergetic process based on collaboration and solidarity among creatures” (1995, p. 86). Though never named directly, Boff’s influence is evident throughout *Laudato Si’*.

While *Laudato Si’* revitalized ecological and theological discourse, particularly for Catholics seeking a stronger integration of science and faith, it has also been critiqued for insufficient scientific engagement ([Deane-Drummond, 2016](#)). Additionally, a notable absence is the feminine perspective—a gap that persists in broader discussions of integral ecology.

To address this, the present project also draws from ecofeminism, acknowledging the positionality of the participants as women embedded in a patriarchal religious institution, committed to social justice, concerned for the environment, and aware of intersectional dynamics. Coined by Françoise d’Eaubonne in the 1970s ([Verchick, 1996, p. 56](#)), ecofeminism explores how patriarchal hierarchies affect both gender relations and human-nature relationships. “Ecofeminism sees hierarchies exhibited in gender relations through patriarchal social structures, and in relations with nature through an anthropocentric view that humanity is more valuable than nature and all other living beings” ([Bove, 2021](#)).

The Catholic Church, while demographically gender-equal in membership, remains structurally male-dominated. This historical context has led religious women to develop ecofeminist frameworks that resist the normalization of oppression toward both women and the Earth. Ecofeminism seeks to unmask the collusion of oppressive harms toward women and the natural world ([Nogueira-Godsey, 2013, pp. 92-94](#)). Elaine Nogueira Godsey, (2013) writing on Brazilian Catholic theologian and ecofeminist nun, Ivone Gebara, asserts: “Her vocational life defies the traditional theological anthropology advocated by the Catholic Church, which holds that only men are suited to represent God’s work and image on this earth” (p. 92). This perspective is reflective of many women of faith, particularly those in religious life, who challenge dominant narratives and structures by their propensity for inclusive and collaborative presence and leadership.

This project is grounded in a contextual and collective approach. Our religious community’s intentional proximity to under-resourced and marginalized populations makes us particularly sensitive to the environmental and social impacts of climate change. Lived experiences, such as rebuilding after disasters or sharing life with those displaced, offer a radically different ecological awareness than information acquired through media or scholarship. As Verchick (1996) writes, “contextual analysis does not necessarily guarantee a particular substantive result; rather it is the process of inquiry that is



important” (p. 8). Exploring our realities together builds a capacity for diversity and a sense of community. By critically engaging with these diverse experiences and perspectives together, we deepen our understanding and strengthen our sense of community, which in turn opens up even more inclusive and insightful lines of inquiry.

## Exploring the Terrain

The epistemologies of constructivism and interpretivism are relevant to this project due to its subjective and transformative nature. Participants acquire knowledge through personal reflection, shared experiences, and interactions with one another. Constructivism, as a theory of knowledge, holds that knowledge is not passively received but actively constructed by the participant ([von Glasersfeld, 1984, p. 13-14](#)). Yet von Glasersfeld (1984) cautions against a traditional constructivist epistemology “that inevitably leads to the contention that man — and man alone — is responsible for his thinking, his knowledge and, therefore, also for what he does” ([pp. 5–6](#)). He instead advocates a more holistic approach, noting that “radical constructivism maintains...that the operations by means of which we assemble our experiential world can be explored, and that an awareness of this operating...can help us do it differently and, perhaps, better” ([1984, p. 6](#)). This project explores how meaning is constructed individually and collectively as a community within other communities. In honoring von Glasersfeld’s call for greater awareness and holism, a more critical “post-epistemological” ([von Glasersfeld, 1990, p. 19](#); [Noddings, 1990, p. 7](#)) approach is warranted.

Paulo Freire’s critical pedagogy offers such an approach. As the group explores our interconnectedness through reflection and dialogue, Freire’s epistemology supports a movement beyond individual interpretation toward the co-construction of knowledge. Freire (1970) writes: “knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other” ([p. 72](#)). His participatory vision challenges hierarchical models of knowledge transfer, encouraging mutual engagement. In this way, critical dialogue extends the constructivist foundations laid by von Glasersfeld and enables a more integrated path toward understanding.

Interpretivism further affirms the relevance of context and experience. “Interpretivism asserts that social phenomena cannot be understood through mere objective observation, but must be interpreted as meaningful actions, social processes, and experiences constructed by those involved in them” ([Brinkmann, 2014, p. 21](#)). As we examine our attitudes, behaviors, and relationships, interpretivism supports the group’s contextual interpretation of interconnectedness—shaped by diverse experiences, the urban environment, and religious life within a particular charism and the broader Church. My role as both participant and researcher intentionally facilitates active engagement in this exploration and critique.

This project is also framed as a pilgrimage, embodying meaning-making as an unfolding communal journey. The poet Antonio Machado expresses this approach well: “we will make the way by walking.” Like Freire’s view of dialogue, this affirms that understanding arises within—and because of—context. Pilgrimage can be defined as “a journey resulting from religious causes, externally to a holy site, and internally for spiritual purposes and internal understanding” (Barber, 1993, p. 1). The journey of understanding within the context of this project is animated by the Catholic religious tradition of a women’s religious order who desires integrity of word and deed as it explores its interconnectedness with Earth, our sacred and common home, so that we may contribute to and understand our integral well-being (lack of plurality intentional).

# The Paths We Take

In his 2015 encyclical *Laudato Si': On Care for Our Common Home*, Pope Francis addressed the interconnected crises of environmental degradation, climate change, and growing inequality. Writing to all of humanity, he issued an urgent call for global dialogue on how we are treating the Earth and its resources, and how this treatment is intimately linked to the welfare of the poor and marginalized.

This project, framed as a pilgrimage, is a response to that call—an effort to engage my religious community in dialogue that explores our interconnectedness with all of creation. As a vowed member of an international Roman Catholic community of women religious, I ask: How might my community collectively examine and critically reflect upon our engagement with the environment via dialogue, and work to integrate concern for the natural world and environmental justice more fully?

This qualitative study engages a small subset of my local community in a process that includes elements of education, reflection, examen, and dialogue, influenced by Catholic Social Teaching, integral ecology, ecofeminism, and critical pedagogy. Given the personal and conversational nature of this work, I have chosen narrative inquiry as the primary methodological approach. As both participant and researcher, I invited three other sisters to engage in an organic process using participatory methods such as community mapping, collective viewing of short videos, guided meditations, reflective walks, and prayer. Each two-hour session included reflective content and participant-led dialogue, which shaped the flow and focus of future sessions.

Drawing on Paulo Freire's critical pedagogy, participants were invited to reflect on previous and current sessions, share emerging insights, and help identify themes guiding our collective inquiry. By centering the stories and experiences shared in personal reflection and group dialogue, I aim to understand how members of my community make meaning of their relationship with the environment—both individually and collectively.

A significant element of critical pedagogy is dialogue that leads to action. While I affirm the importance of explicit outcomes, especially for empowering marginalized communities, this study focuses on more implicit forms of action—such as self-awareness and consciousness raising—which I recognize as meaningful and transformative action states in themselves. Through shared exploration of lived experience, participants may uncover new ways of engaging the world around them, fostering greater relational diversity, integration, and ecological justice in our shared home.

Framing the project as pilgrimage transforms it from a linear process into a sacred, purposeful journey. It emphasizes spiritual growth and deepening awareness as participants reflect on themes of integral ecology, ecological justice, and our congregation's mission and charism. This journey invites both individual and communal transformation, with the potential to influence the wider community and deepen its relationship with creation.

With broader replication, this approach to critical reflection and dialogue could foster a deeper sense of interconnectedness with the environment and support communal planning for both local action and systemic change. At its core, this project affirms that raising consciousness and inspiring change are central to exploring my community's relationship with Earth. It reminds us—and communicates to others—that everyone and everything matters. We are already embedded in a web of interconnection. Sustainability and justice are not fixed destinations, but ongoing processes: pilgrimages that call us to



attentive listening, critical dialogue, and a willingness to adapt as life continues to unfold.

## Land Acknowledgement

The religious community participating in this study acknowledges with respect the Unami Lenape nation, whose traditional homeland, Lenapehoking, our community is situated. We recognize the longstanding significance of this ancestral and spiritual territory for Lenape Nations past and present. We acknowledge, with sorrow, that we live in a state within the United States that has failed to publicly acknowledge any of the First Nations peoples who were pushed from their homeland. Even as we work to increase the historical awareness of Indigenous exclusion and erasure, we acknowledge the effect of that legacy - in institutions, our community, this country, and the planet.

## Who's Walking

To preserve anonymity, descriptive details have been adjusted where needed, and each of the four participants selected an alternative name by which to be known. All preferred the use of she/her pronouns. The researcher-participant will be referenced as "Guide," a thematic and concise title. With an ecofeminist framing, every effort was made for the Guide to act primarily as participant and allow the group to guide itself.

The participants share life in an apartment above a ministry founded by their religious community. Though now separately incorporated, the ministry continues to serve a highly under-resourced neighborhood in a large East Coast city, offering educational programs for children, adult GED and workforce support, weekly food distribution, and a small senior adult day program.

Among us: one entered religious life after high school and is now in her late seventies; another, a so-called "delayed vocation," joined nearly a decade after college and has recently summited midlife; one is celebrating 25 years as a sister this year and is in her mid-forties, having entered religious life at a very young age; and one, in her late twenties, is in discernment with our community. None of us are native to the city we now live in, although two have been here long enough to consider it home. One of us is from one of Africa's 54 countries; another has lived in several places, always west of the Mississippi.

These are their stories...

## Waymarks



Each session concludes with a "Waymark." A guiding quote that gestures toward the underlying currents of meaning, theory, and transformation present in our shared experience. These quotes, drawn from ecofeminist thinkers, Catholic Social Thought, and critical pedagogues, or indigenous wisdom function as symbolic trail markers in our communal journey

## The Invitation: Love is in the Air

This project began with an invitation—one extended in the quiet rhythms of ordinary community life. On Valentine’s Day, a day of remembering love, I invited the three women with whom I live—my religious community—to consider joining me in a journey. The kitchen table, a place of daily relational and nutritional nourishment, held something unexpected. Deep pink roses, the color of compassionate berry, familiar to us as a community, gathered gently in the middle. Individual, personal sized, cherry pies, a largely house favorite, placed on the four cloth placemats protecting the round wooden table. At each place setting, a Valentine’s Day card. “Love Makes the World Go Round,” the front reminded us, written boldly above a hand drawn globe sharing space with three diverse figures holding hands. Inside: an uplifting message concluded by wishes for a “Happy Hearts Day”—and a short, handwritten note pointing the way to our community prayer space, where “an invitation for loving” awaited.



There, each sister found an invitation to consider joining me in a shared journey. A pilgrimage to explore of our individual and shared relationships with all of creation, shaped by inclusion, prayerful reflection, presence, and dialogue. Waymarked by the quiet gesture of roses and inclusive sentiment, a path towards right relationship and justice was marked. Each was free to choose whether to explore or not as the honoring of choice is essential in matters of relational integrity and interconnection.

I offered the invitation with some uncertainty, simply impelled to respond to Pope Francis’ invitation articulated nearly a decade earlier to the world to engage in a dialogue about how we care for our common home—and how deeply our love for people and planet must be intertwined. Unclear exactly where the path of our dialogue might lead, I offered this small group a sense of direction, but not a map. I was both guide and fellow pilgrim, stepping into the unknown alongside my companions, trusting that what we needed would emerge as we moved.

*This inclusive path is one that I intentionally did not chart alone. We would co-create it as we explored, listening for what beckoned us, reflecting on what would emerge, and making our way by walking.*

And so, we set out with care.

### A Few Logistics Concerning the Journey

As researcher and participant, I discussed my need to document and/or record sessions as a means of collecting data via experiences shared that I would be writing about and displaying through pictures. I ensured anonymity unless they wanted to be referenced explicitly, and asked if they had questions or concerns about how I would be engaging the content of our time together. I asked for permission to

proceed under the current understanding and agreement given.

I communicated the relational nature of the project, flexibility of process, and the importance of articulating emergent thoughts, feelings, concerns, or questions so that each of us is shaping the collective experience. Reflected for the group on Paulo Freire's approach to co-constructed and mutual learning where each of us are both learner and teacher as we engage one another and all of creation in this journey to grow in our awareness and understanding of our interconnected reality.

We discussed use of some terms to ensure we were approaching material with similar understanding. We talked about how sometimes words are used interchangeably like "natural world" and "the environment." We discussed that we may bump into confusion from time to time about concepts and to be aware that we might not all share the same understanding for certain references. Encouraged group to be as conscious as possible but also solicitous when there may be a need for clarity.

We confirmed time and place for gatherings and agreed that we would try to hold two hours of availability for each session where at all possible. The group preferred a fixed day of the week when possible for ease of planning.

Photos used in this storytelling were taken by researcher unless indicated otherwise.





## Session 1: Collecting Ourselves for the Journey



We gathered on a Sunday morning, in the heart of our shared living space. We formed a cozy circle of three stuffed chairs and a couch around a wooden, glass-topped coffee table. There was the smell of toast and the clinking of metal on ceramic as a participant refills her coffee. We gradually slid into our usual places, rounding out the circle as the hour approached. Waiting for us on the table at our center was a lantern candle, an open Bible, and an up-righted ceramic tile depicting our foundress—with one arm wrapped protectively around a woman and child, and the other reaching towards others nearby. An image of compassionate service - of being seen and felt and gathered in. A reminder without words that, “the poor need help today, not next week” as she is often quoted. Also sharing the table space was a colorful painting: a round table with diverse figures seated around it—different ethnicities, faiths, ways of being. One seat was left empty, beckoning the viewer to take their place. Also, there was a tented image of a compass, a remnant of our last assembly’s invitation to “Explore Anew.”

We began with an invitation to remember the stories embraced by the table before us. I invited each of us to lean into the symbols and connect ourselves in this space and time. We named the Lenape Nation, the first peoples of this land we now live on, and, with gratitude, began in prayer. A woman of the Lenape Nation—voiced a prayer across traditions, across history, inviting us into relationship with Earth and each other. A short video on reconnecting with Nature followed, and then, silence. A silence to arrive in. A silence to absorb and become one with. A silence to re-member ourselves.

Each person brought a symbol, a piece of their story, to remain in the shared space— something that spoke of their relationship with the natural world. In this way, our personal stories could begin to shape the collective one we would create together. The table slowly transformed into an altar of lived connections:

*“Access to safe drinkable water is a basic and universal human right, since it is essential to human survival and, as such, is a condition for the exercise of other human rights. Our world has a grave social debt towards the poor who lack access to drinking water because they are denied the right to a life consistent with their inalienable dignity.”*

This quote from Pope Francis (2015, art. 30) about water was provided by a participant. She has had this quote hanging up on a card in her workspace. She keeps it there because she has a great concern for the well-being of the planet and worries a great deal about the environment and climate change. She has a particular concern regarding water and this care is what impelled her to go into environmental engineering.



This rock was shared by a participant who grew up on a rocky coast very close to the ocean who feels a strong spiritual connection to the ocean to this day. The rock is painted with the words "Lord increase our faith" and was given to her by a friend many years ago. The power and rhythms in nature speak to her of God and how God makes a way and shows those who listen. She intentionally placed it near the

Exploring Anew card on the table because she felt it resonated with what this time of sharing was about for all of us.

This turtle was shared by a participant who grew up along a river and who spent a great deal of time outside as a child. She shared that the turtle was one of her first companions as a kid. It's gentle, often skittish, and mysterious presence animated wonder and curiosity within her, as well as a desire to protect her friends in the natural world whom she spent so much time with growing up.



Another participant placed a dish of soil near the turtle, "to make it feel more at home." She really wanted to bring the sun into the space because for her there is no beginning or end in nature and felt she could not be separated easily from nature. Since she could not capture the sun, she had to settle for bringing the soil.



After this symbolic sharing, I asked if there was anything more—something not yet spoken, something that had been stirred.

One participant wanted to add that she thinks humans are destroying creation. She wished nature could talk because it has so much to say. Nature speaks loudly to her by how it makes way for itself. As a child, she could not understand how people could become disconnected from one another—until she saw it happen. "*Nature teaches me to cooperate,*" she said. "*To make room.*"

Another participant wanted to add her love for animals that she feels reflects the relational side of her connection to nature, while her work as an engineer engages her intellectually. Looking over towards the participant who shared the dirt, she mentions wanting to refer to something that symbol reminded her of from school. She recalls a professor from a soil science class describing soil as uniquely composed of organic and inorganic elements—dying leaves, rocks, water, air, and microbes. The professor was highlighting the unique assemblance of bits of everything in nature—seeing soil perhaps as the next best thing to the sun as far as she could see.

*As we reflected on the symbols now gathered at the center, I proposed the idea of naming ourselves after what we had shared—a way to carry these stories forward without revealing names. The participants embraced the idea and so from this point further, individuals in the group will be references as Rock, Soil, Turtle, and Water.*

In this part of the session the group reflected on their personal journeys toward religious life. They describe how they became connected to our community. Stories of invitation, relationship, and revelatory way finding.

Rock described her path as "God's way." Taught by sisters from the community in high school, she later transferred to their school in another city during her senior year when her father's job required the family to relocate. That same year, her mother was diagnosed with cancer, and a sister's kindness in

visiting her mother, and their attentiveness to her family, deepened Rock's connection to the community. By the end of the year, she discerned her own call and applied to enter. Walking out the door from the interview, the professed sister said they'd discern and be in touch. "I thought the call came from God?" Rock's mother said in friendly but clear challenge. That being said, Rock was sure she wasn't getting in. Despite her fear, the call from God came - neatly typed on community stationary.

For Soil, faith was woven into her family life throughout her childhood. We prayed together every day and everyone was expected to add their voice. Soil was shaped by the daily prayers her grandmother offered. She interceded "for the blind, the lame,"...and others in need. Soil, being young and in need of prayer ideas, initially repeated the prayers of her elder without really understanding the words. She eventually asked her grandmother who these people were that she prayed for and her grandmother taught Soil about the sufferings of others outside of their immediate circle. Soil was deeply moved and sought to learn more and wondered how she could do more than pray for these individuals. Through inquiring in her church community about who was connecting to people who were vulnerable, soil was introduced to a religious community. With them, she met many of the people from her grandmother's prayers. Over time, she longed for education to serve more effectively, but the religious community she was in did not offer such opportunities. Seeking a new path, she discerned to step away from the order. While furthering her education, she met up with another religious community not far from where she was staying and was drawn to the way the sisters in our community engaged one another and how they served others. The warmth and depth of their interactions and care for those who suffer confirmed her decision to transfer.

After college, Turtle joined a faith-based volunteer program before starting her career as a social worker. She was drawn to exploring new cultures, living simply in community, and serving alongside others motivated by faith. Her first encounter with a sister came during an interview for the program they sponsored, and that service year introduced her to both the community and the experiences she'd hoped for. A second volunteer year led to a job with the program, deepening her connection to a life of service. Surrounded by others committed to simplicity and justice, she began to wonder if religious life might be her path. After years of trying to "figure it out", she yielded to the wisdom that experience is often the best teacher. She tried it—and it fit.

Water's path was sparked by a conversation with her spiritual director, who observed her deep faith and concern for suffering in the world, yet sensed she was "spinning her wheels." He nudged her to explore religious life. She was hesitant, thinking nuns were only teachers or nurses and so not a match for her path as an engineer. Wanting to keep her word to her director, she inquired with a few communities. Before hearing back from communities she'd contacted, a church bulletin announced a talk by a sister from our congregation. The timing felt like a sign. That encounter led to informal discernment, and through relationships with other sisters, she began to see herself in religious life in a way she hadn't before. Her journey of discernment continues to unfold.

*As each story unfolded, I began to see more clearly how calling and connection are rarely linear. They are winding, full of unexpected companions and turns. But what marked every story was a kind of listening—to the world, to others, to Spirit, and to the self. A listening that slowly became a response.*

As the session ended, we found ourselves situated differently than how we arrived. Something had shifted, however subtly. In the symbols on the table, the stories they evoked, and the earthy names we adopted opened way for relational space. We had begun the pilgrimage by gathering inward and



packing our bag with a fuller sense of selves, how we got here, and who comes with us. With a greater sense of who we are, we set out.



*“The universe is not a collection of objects, but a communion of subjects.”*

— **Thomas Berry**, *The Great Work: Our Way Into the Future* (1999), p. 17

## Session 2: We Are Here! Which is Where Exactly?

The shared living space buzzed with quiet activity that Sunday morning, as the group drifted in one by one. On the dining "room" table were supplies that hinted at the meeting ahead: markers, crayons, and colored pencils mingling with rolls of wrapping paper and flattened boxes, neatly pushed aside. They weren't a usual sight, prompting a few curious remarks. "Are we cleaning out?" someone ventured, eyeing the scene suspiciously. Another murmured, "Oh no," came a groan from another, recognizing that something artistic might be in store today.

One participant calmly pulled out her crocheting, settling into the rhythm of waiting, while another gravitated toward the coffee pot, grateful and seizing the moment to fill up. Yet, one among the group was missing. "I'll check," one offered, disappearing down the hallway toward the bedrooms. Moments later, a faintly harried voice called back, "Coming, coming!" Relief swept the room as the missing piece of their little gathering appeared.

"Welcome, traveler," someone greeted with a warm smile, prompting laughter from the others. With a grin and a hurried thanks, she slipped into her seat. "Coffee?" Someone wondered aloud in her direction. "I am fine." She assures the group.

"Thanks, everyone, for coming back," the participant/researcher offered lightheartedly.

*This gathering space, once ordinary, now seemed to carry a quiet momentum—layered with prior conversations, shared intentions, and growing trust. The table, cluttered with art supplies and everyday objects, mirrored our own inner landscapes: textured, complex, and waiting to be mapped.*

We began with a short video, "What is Integral Ecology?" by Eco Catholic. It introduced Pope Francis' framing of our interconnected crises in *Laudato Si'* and invited us to imagine working together to protect our common home.

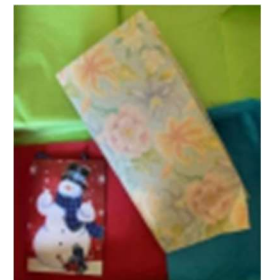
From there, we moved into our "Proximity and Connection Mapping" activity where each of us asked to draw a map of our personal connection to nature, considering physical proximity, senses, and relational connections. The invitation was open-ended, and art supplies were available, though some opted to use their own materials.

Soil shared first. Her map transported us to her childhood in Africa, skipping over her current urban surroundings because, she said, they didn't stir her in the same way. "I wanted to draw the sky," she laughed, "the moon and the rain!" Her map showed villages and animals together, a church humorously next to a factory—"Maybe they repent after polluting." She described how bribery often bypassed forest protections and how the smell of charcoal still stays with her. Her stories, rich in texture, held both laughter and lament—especially as she spoke of elephants knocking over mud homes in search of food and water. "We are in this together," she declared, naming our shared responsibility to care for Earth.

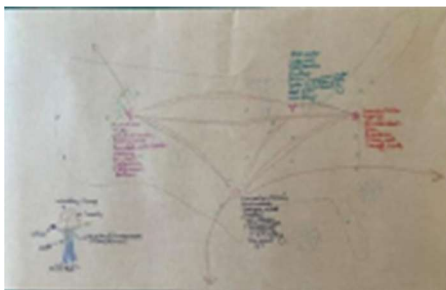


Turtle layered her map with flowered paper, expressing a deep connection to nature. Over it, she placed translucent purple paper, symbolizing how urban life obscures that connection. Her map had nature "poking through" as weather, food, birdsong. She drew herself as a bee: small, mobile, cooperative, essential. Yet her senses in the city were dulled by sirens over birdsong, exhaust fumes instead of flowers, and structure in place of sunsets.

Rock mapped memory through the seasons. Her childhood in New England was filled with winter joy—sledding, snowmen, and time with family. Summer meant oceans and mowing the lawn with her father. Her map emphasized rhythm and sensory immersion: the silence of snow, the music of waves.



Water organized her map around places she's lived. From the fishy lake smells of



her childhood in the Northwest to dry, dusty detachment in the Southwest, each place shaped her differently. Camping with her father, hiking in the Midwest, witnessing tourism's environmental costs, noticing birds and stray cats thriving among the city's waste—all these found their place on her map. As an environmental engineer, hurricanes and water systems were never far from her thoughts. "Even public transit is part of how I try to tread lighter," she added.

*As our maps unfolded, a subtle shift occurred. We moved from personal landscapes to collective noticing from which questions regarding awareness, power, care, and complicity emerged. We acknowledged how our senses, influenced by our surroundings, can either deepen or dull our relational awareness. We also sensed something was being missed or unseen in our everyday surroundings—and that our different lenses might help us piece it together.*

In reflecting about each other's maps and the connections they held, litter came up—a lot.

Soil voiced shock at how much garbage lined our streets, noting she'd lived in D.C. and Connecticut but felt confused by the condition here. "I wasn't sure I was in America," she said remembering when

she first arrived in the city. Water, who is attracted to city life for its environmentally efficient, also noted her surprise at how normalized littering seems in this area.

Soil shared how in a former community, residents would clean the streets together. “It doesn’t seem as acceptable here,” she said, unsure if it’s seen as overstepping. Water agreed—her whiteness and newcomer status make her hesitate to act. “I don’t know how that would be received,” she said.

Turtle asked: “Why is the litter here?” Soil wondered if it came from a lack of connection. Water added that infrastructure matters—many people don’t have consistent waste removal access. She recalls hearing about programs for the unhoused in another city that helped with trash services.

Rock pointed to deeper patterns: disinvestment. The area used to have more longtime residents who cared for it. A community garden once spurred local pride, but now, “It feels like houses are just shelters now,” she said. Soil nodded. “People seem to think only about themselves,” she said, “not their impact on others.” Soil wonders what challenges keep them from caring.

Water mentioned *Evicted*, a book highlighting how evictions and corporate ownership drain neighborhoods of their agency and resources. What looks like neglect, she explained, often stems from systemic economic forces. Turtle connected it back to environment and identity. “When trash is everywhere, you assume it belongs,” she said. She’s seen outsiders dumping here, too. “It’s becoming normalized,” she added. “A deepening disregard—for self, for others, for Earth.”

*Here, the conversation was shifting the group beyond a focus on litter and into social erosion that takes place when disconnection is normalized. A question lingered: How do we reclaim reverence in the face of disregard?*

As the conversation slowed, we paused: The guide asked “What are we noticing? What’s emerging? What feels unfinished?”

Not being familiar, Water asked if what we were seeing was a city thing, a regional issue, or something broader. Soil observed that some neighborhoods are very clean—maybe those are maintained differently? Water heard that workers were paid to keep up tourist areas. Turtle admitted that this conversation highlights that she doesn’t know enough about particulars concerning our local waste, food, water, and electric infrastructure. “We need to explore more,” she believes. Water adds with a grin, “Yah, I need at least three more layers of data.”

Rock reflected on neighborhood changes. Turtle mused about how we’re perceived, “the nuns,” living in this commercial space. Would things feel different if we lived in nearby homes? Rock reminded us that longtime community leaders are moving on; maybe we need to show up differently. Turtle mentioned how our ministries once naturally connected us to neighbors. But times—and roles—have shifted there a bit. Maybe it’s time we explore new ways of being present, as our own chapter documents have been urging.

*The call to deeper inquiry engaged our willingness to keep asking, to stay proximate, to let complexity inform our dialogue.*



There were a few minutes of silence. We had run over the time we allocated. A next direction did not seem evident. Given one in the group was already late for her next engagement, we ended our time on that note.

In mapping personal proximities to nature, we unexpectedly found ourselves navigating structural realities. Litter gave passage to disconnection and disinvestment. We noticed how infrastructure and ownership shape what's possible, and how silence and distance from neighbors may inhibit us from engaging. Within the unfolding complexity, we shifted into more layered questions, to imagine new forms of engagement, and to wonder how our presence in this place might yet be reimagined. The question is no longer just about where we are, but how are we present...and to whom and what?



*"Paying attention is a form of reciprocity with the living world, receiving the gifts with open eyes and open heart."*

— Robin Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants* (2013)

## Session 3: Rooting Around



We began by circling back. The gathering space held familiar elements: symbols of our religious community's charism and mission, visual reminders of our spiritual tradition, our commitment to inclusivity and invitation, and tangible signs of each participant's personal connection to creation. These, along with the Proximity and Connection Maps from the previous session, were placed intentionally to invite quiet reflection.

The guide offered a verbal summary, revisiting the shared dialogue from Session 2. Each participant's voice was echoed back in short, paraphrased breezes, carrying forward the essences of what had been said, already co-mingling with what had lingered, and what had emerged or was still infusing. In that context, we turned to one another again:

## What did we encounter from reviewing where we have been?

Turtle shared how our last conversation led her to explore online videos about life in our city's neighborhoods. What she saw—young men with guns, smoking, speaking of violence, survival, and a culture of silence—was jarring. Yet amidst the pain, there was a striking common thread: none of them wanted this life for the next generation. Turtle recognized the dissonance between our lived experience and theirs and found herself wondering how these realities connect with the questions we've been asking together.

With a sheepish grin, Soil admitted she hadn't been thinking about any of this. The room burst into laughter. But she quickly shifted gears, sharing excitement over seeing solar panels powering streetlights during a recent trip—technology that reminded her of home in Africa, where such tools are rare and precious. She then turned our attention to a young boy at our center: “aaaalllways—I mean ALL WAYS—in trouble,” she said, shaking her head. He echoes the harsh language he hears at home, and his mother disciplines him using the same words. Soil sees the connection between these children and the men in Turtle's videos. “If a tree isn't straightened while young, it will grow crooked,” she said, quoting a phrase from her culture. Then the question: How will these kids break the cycle, when those they admire are also those who raise them?

Water recalled school interviews that revealed children as young as elementary age experimenting with drugs. She had been shocked by that then—and is still surprised we don't see more needles in the streets given the city's drug problems. Turtle suggested that might reflect differences in the types of drugs prevalent in various neighborhoods. From there, Water pivoted to a book she had read about beach cleanups. The author argued they are more about raising awareness than reversing environmental harm. Water drew a connection to our previous litter conversation—how small acts here may feel futile against systemic issues. Yet still, it is our community who will suffer the most from climate change. The weight of that injustice stays with her.

Rock turned to memory and observation. The neighborhood, she noted, has changed—more vacant homes, fewer people outside, and community meetings that once brought neighbors together now barely happening. “Where is this neighborhood going?” she asked. “What is our role?” With the church and school both gone, she wondered what kind of presence is needed now.

Soil added that abandoned houses create insecurity. Rock nodded, remembering the murders that took place across the street from us. These events sharpen the question of safety, and the instability that marks the area.

Rock wondered aloud how our ministry should adapt. How do we remain a meaningful presence? Turtle picked up the thread, turning to Rock and asking what exactly we mean when we speak of “our ministry.” She reflected on the distinction between the service we offer as a vowed religious community and the work of the formal ministry we helped establish. Perhaps our way of being present in the community can take a different approach than the one taken by the established ministry she offers. Rock agreed and returns us to our foundress's spirit of recognizing needs and responding boldly. Rock suggests we remain open to evolution.

*This moment of circling back allowed us to gather ourselves before stepping outward—rooting ourselves in the journey so far, even as we prepared to move around and beyond it.*

The dialogue circle shifted into motion. Participants were invited to spend about twenty minutes engaging with their surroundings—noticing what spoke, what stirred, what resisted. There was no set path or posture. They could walk or sit, observe or absorb—whatever invited their attention in the moment. Before stepping out, they watched a brief video clip from *Healing Through the Land*, which featured a small group of women from just down the street who tend a nearby garden. The women shared their story and connection to the garden, and concluded it with an invitation, “Just Come!”

*The invitation to come—to see and to be seen—echoed as we stepped outside. The walk, though individual, became an embodied form of collective noticing, drawing our attention to both beauty and burden woven into our shared neighborhood.*

### **What did we encounter from stepping out into the neighborhood?**

Water noted that three of them ended up at the garden featured in the video. Rock expressed joy at finding the garden clean and still cared for. Though the absence of some longtime community members saddened her, she took heart in spaces like the ballpark and playground, where neighborhood children still play.

Soil chose a longer path. She passed by a closed church where they had once worshipped, reflecting on its slow decay—missing doorknobs, a lack of care. Along the way, she noticed smiling strangers and distant music from another church. Though she reached the garden, her path also wound past abandoned cars, broken infrastructure, and wasted water. “I hate to see water flowing like that,” she said. Even so, the human warmth she encountered reminded her of the complexity of place.



Turtle’s journey began with a moment of curiosity—a leaf bag branded “*Lowe’s knows a well-kept yard.*” She listened to birds, a train, and church singing, noting the contrast between streets: some clean, others littered with trash and marked by eviction notices. The walk required constant attention—dodging hazards and debris. On one street, tall trees drew her attention. Their resilience struck her. One tree’s trunk looked like a foot, leading her to think about carbon footprints. “If only these trees could talk,” she said. “Perhaps they have.” Water brought up the broken sidewalks she regularly navigates. She recalled warnings about safety when she first moved in—how perceptions of danger often collide with lived experience. She had stepped on glass, faced catcalls, witnessed drug use—and yet, conclusions still felt elusive. This walk brought her past the American Defenders House, a building she’d never noticed before. Rock filled in details, recalling how the group once met in their shared building.

Water then reflected on how few people she saw sitting outside. When safety feels compromised, she suggested, people retreat. That disconnection from public space leads to environmental neglect. “If people don’t feel safe, they won’t go outside,” she said, “and then the Earth suffers too.”





Soil agreed. She linked disconnection from nature to fear of the outdoors. Yet she held hope that growing awareness could help people navigate danger without giving in to it. She also noted the many stray cats she saw—well-fed, yet without shelter. “Are we unintentionally harming them with our half-care?” she asked. Her reflection turned broader: “Are people overwhelmed with responsibilities or stressors and unable to care? Or have we become too comfortable with neglect?” She wondered how care could be offered in ways that support without invading.

Rock highlighted another kind of threat—developers who assume the community doesn’t care. She recalled past efforts to resist unsuitable development and suggested attending more zoning meetings as one way to protect conditions for sustainable living.

Turtle brought the reflection inward. She remembered how, when she first moved in, neighbors would thank her—a puzzling welcome until she realized how many people had left. That realization humbled her. Connection, she noted, often means moving toward what draws us. She spoke of her own stepping back from daily community engagement, and how the walk invited her to consider whether she focuses too much on disconnection. The session prompted a question that felt personally and communally alive: “As members of this community, how do we, living together in an under-resourced neighborhood, animate the connections we believe are vital for the well-being of all life—both environmentally and socially?”

In this session, “rooting around” offered more than metaphor. The world outside our door mirrored the fragmentation within, and yet, signs of resilience, beauty, and resistance pushed through the cracks as we explored it. We began to recognize that being in the right relationship with Earth requires more than proximity; it asks for presence and a sense of possibility.



***Solidarity is not the same as support. To experience solidarity, we must have a community of interests, shared beliefs and goals around which to unite, to build Sisterhood. Support can be occasional. It can be given and just as easily withdrawn. Solidarity requires sustained, ongoing commitment.***

—**Bell Hooks**, *Feminist Theory: From Margin to Center*, (2014). p. 67



## Session 4: All That is Gold Does Not Glitter<sup>2</sup>

It was a Thursday evening—an exception to our usual Sunday rhythm. Dinner could be smelled simmering in the crock pot as we gathered. The sounds of the ministry’s wrap up drifting up from the floor below: delighted squeals of “Mommy!” and “Pop-pop!” as small feet pattered toward doorways and open arms, followed by a teacher’s familiar rule, “Don’t run!” These everyday sounds of life formed a warm and grounding backdrop as we settled into a quieter space together.

We began with a guided Earth meditation, accompanied by soft music and spacious invitations: to notice with all our senses the presence of creation - to go back hundreds of years and forward in equal measure, to feel how we are impacted by it and how we, in turn, leave our mark upon it. We were asked to imagine landscapes of beauty and of ugliness, and to notice what stirred within us—emotionally, spiritually, somatically—as we sat relating with creation.

*As we emerged from the silence, we brought a sense of testimony to our dialogue—intimate glimpses into the inner terrain each person had encountered.*

Soil began by naming resistance. When prompted to imagine past and future, she recalled thinking, “I’m not going to do this. I didn’t want to.” She chose instead to remain in the present, focusing on the good she sees—children who come to her for hugs—even while acknowledging the pull of overwhelming suffering in the world. She wrestled with questions of why God allows suffering, referencing disasters like fires and tornadoes, as well as the haunting imagery of sick children on television. “Where is God in all this?” she asked, affirming her belief in God’s love but wondering what we’re failing to hear. She taught us about her experience of African culture where people, knowing this kind of suffering to indicate a relational wounding, cry out to God during times of calamity. They implore God, but they are aware it is humanity that needs to intervene and restore the wounding they have done. She sees something deeply amiss in this country and emphasized that humanity has been given responsibility to care for creation—and that this care must be active. Soil shared a story she had once heard on retreat once about heaven and hell. In Hell, people starve with food in front of them because they cannot reach their mouths with long spoons; in Heaven, people use the same spoons to feed each other. For her, the moral was clear—too often, people care only for themselves. She connected this to environmental degradation: trash in the streets and the assumption that “someone else will clean it up.” God, she believes, is calling us to reconcile with creation. “Something is not right!” she repeats and begins to laugh. As she listened to herself, she jokingly admits she should become a preacher and speak up about these issues—though Turtle pointed out with a smile that Soil has already arrived there.



Turtle, too, had been drawn inward. Her reflection centered on life in community—how we are constantly called to balance individual needs with shared rhythms. “How do we make room for creation as another member of the community?” she asked. The meditation led her to consider what she

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<sup>2</sup> J. R. R. Tolkien, "The Riddle of Strider", The Lord of the Rings: The Fellowship of the Ring

might need to let go of—especially the illusion that one can have all modern conveniences without harming the planet. She acknowledged the tension in herself: where and how to spend her energy, how to be more loving and discerning in relationship with creation.

Water shared her ongoing process of reckoning with violence—both societal and internal—and drew connections between this and violence against nature. She questioned whether violence is part of the human condition or even the natural world. Drawing on the framework of four right relationships—God, self, others, and nature—she reflected that her generation is good at tending to the self but sees that all four areas need attention. She named relationality as key to healing.

Rock's reflections brought us to the ocean of her childhood. She shared memories of the sea as a place of belonging and God's presence—contrasted with later experiences of being unable to swim in pools after moving inland. "Nature is our home," she said, affirming a vision of creation as sacred and interconnected. For her, caring for creation is part of our call to reflect God's love—to live as if there truly is enough for everyone.

Following a brief pause, we moved into the second part of the session: an Ecological Examen. We prayed for the grace to examine our behaviors—the daily choices that impact creation. We were given simple yet probing questions about water use, waste, energy, and consumption. The invitation was to reflect on just one or two, to notice what surfaced.

### *This second round of sharing surfaced habits, tensions, and small movements of change.*

When we reconvened, Water shared that she didn't focus on a specific question but is "always thinking about this stuff." She appreciates living in a green building with good insulation and a green energy supplier, which relieves some of her worry about energy use. In contrast to past living situations where she struggled to make good environmental decisions, she values the "built-in care" of this community. Water resists fast fashion, prefers secondhand items, and is committed to reuse. She admitted she "used to be really bad about wasting food," but the shared efforts of the community have helped her improve. At the same time, she feels "guilty about all the driving" she does for meetings, wondering about the gas she's using. This time of discernment involves "trying to adapt to the customs of the community," while noticing areas where she feels "a little resistant or uncomfortable." Water admits "I feel like I'm overly aware of my impact on creation."



**Community Compost Bin**

Soil reflected on her initial struggle with waste in ministry settings, especially food waste, which made her think of hunger and scarcity. It's hard to watch people waste food when you know how many go without." When she helps in the kitchen and sees how much food and milk get's wasted, she tries to point it out to the kitchen staff. They get tired of hearing me, but I say it anyway, "It's not OK. She's grateful that "we're really good here about trying not to waste food." Growing up, wasting food "wasn't even an option," and she continues to be shaped by that mindset. She finds it hard to watch wastefulness, especially in a culture that often "takes so much for granted." Soil emphasized the value of water, shaped by her experience of seeing people and animals suffer due to its absence. She tries not to waste water when washing dishes or clothes and mentioned a tension between "reusing and recycling" and water use and worries that washing uses up more resources than say disposable paper towels. Water agreed, sharing her own frustration: "No matter how little food I waste though, it's still not going to someone who's hungry," but stressed that "being aware and not wasting" still matters.

Looking in Soil's direction she added that "paper towels take so much water to make," which raises questions about trade-offs in choosing reusable options.

Turtle expressed appreciation for the community's openness and learning from each other's experiences. "I think we are really curious and open and I think we're aware that there's no expert here." She highlighted the importance of relationality and how we help each other by our questions, knowledge, and noticing. Inspired by Soil's awareness about food waste, she wants to be "more bold" in her own care for the environment. She acknowledged that being introverted can hold her back from expressing care and felt an invitation to be "more attentive to how I relate to the community." She's reflecting on how to share her desire for stewardship in whatever circle or path she finds herself.

Rock returned to the local—the community's green building renovation—and how it once faced resistance but eventually became a place of pride for the neighborhood. She sees that "we have come far," but there's still "a long way to go" in terms of green renovations and sustainable choices. She wonders how aware other convents in our community are of their environmental impact in areas like "food purchasing or lifestyle." Rock sees our example as a quiet influence and believes in the importance of "making intentional decisions" that reflect a "simpler lifestyle and a lifestyle of care for the Earth and for God's people." She feels we are on "the right road," even though there's still work to be done. The invitation to choose simpler, more intentional living is on-going.

*Bell Hooks writes, "The struggle to be whole, to live in a way that reflects our deepest values, is the hardest and the most rewarding work of all." (Teaching Community: A Pedagogy of Hope, 2003, p. 13). This session echoed that very struggle in its longing to align inner convictions with outward practices, to root daily actions in relationality and care.*

*Not everything that is gold glitters.* The title, taken from Tolkien, reminds us that value, meaning, and insight often dwell in places overlooked or quietly held. This session didn't carry the lively back-and-forth of earlier gatherings—but it moved us inward. The stories shared were not dramatic, but deeply rooted: memories of the sea, questions of suffering, small daily choices about food and water, and the ongoing discernment of how to live with love. Together, they revealed a quiet richness—glimmers of gold in the soil of everyday life.

## Waymark Constellation



*"I think we're aware that there's no expert here...we help each other by sharing our questions, knowledge, and noticing."*

—Turtle



*"I feel like I'm always overly aware of my impact on creation."*

— Water



*"It's hard to watch people waste food when you know how many go without."*

— Soil





*“We have come far, but there’s still a long way to go.”*

— Rock



## Immerse Yourself!



### Session 5: Setting Out from Here. Which is Where Exactly?

In this leg of the pilgrimage, the companions set out from a shared moment of stillness: a contemplative pause after encountering a woman’s story in a short film. As she spoke of slowing down, reclaiming wonder, and recognizing herself as part of all things, each of us heard something different. Though we began side by side, our responses diverged, each drawn down a different trail shaped by our own uniqueness. These paths led us across unique terrains within a vast, relational landscape.

#### **Belonging Trail**

Rock’s steps moved instinctively toward an awareness of human connection. The woman in the film, she said, “seemed so lonely to me... never mentioned family, never mentioned anyone.” Though the woman seemed at peace in her life, Rock felt something was missing. Her trail led her into memory of another isolated path she once traversed. Something about the quiet life of a couple from her childhood came into view. They lived on a farm and had no children and no extended family. They had one another, but “it just seemed like a very small little world in which they existed,” she recalled, “and I think life can be much so more.” For Rock, the way forward is an inclusive one. The Belonging Trail wound Rock through the terrain of longing and the mysterious possibility of paths enhanced by companions.

### Resiliency Trail

Soil's path branched off from the others, tracing the contours of compassion and recognition. She admired the quiet strength of the woman who had endured a hard childhood and was now consciously living differently. "I like how she's reclaiming something," Soil offered, "taking the opportunity now to live in a way she couldn't before." She recalled a saying from her country. "You may hear people who are struggling say, 'Oh, I am from a poor background. I am from a poor family.' But when you reach 25 and you're still saying, 'Oh, I am from a poor background...' then it becomes *you* who are the poor background or poor family!" Essentially, a nudge to stop making excuses. "I don't know what she went through, but it seems like she's not clinging to her 'poor' background like some do." The Resiliency Trail traced the terrain of quiet determination and inner strength, leading Soil to witness the dignity that emerges when one reclaims a life with purpose and self-respect.

### Revelation Trail

Turtle's trail meandered with quiet attentiveness, moving slowly through questions that deepened as she walked. She was moved by the woman's simplicity—how close she seemed to get to the essence of relating to everything. "Life is so vulnerable," Turtle reflected, "and she seemed to embrace that." The woman's quiet advice to "go slow" spoke to her. It felt like both a sacred invitation and prescription. There was something sacred, she said, about how the woman unlayered the extra and pointed toward what really matters. For Turtle, the sacred is found in relationship and connection. The *Revelation Trail* sauntered through the terrain of simplicity and vulnerability, offering Turtle a glimpse of the sacred made visible when we excavate the extra and walk slowly into our vulnerability.

### Perspective Trail

Water's journey was the steepest, descending toward depth and shadow. She was drawn in by the woman's honest awareness of death, of its presence on the horizon. "It's not a real American or 21st-century concept to be so unafraid of death," she noted, "there are so many ways to distract and run away from it, so much noise." She admired how the woman seemed to embrace it with ease. Water paused there, as if internally focusing on an emergent detail. "The reality of life is death," she said, "and it puts everything else into perspective." The Perspective Trail navigated Water through terrain infused with mortality and awareness, offering a clearer view of the present and what truly matters.

*Each of the companions eventually returned to the group having journeyed through varied terrains of longing, dignity, vulnerability, and mortality. Though our trails wound separately, they traversed the same broader landscape: the relational ground shaped by our shared frameworks of care, justice, and interconnectedness. In this journey, difference deepened the shared inquiry. As Indigenous wisdom reminds us, one never steps into the same river twice. We arrived changed by the paths we took and by the sacred listening we offered one another along the way.*

From here, we turned to a more explicitly communal reflection—reading and discussing a *reflective article* written by a member of our own religious community. Her words were both contemplative and urgent, asking whether we have done all that we can to make personal and systemic changes and choices that prioritize the health of the planet.

In the dialogue that followed, Turtle named the tensions of collective discernment: the struggle to prioritize environmental concerns among many urgent needs, the challenge of living a "spirituality of limits," and the irony that to make space for what matters, something else must yield. Water appreciated the way the article connected ecological responsibility to our vows—especially poverty—

and emphasized that both personal and systemic actions are needed. “Recycling and turning off lights are like chores or manners now,” she said. “But do we remember why we do them?”

Soil found herself reflecting on how the concept of “enough” shifts over time, especially as her current experience of poverty in the U.S. differs from her life experience. For her, caring for the Earth and for herself feel intertwined. She spoke of wanting an exercise bike as a communal investment in wellness yet questions how that desire fits within a vow of poverty. “There’s a lot to digest,” she said, “and it must be done slowly.”

Our conversation circled back to deeper questions for personal and communal reflection. What does poverty look like in today’s world? How do we determine what “enough” is? What is reasonable, what is excessive, and how do we decide together? As Turtle said, “There’s no single measure... but the questions are essential.”

Our dialogue turned to the systemic realities of consumerism, industrialization, the power of a few profiting from the many. “It’s this me, me, me focus,” said Soil. Turtle emphasized how small shifts in awareness can create wider impact, even if change is slow. Rock grounded the conversation in intentionality, recalling how this building was the neighborhoods first green building project and the compromises, resistance, and learnings it entailed. She reflected on how our foundress always acted “for the good of others,” and wonders how we might carry that legacy forward amid today’s ecological crisis. “What would she do now to make life better in this neighborhood?” she asked.

*This final session brought many paths together in terms of personal reflections, systemic awareness, and spiritual practices. We walk away with deeper questions and a confirmation that ecological conversion is a lifelong practice of negotiating. As our 96-year-old sage from the video reminded us: go slow. But keep going.*

In this session, we entered a space shaped less by fixed paths and more by fluid currents, where the intimate and the complex flowed into a living ecology. As in the river whose waters are never the same twice, each moment of presence altered the collective, layering diversity into our sense of “here.” We did not set out for a particular destination, but rather to immerse ourselves within the developing current and experience the subtle interplay between memory and place, intimacy and systems, vulnerability and responsibility. What emerged was not a conclusion but a disposition: a way of relating that attunes us to the elements of our lives, interacting with one another and co-creating our ecology.



*"The ecological crisis is a summons to profound interior conversion... a way of seeing that is based on the conviction that everything in the world is connected."*

—*Pope Francis*, *Laudato Si'*, (2015) art. 217

## Unpacking from the Journey

This project invited members of our local religious community to engage in reflection and critical dialogue around our relationships with Earth and one another. Over the course of five sessions, we entered into a pilgrimage that moved from naming and remembering, to questioning and reimagining. This discussion offers a synthesis of what emerged through storytelling, participatory activity, and critical pedagogy that were guided by the frameworks of Integral Ecology, Catholic Social Teaching (CST), and Ecofeminism.

Throughout the sessions, participants grappled with the tensions of living within unjust systems. In Session 2, personal stories shared through proximity mapping began as reflections on individual relationships with nature. In the dialogue that followed, these stories prompted a shift toward more collective questioning. Water, for example, noted the presence of litter in her mapping, which Soil then picked up on, opening a broader conversation about neglect and environmental degradation in our city. Movement from the personal to the systemic continued in Session 3, where walking the neighborhood engaged us in a practice of presence, and prompted reflection on place, visibility, and belonging. These moments intersect with Integral Ecology and Catholic Social Teaching by how they immersed us in the interconnected realities of social and ecological systems. Our reflections revealed a growing recognition that we can be both part of the problem and the solution. In either case, proximity matters, because relational proximity opens one to the possibility for solidarity. It is in this kind of with-ness that complicity potentially gives way to care.

Throughout the sessions, dialogue shaped how we came to understand our experiences in relationship to one another and the world. In the spirit of Paulo Freire, who emphasized dialogue as a practice of critical reflection and the co-creation of meaning, we engaged each other as co-learners. In Session 4, for example, the more contemplative nature of the ecological examen, offered space for personal reflection while in the context of the collective. This slowing down allowed for deeper awareness of the ways our choices and actions impact the well-being of the Earth. The reflective space cultivated an openness to complexity and mutuality. That openness had expanded into a shared willingness to dwell in ambiguity and interconnection by Session 5. We stayed with the questions, noticing shifts in perception and imagining new ways of relating. This way of knowing, acquired through relational presence and shared reflection in a dialogical process, offered a pathway towards not only integration but transformation as well.

Earlier sessions addressed experiences of disconnection and systemic brokenness, while later sessions shifted toward articulating what participants hoped to embody and cultivate. Through dialogue, we began to recognize how our everyday personal matters, such as our consumption, how we care for the environment, and how we relate to others, are also connected to larger social and ecological systems. Personal reflections revealed that individual longings often echoed a collective desire for greater justice and ecological harmony. In line with Catholic Social Teaching, particularly its emphasis on the sacramentality of creation and the call to justice, we recognized the significance of aligning values with action. The simplicity of everyday choices such as how we eat and what we waste emerged as pathways to transformation. Echoing ecofeminist principles, participants began to understand Earth not merely as something to protect but as a relational presence to be in communion with, emphasizing the importance of care and interconnectedness.

As explored in Sessions 2 and 3, physical and relational closeness to place and one another created the conditions for deepened awareness. Walking familiar streets, mapping sensory and emotional



connections, and revisiting earlier reflections in dialogue made space for realizations that could not be rushed. Silence and stillness were as meaningful as speech, inviting gradual shifts in perception.

This slow cultivation of consciousness reflects a core tenet of critical pedagogy: that education is not passive or neutral, but a dialogical and reflective process aimed at unveiling reality and opening paths toward more just ways of being. Across the sessions, especially in the reflective nature of Session 4 and the relationality of Session 5, learning happened through encounters. Through narrative inquiry—drawing on lived experience, storytelling, and meaning-making over time—we engaged not only cognitively, but affectively and relationally.

Aligned with dimensions of ecofeminism, Integral Ecology, and Catholic Social Teaching, this contemplative way of learning called for attentiveness to the slow work of knowing, of growing together, of shared meaning-making and becoming-with. The use of reflective dialogue, story sharing, mapping, and contemplative practice created space for a kind of knowing that is rooted in relationship. The shared naming of complexity, pain, and desire for change arose not from a willingness to dwell in questions together.

This project did not seek to produce definitive answers, but to nurture deeper attentiveness, integrity, and collective discernment. Through relational presence and shared reflection, we cultivated a way of knowing rooted in encounter. Together, we practiced dwelling in complexity, naming what matters, and attending to what calls us forward. The journey continues—not as a fixed path, but as a reoccurring Pilgrimage toward more just and loving ways of being in right relationship with Earth.

In this spirit of continued journeying, we offer this reflection to our religious community and others discerning similar pathways of re-connection and re-membling. Pilgrimage, as we have come to know it, requires an intentional posture: active and receptive, willing to be shaped by what we encounter. Interconnection, we found, is not merely a concept to grasp but a way of being to experience.

If Rock were to offer guidance, she might speak of the sacred strength of commitment and the rooted presence required to remain with the questions, even when clarity is elusive. Water would urge attentiveness to flow—within systems, stories, and Earth itself—and call us to engage anew with passion and persistence, to walk with complexity without fear. Soil would bring the wisdom of relationality and resilience, a presence shaped by communal ways of knowing and the gift of relational belonging. Turtle would remind us that slow, deliberate steps make for lasting change, and that the gentle but steadfast power of time and proximity can reveal what quick solutions overlook.

As the poet Antonio Machado reminds us, “we make the way by walking.” And in this walking...together, slowly, with care...we might find ourselves not only seeing differently but becoming different. For the sake of Creation and all that lives, may we keep walking toward more just and loving ways of being in right relationship with Earth.



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# Menstrual Change: Shifting narratives around menstruation

Emma Griffin (She/Her)

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## Abstract

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Asking how menstrual equality organizations change societal narratives surrounding menstruation, this study analyzed differing sources of data, ranging from general public comment regarding menstruation and key informant data from the non-profit organization “Period.”, taken from a historical, educational, and feminist lens. Organizations like Period. are affecting teens more dominantly than older generations and are therefore changing societal narratives for the incoming generations through education and advocacy. The future of our societal notions about menstruation are being changed from the work of menstrual equality groups to educate and support younger generations of people experiencing menstrual inequity like lack of education or access to necessary menstrual products. Therefore, these groups are reducing menstrual inequality at a slower pace while forming a solid foundation for new areas of achievement and success in menstrual advocacy.

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## Introduction

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This project focuses on the social narratives surrounding menstrual cycles by analyzing data taken from online forums found in YouTube videos and news articles as well as one on one interviews from key informants and their respective data sources. The overall goal of this project is to evaluate the ways that menstrual equality organizations are changing the narrative around menstruation and period poverty. In the long term this project hopes to form the foundation for more research surrounding menstruation and the environmental pollutants that affect people who menstruate in more extreme ways than those who don't. The central question asked is, how are organizations fighting for menstrual equality contributing to new societal narratives around periods and menstruation? When discussing menstrual cycles, the definition of menstruation comes from the [Encyclopedia Britannica](#) to mean, periodic discharge from the vagina of blood, secretions, and disintegrating mucous membrane that had lined the uterus (Clayton, 1998). For this reason, this study will continue to use the term people who menstruate throughout.

There are four phases throughout the menstrual cycle that contribute to mood, energy level, and cooperative ability. [The menstrual, follicular, ovulatory, and luteal phases each have their own major impacts to the energy and mood of the menstruating body.](#) During the menstrual period, hormone levels drop, the uterine lining is discharged causing a surge of blood and often pain around the uterus. The follicular phase occurs when blood discharge stops and hormones begin to rise. Ovulation only occurs for two to three days following the follicular phase with a peak of testosterone to prove its presence. Finally, the luteal phase follows when ovulation has not produced an implanted egg. In this final stage menstruating bodies experience a slow decline of hormone levels which can lead to heightened feelings of depression and anxiety before the cycle starts again. Because of this rise and fall of hormones throughout a roughly 28-day period and the shedding of the uterine lining, menstruation is a large part of life for those with this cycle. Therefore, it is imperative that menstruating bodies are taken into account when discussing work life balance, sanitation resources, and paid time off in the modern lens.

This study targets the opinions and beliefs of the general public and compares these to the opinions and work of those in the menstrual equality field who are pushing for new legislation to support people who menstruate. To do this, it looks at popular websites that occasionally discuss

menstruation and allow public comment, then gathers the data on the general public's opinion of menstruation. It then will compare this data to data coming from organizations like Period. who evaluate their influence from surveys given to teenagers in school today. From the comparison of these two sources of data a picture will appear of what the older generations who did not experience this outreach believe about menstruation and the way that work in menstrual equality is affecting younger generations.

Researching topics related to menstruation are important because of the amount of people who menstruate. [1.8 billion people worldwide menstruate every month](#) (Rohatgi,2023). With 8.2 billion people on this planet and counting, that is 22% of the population globally that are currently experiencing some form of a menstrual cycle. These numbers do not include the people who are postmenopausal who would have benefitted from this form of research during their time menstruating. Reasonings for not studying menstruation can come from many different areas, from the lack of representation in medicine that persisted until people who menstruate played a more dominant role, to the impacts of generational trauma and shame around menstrual cycles that still persists in some cultures today.

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## Literature Review

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### I. Introducing the Topic

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Menstruation has often been seen as taboo or irrelevant to daily discourse. Unfortunately, across many types of societies, menstruation has been and still is viewed as inappropriate to discuss, a “women’s issue”, or in some cases a disease. This is true specifically in religious based cultures that follow bible text that inform their opinion on people who menstruate. This can be seen in specific through the following [bible verse](#):

“When a woman has a discharge consisting of blood from her body, she will be unclean due to her menstruation for seven days, and anyone who touches her will be unclean until evening.”

There are, of course, societies that do not currently have social stigmas surrounding menstruation due to several factors. For the purposes of this research however, societies that use the study of the holy bible to inform their world view and political landscape, such as the United States, will be utilized as the context for long standing misinformation and beliefs around menstruation. Due to the nature of organized religion and societal growth, longstanding religious beliefs have led to a growing number of issues regarding access to proper education in menstruation, a large portion of people not getting their needs met, and a growing need to hide periods or menstrual topics from the general public when the majority of people are very much aware of their presence.

In this paper I will be diving into this topic by discussing the ways that stigma and misinformation contribute to the societal narratives around menstruation. We will look at three sides of this issue starting with the historical context of menstruation, asking where these ideas come from and what books or theories shaped our menstrual world today. Moving to the current way that the general public is educated on the subjects and how large groups of people are left out of the conversation when it comes to knowledge about or management of menstruation. After looking at the class politics of menstruation, where groups of lawyers and activists are starting to fight for a narrative change around these topics, the debates will lead us to multiple questions that remain unanswered within the discussion of menstruation that only more research can answer.

## II. Establishing Relevance

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In today's society we are built around money as the system of choice when it comes to receiving goods and services. This system benefits those that pay into it and have the ability to continue to work for it. Unfortunately, the system we have built and continue to use leaves thousands of people without the means to support themselves on the streets, or without the proper care they need. When relating to menstruation this leads to a term dubbed "period poverty". Menstrual products are often single use devices necessary for absorbing blood and dead tissue as it is cleaned from the lining of the uterus. These products cost a minimum [lifetime total](#) of 1700 US dollars on average. This number does not include the outlier periods that last for over 7 days or people with PCOS who often bleed much larger amounts of blood than average, nor does it represent any product other than pads, as tampons or menstrual cups are often at a much higher price range. All of these factors combine to leave many people who menstruate without the necessary supplies to support themselves. With the social taboo surrounding periods and the menstruating uterus, support is even harder to find.

Focusing on menstruation and types of bodies that do not adhere to masculine frames of reference is necessary because menstruation and menstrual politics is an indicator of multiple sustainable development goals. There is a growing link between [chemical usage and menstrual side effects](#) but a current lack of overall information to make broader assumptions about the ways that chemical pollutants are affecting the average menstrual cycle. Removing unjust and untrue narratives around menstruation is the first step in a walk towards a world full of medical research and understanding for those with irregular, painful, or even normal monthly cycles.

## III. Overview of Relevant Literature

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### *A. Historical Context*

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As promised, we will be starting with the historical contexts at play. In short, how did we get here? The answer seems to be a slow rise in fear regarding menstruating women. According to [Blood Magic: The Anthropology of Menstruation](#), the idea of menstruation being related to pollution and evil spirits comes from a twisting of ancient ideas around menstruation. Looking at the Beng people, a small ethnic group on the Ivory coast of Africa, the practices of old Earth based religions are still upheld. In these practices comes many rituals for menstruating women such as, not going into the forest, not cooking meals, nor tending to the fields. These acts would "pollute" the Earth but not for reasons we would assume today. When asked about it a native man said "Menstrual blood is special because it carries in it a living being. It works like a tree. Before bearing fruit, a tree must first bear flowers. Menstrual blood is like the flower. It must emerge before the fruit - the baby - can be born. Childbirth is like a tree finally bearing its fruit, which the woman then gathers." This answer is vastly different from the ideas many hold today, yet the rules in place around menstruating people seem to be extraneous from the ideas around menstrual blood. This idea of pollution in this culture is akin to the sanctity of the Earth and the perception that menstrual blood in the forest was linked to multiple disasters or ill-fated events like dead crops, difficult childbirth or drought. This group of people, though not untouched by the outside world, potentially uphold an opinion about menstruation that is much more common to pre patriarchal ideas. The author moves to assume in the introduction to the book, "in other cultures (such as the Beng people) menstrual customs, rather than subordinating women to men fearful of them, provide women with a means of ensuring their own autonomy, influence, and social control." The people who menstruate in the Beng villages stay out of the forest to protect themselves and their relatives from ill health, not to adhere to the subordination of those who do not menstruate; a theme commonly found in cultures with heavy stigma surrounding people who menstruate.

Moving from Earth based religions to the beginning of modern-day ones the Jewish religion has



many rules and regulations regarding menstruation that can be traced to the first century teaching of Kabbalistic Mysticism. In [Men and the Menstruation Dynamic](#) by Mina Meir-Dviri the idea of menstrual cycles being evil were linked to the first century where “The menstrual cycle is thus responsible for causing the human world to degenerate and Israel to be exiled.” This notion of menstrual cycles being the downfall of humanity is sourced in the first century Kabbalistic teachings. Further in the teaching of the Kabbalah the ideas that men can be harmed from a menstruating person is explicitly spoken of by Meir-Dviri: “Out of his natural order he is under influence of menstruation, that is, his essence is twisted, distorted. Under the spell of menstruation his personality is a falsehood, a switcher of identities. He is socially dead.” This is due to the perception that people who menstruate are impure and unspiritual during their menstrual phase. This idea of a menstruating person causing spiritual harm can be seen throughout literature and led [to family purity laws](#) for people who menstruate in Jewish culture even today.

As the centuries dragged on and the ways the Earth based religions grew few and far between, laws and rules regarding menstruation became more strict and even less sensical. With only the ideas of ancient texts to move from, the fear and shame surrounding menstruation had grown. In Orthodox Jewish culture, [after the seven days of impurity, or menstruation, the menstruating person must go to a mikveh](#), a tub of pure water, to ritually cleanse themselves of the impurity of menstruation. Menstruating people were not allowed in public life, nor able to touch or be near their partners for fear of making them as impure as they were. This tight grip on people who menstruate was a significant indicator on the second-class citizenship of women in Israel in the eighteenth century, the notion of other genders who menstruate, which we are aware of today, was not in the public knowledge or discourse. Menstrual laws disproportionately separated women from the public eye and through this removal, caused a subordinate view of the whole gender, ultimately leading to menstruation being seen as shameful or to remain hidden in many religious sects and consensus. This influence has lessened over the centuries but still continues to play a role in older generational beliefs around menstruation and gender equality as [younger generations frequently turn away from religious practices](#), older ones are seen to have a much stronger kinship to religious ideals and traditions.

### *[B. Education and Public Opinion of Menstruation](#)*

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From this removal of menstruation and menstruating bodies from the public eye comes a lack of education and large swaths of misinformation regarding menstruation. A study done on [school-aged boys in India](#) shows a large gap of knowledge when it comes to education in the global population. The research was done with focus groups of 85 boys aged 13 - 17 in three different states in India and showed that the majority of information these boys received was informal, meaning it had to be researched on their own time or learned about from people who menstruate around them. This information came after many boys denied they knew anything about the subject despite them previously confirming they had some knowledge. Once they opened up, the information they gave was riddled with misinformation regarding the biological nature of menstruation with one saying, “blood comes out of their mouths, and they fall over a lot.” The results of this study show that the amount of information boys in this demographic receive is abysmal, with many boys saying they wished for more formal education regarding the topic. It's not just in India where the taboos of discussion around menstruation bleed into schooling. It is a global issue as well.

A study supported by Frontiers in Reproductive Health published in 2022, found that [this lack of information extends to the United States](#). The study highlighted the issue of menstrual taboo and the reluctance to discuss menstruation at all, the ways menstruation education is tied intimately to sexual education and the growing political discourse that says parents should be the ones who teach their children about these issues. Through this research it was found that adolescent girls, the subject of the report, “desired more education on menstruation and puberty topics in schools, including more

emphasis on practical guidance.” Some citing a limiting factor of their education on the discomfort of the instructor when teaching topics of menstruation. In another study it was found that the [reluctance of the instructor](#) when teaching about menstruation further stigmatized it. This lack of education regarding menstruation has led to misinformation and shame with people who menstruate being left in the dark when it comes to how their bodies operate during their time of the month.

Lack of education surrounding menstruation also leads to a lack of discussion and an overall silence about the pain that goes into the removal and release of the lining of an internal organ. Dysmenorrhea or painful period cramps are common to most people who menstruate, but it is not seen as something that is abnormal as the silence that surrounds menstruation is so pervasive within society. Jada Wiggleton-Little dove into this reality where dysmenorrhea is disregarded time and time again due to the normalized silence of pain in the menstruating community. This report titled [“‘Just’ a painful period: A philosophical perspective review of the dismissal of menstrual pain.”](#) Goes on to discuss the ways that this normalization of pain during menstruation has led to major difficulty receiving pain management, with menstruating people fighting for recognition for many years before receiving treatment. Wiggleton-Little goes on to say, “Even if a menstruating person reports severe or debilitating menstrual cramps, a listener can fail to be concerned or alarmed due to societal practices that causes the listener to misperceive the reported pain as “normal.”” The public opinion and lack of knowledge around menstruation and the pain level associated disproportionately impacts medical knowledge and the motivation to discover treatment options for people who experience severe levels of dysmenorrhea. This lack of research creates even more gaps in access for people who menstruate to understand themselves and their bodies.

### *[C. Class politics of Menstruation](#)*

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With historical contexts of menstruation being seen as evil or unclean and modern education still lagging behind contemporary information regarding menstruation there is a systemic disadvantage taking place in the form of period poverty. In the book, [Menstruation Matters](#), the authors, Bridget J. Crawford and Emily Gold Waldman, dive into topics regarding the law’s silence on menstruation and the fight to end the “Tampon Tax”, or consumer taxes on menstrual products. They discuss the perfect storm of stigmatization of both menstruation and poverty which lead many people who menstruate out of luck when they decide whether to buy food for their families or menstrual products for themselves. Approximately 11.5% of women in the United States live in poverty and around two-thirds of low-income women interviewed in St. Louis, Missouri said they had been unable to afford menstrual products in the previous year. The politics of menstruation bleed into the intimate lives of all people who menstruate with taxes where there shouldn’t be and a lack of access for those who need it. A study done in Kinshasa (DRC), Ethiopia, Ghana, Kenya, Rajasthan (India), Indonesia, Nigeria and Uganda in 2021 shows that wealth inequality does not only affect people who menstruate in the United States but all over the world in sometimes dire consequences. The study titled [“Understanding Period Poverty: Socio Economic Inequalities in Menstrual Hygiene Management in Eight Low- and Middle-Income Countries”](#) by Laura Rossouw and Hana Ross found that access to MHM (Menstrual Hygiene Management) spaces was disproportionately affected by wealth but bring up another issue regarding class politics, gender-based violence.

“The most notable and worrisome inequality is in having access to lockable and safe MHM spaces. Across countries, women and girls from less wealthy households are less likely to access safe and lockable MHM spaces compared to those from wealthy households. Ensuring that all females have access to MHM spaces where they feel safe and empowered is nonnegotiable. This is particularly worrisome given the prevalence and severe consequences of gender-based violence.”

Gender-based violence being on the rise and lack of education and information around people who menstruate, who are mostly women, being connected has not been studied extensively but could very well be according to the [Journal of Family Medicine in 2022](#).

With the rise of gender-based violence and the push to fight against negative connotations for menstruation the book [Out for Blood by Breanne Fahs](#) discusses activism and art meant to shatter the norms of menstrual silence. The need to break the silence and work towards greater visibility is a large pull for many artists, with Fahs describing menstrual art pieces and stunts meant to leave viewers thinking about their own perceptions of blood and people who menstruate. The book describes one act of rebellion done in Madrid

“In one such stunt, a group of women issued a manifesto entitled Manifesto for the Visibility of the Period (2010) and then took to the streets wearing white pants and shorts blatantly stained with menstrual blood. Defiantly joyous and visibly laughing, the group of women walked hand in hand through the streets posting their manifesto and bleeding openly.”

The manifesto they posted said “by attempting to hide our periods, a perfectly natural bodily function, we are participating in the patriarchal system and effectively punishing ourselves for being women.” Change is around the corner for people who menstruate. The activists, organizations, and artists that push for that change are the people actively changing the societal narratives from age old patriarchal gender-based biases to joyous, genderless, and innately human.

#### IV. Identifying Knowledge Gaps

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Within the dominant literature comes an incomplete picture of menstruation. There is a lack of knowledge in almost every topic with a struggle to find even basic information regarding pollution and menstrual cycles. With limited resources the possible outcropping for research questions is vast and seemingly endless. From the context provided becomes one of narrative and discussion. The question stems from the perceived stigma that is still relevant today, the almost non-existent education system that perpetuates the stigma, and the need for art and activism to throw a wrench in societal expectations for people who menstruate. With this activist approach, organizations that are fighting all of these social conundrums through a non-profit lens have recently started fighting period poverty. The historical context being for the silence and seclusion of people who menstruate, the educational context indicating a lack of access and proper instructors on the subject, and the class politics of capitalistic gains outweighing menstrual hygiene management for a large portion of people who menstruate. The question comes to those activist groups that are fighting in these conditions for menstrual equality. How are organizations fighting for menstrual equality contributing to new societal narratives around periods and menstruation?

The following study begins to close this gap in knowledge by collecting current data on public opinions of period poverty and menstrual shame and interviewing organizers at the not-for-profit company Period. about their perceived influence in changing narratives around menstruation. Period. is known for collecting and distributing menstrual products to communities in need while educating and reducing the stigma around menstruation as well as collecting data from teenaged people who menstruate to support their work.

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## Methodology Research Questions

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The research question that is the center of this paper involves societal narratives around menstruation and the ways that organizations fighting period poverty are also counteracting societal expectations regarding menstruation while creating a safer place for people who menstruate to discuss their experiences. So far through literature review and social context it can be seen that the historical landscape that shaped our current world has not been fully eradicated. There are still instances of neglect and violence due to the taboo of discussing menstruation and those that experience it. Ideas surrounding people who menstruate as being lesser are seen through gender-based violence, a neglect for proper menstrual education, and laws and regulations that fail to support a population experiencing pain or discomfort every month. Religious ideals, though less relevant now, have set up a cycle of neglect for those who experience menstruation, created a perfect storm of shame and disempowerment regarding menstruation that women's rights groups have only recently started to fight against. *Menstruation Matters*, one of the first books ever written regarding menstrual law, was published less than 5 years ago in 2022. The fight for menstrual equality is new. The goal of this paper is to find out how societal narratives are shifting, in which direction, and by how much. This will serve as a foundation to determine the next steps towards further equality, less gendered violence, and more education.

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### Epistemology

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The perspective of this project comes from a combination of knowledge. First, regarding the dominant pedagogy for educational research and development, informed by the researcher's undergraduate degree, creating the ability to find and dissect differing educational groupings from those who experienced education in a classic sense based in fact memorization or more modern sense based in critical thinking and conclusion making. Second, from the growing participation and interest in fights for legislative assistance for menstrual equality, that supported the understanding of slow growth and subtle movements towards change. Third, lived experience as a person who menstruates where a need arose to dive into research surrounding menstruation due to lack of access to adequate education during youth. The connection to this work has created an emphasis on curiosity rather than judgement when relating to each instance of menstrual disparity and injustice. From this lifelong quest to find information regarding menstruation, a feeling of lack surrounding the attainment of adequate knowledge was cultivated created a drive to understand and contribute to the growing knowledge of menstrual cycles and gender equality in medical research. This, in turn, contributed to the perspective that with more information on the daily habits and interactions of those who menstruate there is an opportunity for positive change towards menstrual equality.

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### Theoretical Framing

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The theoretical framework relevant to this work is feminist theory. When discussing feminist theory, the views of Robert Verchick come to mind. Verchick's work titled "In Greener Voice: Feminist Theory and Environmental Justice" highlights the type of framing that is relevant in its three step methods to feminist work. The first step is unmasking, the second is contextual reasoning, and the third is consciousness raising. The greater research methods regarding menstruation are still in this first stage of unmasking. Based on current data regarding education there is still a large "mask" of misinformation being circulated around menstruation and thus the research collected here merely touches the surface of the capacity for menstrual research and the three steps of feminist theory. Ideally, this theoretical framework will allow for the true unmasking of menstrual disparity and touch on the next two steps



with contextualization and consciousness raising when discussing with key informants.

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## Methods

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Methods used include interview style questioning of key informants such as the not for profit organization Period. whose mission statement focuses on three key areas regarding advocacy, education, and service. Reports and contextual information were found via the Copley Library and Google Scholar; the organizations were found via web searches. Those who were interviewed were at the discretion of the organization they were a part of. This work also draws from comment pools from the general public where discussions around menstruation and menstrual equality were taking place. Places such as YouTube and news sources were utilized to get a wide sense of the general public as direct access to the general public was not feasible for a study of this size.

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## Analysis

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Data was analyzed through hand coding, or recording interviews / collecting comments, typing them up, printing these data points, and then highlighting the key terms each interviewee used when answering the question. The terms were broken into themes represented by differing colors to allow for the ability to scan over the information and find patterns regarding certain contexts like, lack of education or narrative change. These themes will be related to the three steps of feminist methods with unmasking, context, and consciousness raising holding primary stake in the analysis of the interviews. Other methods of data analysis included the creation of visual representations of data to allow a fuller picture of the data set and information gathering.

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## Results and Discussion

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Through multiple avenues such as data collection from online forums, key informant interviews, and data collected by the company Period. on the state of the period in America today, this research uncovered some of the current trends in menstrual equality narrative change and find ways that menstrual equity organizations are shifting the narrative towards more equality in menstruation. The main take away from this deep dive into data from these sources was that education plays a major role in fighting for menstrual equality.

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### Data Collected from News Sources

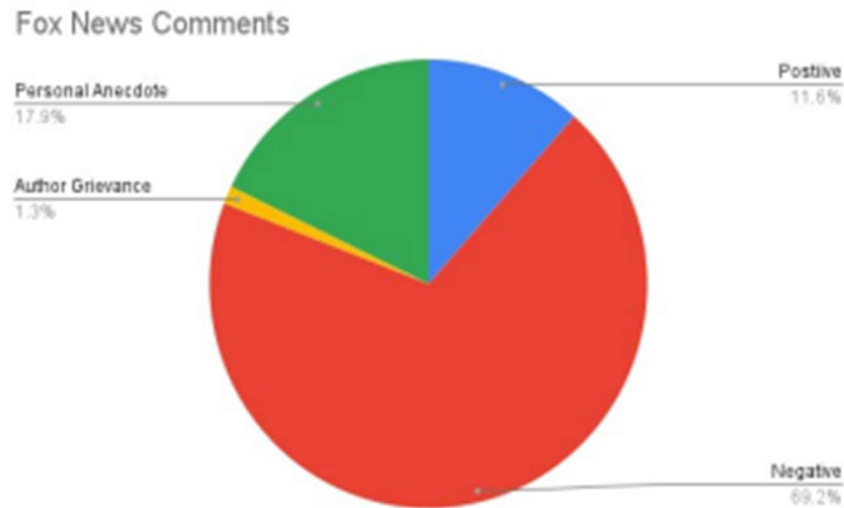
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For this section of data, an article discussing California's implementation of laws to maintain free menstrual products in school bathrooms was found that was listed on both a politically right leaning and politically left leaning news website. This was done to discover the ways that differing sides of the political spectrum respond to new developments in menstrual equality. The articles posted on [Fox News](#) and [The Washington Post](#) both had comments from news readers directly responding to the article. The comment sections from both sources were analyzed to find a data set of positive or negative reactions to the idea of free menstrual products. The analysis of this data allows for a baseline for both sides of the political spectrum, with Fox News representing the conservative world view and The Washington Post representing the progressive side; this comes after YouGov, a public opinion research group and data bank, [cited the two sites as being seen as such](#).

The article, posted on October 10th, 2021, was written in a neutral tone in both articles with the Washington Post author going into slightly greater detail surrounding other states and countries that have similar bills. The main point of the passage for both was to discuss the new bill signed by

Governor Newsom of California that mandated free menstrual products be placed in school bathrooms. The data proved that the right side and left side of the political spectrum are vastly different in their interpretation and acceptance of fighting menstrual inequality.

Looking at the comments from Fox News represented in this pie chart, only 11.8% of the 400+ comments could be considered positive.



Key comments that were labeled positive included comments like:

“If tissue and soap is required why not sanitary products for women.”

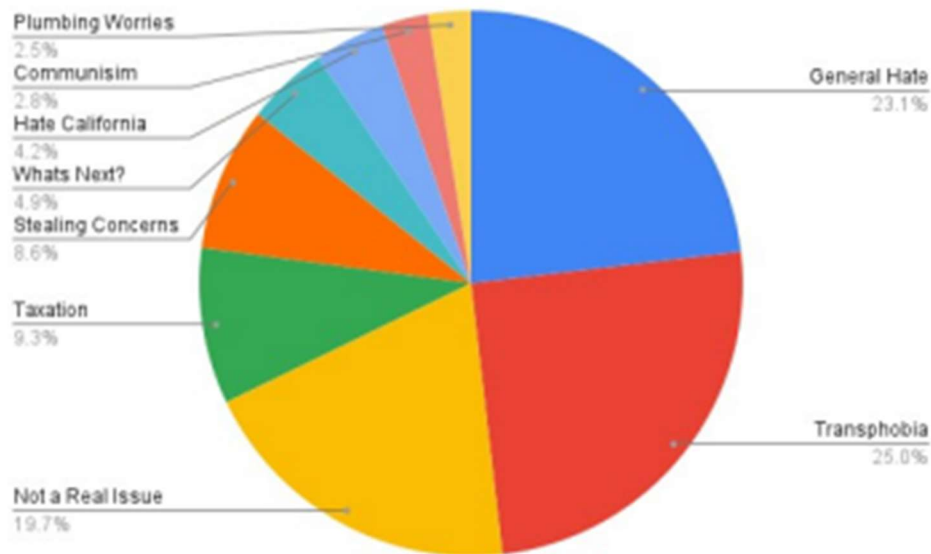
“I never thought I’d agree with a law coming out of California, but as a woman, I have always said that this should be a thing. I understand that the nurse’s office had them freely available, however, it is really embarrassing having to go to your teacher and explain that you need to see the nurse.”

“I do not understand people complaining about sanitary napkins / tampons being provided for free in bathrooms when we supply toilet paper, paper towels, and soap in bathrooms. They are all needed for sanitary reasons.”

“this is good news.”

Many of the positive comments came from either personal anecdotes that overwhelmingly agreed with the measure, or the logical conclusion that the article also comes to, that menstrual products should be expected in public restrooms just as toilet paper is. Personal anecdotes that were not labeled positive often did not come to a positive conclusion that the law would help those who are in need, they were put in their own category as they often just contained storylines from personal life experiences only slightly related to the topic of the article. The author grievance category was added to contrast the Washington Post article and only made up a small majority, these grievances were mostly connected to the word menstruation or equality, jeering at the vocabulary the author chose for the event.

As the negative category for Fox News was so vast I decided to further divide it into parts. The parts included general hate comments, comments that expressed hate towards women or the world in general.



Examples of these general hate comments that took 23% of the total negative comments include:

“Never trust someone who bleeds for a week and doesn’t die, let alone once every month”

“This will be for low-income students between pregnancies”

“Just keep them pregnant and we don’t need them”

“I think the government should sterilize 50% of the young female population to prevent overcrowding, of course it will be the white and Asian race. We have to let the other races catch up in development.”

Another large majority were comments directed specifically toward the transgender community, with comments like:

“Ok, fine, just keep the gender confused kids away from them.”

“Which bathrooms? The ones where men think they are women and thusly believe they SHOULD menstruate? The men’s room for those who menstruate but self-identify as a man? What about the gender-neutral ones who can’t figure out day to say that because they think they are a man do SHOULDN’T but do...”

“Yeah, this is going to go bad. The feelings of those who identify as girls are going to be hurt because they won’t actually be able to use them. The horror!”

“Along with a roll of duct tape. Obviously for those that identify as a female but are truly male.”

This comment:

“Can I have free tampons if I IDENTIFY as being a menstruating person? At any rate we have learned the new liberal make believe term “period poverty”. Ok... typing this message made me feel so gross...”

shows the multifaceted nature of this group's opinions and harps on many of the negative comment's zones like transphobia and general hate, but it also adds in a narrative that can be seen throughout the majority of the comments. This demographic does not believe period poverty is a real issue. As the chart shows about 20% of the comments coded directly discussed how period poverty was not a real issue because women have these products already or the commenters did not believe that schools did not provide them.

“The victimization of women continues...perpetrated by, you guessed it, liberal feminists. Schools always have those items available. What would we do without people telling us how poorly we have been treated and that we are owed something for it??”

“The menstrual equality thing is just more of the Left's blah-blah. I do not ever remember NOT having feminine care products available during my high school years. And, the school nurse always had something available in a pinch! What a stupid thing to codify into law...”

“I remember something called “personal responsibility.” A little preparedness goes a long way. I am over sixty and remember that these things were always available at school if needed.”

The other comments did not directly say that period poverty was not an issue, but the negative tone added to this conclusion. For example, in the What's Next? category, commenters harped on the idea that birth control would be the next free things available in schools among other things,

“what is next free condoms?”

“What's next, KY Jelly and Preparation H?”

“Why not provide free birth control pills to all school girls, and force them by law to use them, so none of them will get knocked up and need an abortion.”

“What's next, mandatory jalapenos at public schools? Because Hispanics will die without them?”

This group of commenters could be added to the “Not a Real Issue” category easily and contributed to the trickiness of analyzing this type of data. On the flip side the comment group of that worried about people stealing the free products could possibly have the opinion that period poverty is a real issue plaguing low-income families today as they often mentioned how the school would be providing not only the students with products but extended family as well, and implied students would steal them to sell them or hoard them, implying the need was there for these students to get free supplies.



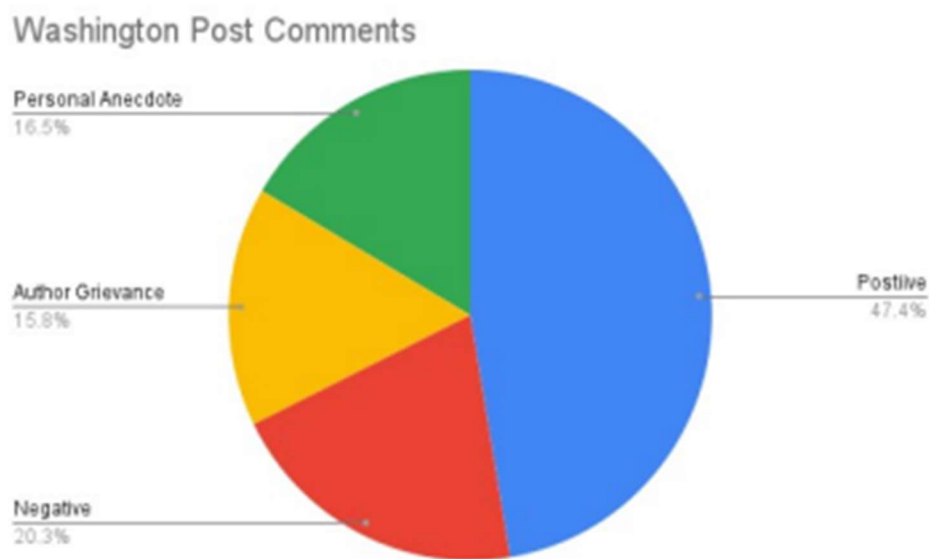
“So did you ever notice that the toilet paper roll is locked up? That’s so people can’t steal them. How are they going to keep young ladies from grabbing enough supplies for momma, Aunt Betty, and all the women in their life?”

“How much is free Tampax going to cost? So stupid. I could see vending machines to buy them. If (t)hey are free People are just going to steal them. What a mess”

“And the first ten girls in the bathroom every morning will steal everything there is...”

“did anyone think that the girls are just going to steal the entire box of them leaving nothing for the next.”

In contrast the Washington Post commenters who lean more on the left side of politics had overall positive responses to the new bill fighting for menstrual equality.



Almost half of all the commenters on this article had 47% positive comments such as:

“THIS These items should be free to all girls - e v e r y w h e r e.”

“Good. Should be federal law.”

“This is long overdue and once again CA leads the way. Unlike red states, we don’t hate women.”

While negative comments made up only 20% of the total 130 comments analyzed. The negative comments were a microcosm of the Fox News comments with opinions such as these:

“I’ve read articles where women are saying they can’t afford these products and are relegated to using old towels, tissues, cut up cloth etc. A typical packet of tampons or pads cost under \$10 - you can’t afford \$10 a month? I was brought up in a working class household, but never remember not being able to afford menstrual products...don’t know

of any student who does not have a cell phone...but you can't afford menstrual products?"

"We need gender equality here folks!!! Young men should get free condoms for when they feel horny – or at least a fondling from a transgender student in the rear stall."

"What if these products are taken home for momma and for Aunt Betty?"

So, it can be seen again that the negative comments make up a group of people who do not believe menstrual equality is an issue, or the solutions provided by the law described are not worth the result of access to much needed products, leading back to the issue of education on the subject matter.

A large difference between commenters in The Washington Post and Fox News can be found in the 16% of commenters from the Washington Post that had grievances with the author of the article. From the Fox News chart, the author grievance section was very small, only eight people mentioned that the word choice of the author was inappropriate, and they focused on words such as "menstrual equality" or "period poverty" being incorrect or not real, effectively adding them to the negative category:

"‘menstrual equity’ they have passed insane a while back"

"nice of the governor to be thinking about menstruating people (as opposed to “women”) instead of wasting time with things like reading, writing, arithmetic, science, social studies, etc."

"‘menstrual equity is a matter of human right’ menstrual equity? That’s a thing? Wow."

The Washington Post’s commenters that had issues with the author had a different tune. This group of people had issues with the author's choice to say, "period products" rather than "menstrual products."

"The term is menstrual. Menstrual products. Please call it what it is. ‘Period’ products sounds silly and childish"

"California will require free period products in public schools and colleges If you can’t bring yourself to say “menstrual” maybe you shouldn’t be the guy writing this article."

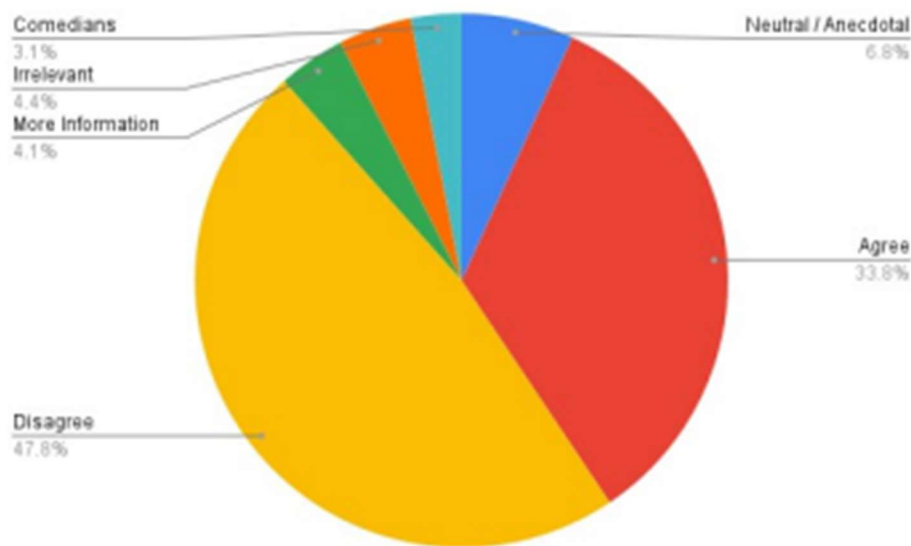
"Period? is that word still used? How about just saying menstrual or menstrual cycle? Period is what girls whispered to each other in the 50s if they weren’t using derogatory terms."

This type of grievance can create a different perspective of the left-leaning audience. Though 16% of comments directly had issue with the author it can also be said that due to the nature of the grievance this group is in support of even greater menstrual equality than the article mentions and have turned away from obscuring menstruation with euphemisms as was often practiced in the past.

After analyzing these two comment sections it can be seen that the left leaning public is more likely to support menstrual equity strides than the right leaning public. It can also be stated that the repeated occurrence of disbelief that an issue such as period poverty exists creates a need for more menstrual education and advocacy to change these incorrect narratives around menstruation.

Another avenue that was explored when it comes to the general population and their opinions of menstruation was through YouTube comment sections. The video analyzed was from 2020, right before the global pandemic, and took place on the main stage TED conference. TED is a non-profit organization that focuses on spreading new and cutting-edge ideas to the general public through conferences. It highlights new ideas, technologies, and discoveries that can benefit humankind. This particular TED talk was titled “[Why can’t we talk about periods?” by Jen Gunter](#), a gynecologist and author. The primary watcher of TED talks on YouTube is often thought to be rather progressive and accepting of taboo, but the data and the comments reveal a different reality.

Of the roughly 300 comments analyzed, roughly half of them disagreed with the idea that there was any stigma surrounding menstruation at all, saying menstrual taboo did not exist or did not agree that periods should be talked about.



71 of the 140 disagreeing statements were gender based, with users saying:

“bcz men don’t want to hear it. Period.”

“It’s your reward for partaking the forbidden fruit. Enjoy!”

“sure you can. But just don’t expect most men to be interest.”

The other 69 comments in the disagree section were made up of comments complaining that the title of the talk was “Why can’t we talk about periods” while she had a platform to talk about them, or how no one is stopping anyone from talking about periods at all:

“Having a Ted talk about periods while complaining about not being able to talk about periods.....”

“There are plenty of reasons to discuss periods. No one is saying we CAN’T though.”

“yeah but we DO talk about periods. I’m sorry but this really isn’t a thing.”

These comments indicate that the user's are not aware of menstrual inequality being affected by advocacy, allowing period poverty and people who menstruate to be left in the wayside once again. In the agree category there were many that supported the speaker, Jen Gunter, and commented their praise for her energy and presence on stage. There were also a number of people who joined the chat from countries outside the U.S. This comment was found particularly interesting:

“As a male citizens from germany i am very confused about period shaming and i can certainty say most of the people in europe are confused as well about this topic. Because we learn in school, about the ago of eleven, that period is a natural and complex system in the female body. So, to shame a woman or girl about period shaming is kinda a sign for stupidity. Like Ms. Gunter says about nosebleeding”

This post was similar to a couple of other European and Scandinavian commenters that talked about menstrual taboos not being relevant to their country and four out of five commenters from these countries discussed how they learned about menstruation in school and are confused about the narrative Dr.Gunter is speaking on. This access to education is pivotal to changing narratives around menstruation. However, not all comments from outside the US were positive, people from India, Sudi Arabia, and Croatia commented on the intense stigma their culture has around menstruation. The commenter from Saudi Arabia ended their comment with

“I really do think people should be more educated on them, because I experience extreme pain when on my period, but it's often brushed aside. “You'll be fine, stop complaining,”

Education has come up in multiple ways throughout the data so far and will continue to be relevant as the More Information section of these comments consisted of people either seeking or providing more information.

“.. what would be a specific factor in pads that causes dire period cramps?”

“does anyone have a link to the study she cites for menstrual pains and second stage labor?”

“7:06 make me wonder about menstrual cups, if the suction is too tight on the cervix can this cause health issues in the long run? Like with blood clots or hinder the menstrual process somehow?”

This section could also be placed in the agree section creating a total of 38% in this category. The other categories consisted of ‘Comedians’, a place to put comments that were obviously aiming to be funny like:

“because there are too many question marks”

“don't forget about the commas,,,,,”

as well as irrelevant, consisting of people commenting “first!” or “where my early squad at!” and finally the anecdotal comments could not be determined to be positive or negative but merely talked about a life event often surrounding periods.



Data taken from these comments shows that there is still work to be done in terms of menstrual equality. Getting the word out that menstrual inequality is a real and pressing issue is the first step towards menstrual equity and with 48% of people disagreeing that it exists it's important to look at data taken from organizations that are doing this work.

## Key Informants

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To supplement this research an interview was held with Period. the non-profit organization to discuss their goals and model for supporting menstrual equity. This organization is a leading contributor to the fight for menstrual equity in federal and state laws as well as distributors of menstrual products to those in need. The first interview was conducted on Zoom and then transcribed for the most accurate representation of the data. After a few weeks an in-person informal interview was conducted at Period. HQ in Portland, OR, where the company was started.

The interviews conducted with Period. Were completed with Emily Swanigan, the strategic communications manager for Period. Swanigan described her role as the overseer of all external communications at the organization and had been with them for over three years. Period. is youth led, having many chapters of high school or college students who lead the organization's operations. She mentioned the youth's influence on their work very often and can be quoted as saying "It's really the young people that show me that things are changing. They are way ahead of where I was when I was their age, and I am continually taking their lead." Swanigan believes things are changing because of her interactions with these youth leaders and the amount of pushback they have been receiving from those who disagree with new menstrual equity legislature. When asked about how she views the general public's reaction to menstruation and topics around it she says,

"It's going to vary depending on who you ask, but I think we're doing the right thing. I think that that means we're moving in a good direction because I think anytime there's movement or growth in culture and in society, that means boundaries are being tested. But I think that's for the better."

Swanigan sees some pushback as an indicator for if her organization is making a difference, pushing boundaries, and advocating for growth. She speaks on the key to supporting menstrual equity as holistic, in support of the whole person and community. "It's not a niche part of someone, but it is reality. and it is also something that impacts communities and not just like the few and far between."

Overall, the focus of Period. is on education and outreach to those who require it. Period. has a number of educational materials for educators to stop the stigma around menstruation and menstrual equality. Swanigan states:

"A lack of comprehensive information about reproductive health leads to stigma. It leads to shame. It leads to policies that strip people of their bodily autonomy. That's why It's so important to start education about this so much younger."

The overall goal of Period. and similar organizations is to promote more education in places where they see the need. Period. released three data sheets in partnership with Thinx, a company that makes underwear for menstrual management. The data set is quoted by Swanigan as being a major indicator of her organization's perceived impact.

The state of the period is a document created to track data on period poverty and teen perception on menstruation in the United States. Three issues were released each one year apart: [2019](#), [2021](#), and [2023](#). These data sheets go over many areas of discourse regarding people who menstruate and attend school. They are broken up into four main parts, Access, Stigma, Open Communication, and Call to Action. The question that this data seeks to resolve is are teens becoming more aware of menstrual equity and the need for adequate access to menstrual products through the years of this study. From the data provided the answer can be a resounding yes on most things. Starting with access to menstrual products, in 2019, 61% have worn a tampon or pad for more than 4 hours because they did not have enough access to menstrual products. This can be compared to 2021 where 51% of students have worn period products for longer than recommended and also 2023 where only 40% of teens have worn products for longer than recommended. This slowly shrinking number speaks to the wider availability of menstruation and the success of companies fighting for more menstrual product access.

When it comes to social stigma, the number of teens who believe that society teaches people to be ashamed of their periods went from 65% in 2019 to 60% in 2023. A small turn of the needle but significant, nonetheless. Open Communication leads to questions about access to menstrual education in schools and in 2023, 35% of teens said that their health teacher appears to be uncomfortable discussing menstruation; this is down from 42% in 2021. A 7-point drop is a significant indicator that educators are taking menstruation more seriously. Finally, the call-to-action section talks about menstrual equality. Despite already being 73% for an increase in menstrual health curriculum, in 2021, there was an increase to 78% in 2023 with teens agreeing that menstrual health should be seen as any other subject, akin to math and social studies. These data sets show that Swanigan was right to follow the youth leaders through this journey to menstrual equity. They are asking for education in multiple ways even 78% of teens surveyed wish there were more vocal advocates talking about menstrual health. This number jumped 5 points since 2021 proving that the youth of today are calling out to be educated about their own bodies.

### Why is this important?

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This data is important because menstrual equality is the first step down a long road towards sustainable development. [People who menstruate have been adversely affected by every instance of chemical or environmental pollution](#). The hormonal cycle associated with people who menstruate is easily disrupted or dysregulated from environmental pollutants and toxic chemicals. People who menstruate have borne the weight of these pollutants unequally due to the taboos and misinformation surrounding menstruation. With more data and advocacy for menstrual equality in terms of access and education, there is more opportunity to develop into a sustainable and just world where people who menstruate can feel safe in their bodies no matter what phase of their cycle they're in.

### Conclusion

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This study started as a question into ways of creating more equality and representation for people who menstruate. The literature review allowed for a deeper look at the ways that historical context, current educational patterns, and new age activism are forming a basis of where people who menstruate exist and where they are going. The data collected discussed four differing places where menstrual equality is being discussed and fought for or against. In the article regarding free menstrual products in California, it was seen that right leaning political commentators were actively fighting against menstrual equality for a number of reasons while the left leaning writers seemed to fight harder

than the article was with their grievances over the use of period or menstruation. These two arguments boiled down to those who understood that period poverty or menstrual inequality was a real issue pressing those that menstruate today and those that did not.

The same could be seen in the comments analyzed from the Ted Talk on menstruation. Those that disagreed with the notion that a ted talk on the subject was necessary also indicated that their knowledge of the disparity that exists is limited, with about half of those that disagreed with the need to talk about periods saying that it was a non-issue.

When discussing with a worker in the menstrual equality movement, the perspective shifted. The idea that young people are changing the landscape for menstrual equality came into view and the data taken from The State of the Period supported that. Over the course of 6 years teens were slowly starting to step away from shame and discomfort surrounding menstruation during school hours and data points went up with regard to access to period supplies. Organizations like Period. achieved this by providing education and advocacy programs delivered by their team and youth leaders.

After analyzing four differing data sets this project concluded that the way menstrual advocacy groups shift societal narratives surrounding menstruation is through education and continual work to end period poverty. Their work is primarily affecting younger generations and through this targeted awareness a new continuum of social acceptance around menstruation is slowly growing. Data analyzed shows that as of today the general public's opinions of menstruation are heavy with misinformation and from this, we can see that people like Emily Swanigan from Period. have work to do when it comes to educating the older demographics, but when it comes to teens and the next generation, youth leaders are pulling us toward a future where menstruation is not a disregarded part of society and those who experience it are understood rather than shamed.

The future for the next generation of menstrual advocacy is bright. Dismantling shame and taboo around menstruation will open doors to support more research and data collection surrounding menstrual cycles and the way that sustainable development must support people who menstruate. Removing taboos can create opportunities for research such as fully understanding the effect of current chemicals and [diets on dysmenorrhea](#), or painful menstruation, create more opportunities for [stem cell research using menstrual blood](#), and illicit even more questions to be answered in the connections between [our changing climate and the bodies of those who menstruate](#). This research hopes to be a steppingstone, forming a foundation of knowledge that can support future discovers in menstruation and the lives of those who experience it.

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# **Inafa'maolek in the Eye of the Storm: Centering Disability in Climate Resilience**

**APRIL 2025**

**CELINE FUJIKAWA**



## An Unseen Emergency

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As climate change increases the frequency and intensity of disasters, the gaps in emergency planning become starker—especially for communities historically marginalized in both policy and practice. On the island of Guam, where colonial legacies, militarization, and environmental degradation intersect, people with disabilities are too often excluded from disaster management efforts. This article explores the systemic marginalization of people with disabilities in climate resilience planning through a decolonial, participatory lens, drawing from interviews with local advocates, community-based organizations (CBOs), and Indigenous Chamoru knowledge. The stories of Mariana, Alex, and Haggan reveal how community care, cultural values like *Inafa' Maolek*, and traditional resilience strategies offer critical pathways toward inclusive, equitable disaster preparedness. By re-centering the perspectives of people with disabilities and elevating local knowledge, this project challenges deficit-based models and offers narrative-driven insights for transforming disaster systems into spaces of collective care and justice.

# Climate Change, Colonialism, and the Forgotten Few

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When I was 16 and living in Guam, I was the caretaker for my grandmother, who had mobility issues from aging and used a wheelchair. She loved to leave the house, whether to go to church, visit friends, or simply enjoy the fresh air. But at the time, I did not have a driver's license, and even if I did, accessibility was not guaranteed. Our village had no sidewalks, making it incredibly difficult to walk anywhere safely. When I had to take her to church down the street, I often had no choice but to push her wheelchair on the road, dodging cars that passed too closely—some speeding, others unaware of the risk we were taking. I remember feeling frustrated that something as simple as leaving home was a struggle, not because of my grandmother's disability, but because the infrastructure around us was not built with her in mind.



**Figure 1. Picture with my grandmother in 2016.**

That experience has stuck with me, and it shapes my approach to this project.

## Disaster as a Mirror to Inequality

When disasters occur, they often expose and deepen pre-existing social and infrastructural inequalities—especially for communities historically excluded from emergency planning processes ([FEMA, 2022](#)). In Guam, a Pacific island increasingly affected by the intensifying impacts of climate change, these disparities are particularly pronounced. Typhoons, flooding, and sea level rise pose existential threats to the island. Events such as Typhoon Mawar (2023)



and Super Typhoon Paka (1997) have revealed persistent gaps in how federal and territorial agencies prepare for and respond to the needs of marginalized populations (Figure 2)([Mycoo et al., 2022](#); [Swenor et al., 2024](#)). These gaps continue to place certain groups—including people with disabilities, older adults, and economically marginalized residents—at greater risk during and after disasters, many of whom belong to all three categories ([EPA, 2025](#); [Swenor et al., 2024](#)).



**Figure 2. A photo of my maternal grandmother, my mom, and me at 5 months old the day after Super Typhoon Paka.**

Guam’s unique geographical location and socio-cultural makeup create both challenges and opportunities in addressing these inequalities. The island is particularly vulnerable to the rising impacts of climate change, and its residents—especially those from already underserved populations—face heightened risks due to existing social, economic, and infrastructural disparities ([Mycoo et al., 2022](#)). For instance, as of December 2023, 17.6% of Guam’s population were aged 60 and above, reflecting a sizable segment susceptible to disaster-related vulnerabilities such as restricted mobility and chronic health needs ([EPA, 2025](#)). Additionally, according to the 2010 Census, approximately 19% of veterans living in Guam had service-connected disabilities, a significantly higher proportion than among veterans in the continental U.S. ([Kromer, 2016](#)). This data highlights the urgency of tailoring disaster preparedness strategies to include the specific needs of aging populations and people with disabilities, many of whom fall into both categories.

## Shifts in Disability Data Collection Efforts

It has historically been difficult to locate up-to-date, disaggregated disability data specific to Guam. Most federal disaster reports do not include clear indicators related to disability, and while the U.S. Census provides some baseline figures, these are limited by narrow definitions and chronic underreporting ([Koo & Hudson, 2021](#); [Morey, 2021](#)). For decades, the absence of disability-inclusive data has made it difficult to advocate for resource allocation, program development, and responsive planning in emergencies ([Morey, 2021](#)).

However, during one of my interviews, a participant shared that recent efforts are underway to improve data collection around disability on island. They described a community needs survey recently conducted by their organization, which offered a snapshot of who is being served by local programs—including both people with disabilities and their family members.

*“There’s still a long way to go,” she said, “but we’re finally starting to see some numbers. Most of the respondents were between 46 and 59 or older, which just confirms what we’ve been saying for years—disability and aging go hand in hand. And more than a third of the people who responded were actually family members, not just the individuals themselves. That tells you right there—it’s not just the person with a disability who’s affected in an emergency. It’s the whole household.”*


While the dataset is still limited and does not fully reflect the scope of Guam’s disability population, this shift marked a meaningful step forward. It also revealed how gaps in disaster preparedness ripple outward to impact entire caregiving networks, not just individuals. This kind of data—grounded in local experience and interpreted by those doing the work—offered more than statistics. It helped make the case for systems change.

*“Before, we had nothing—no data, no reports, no numbers to back up our needs,” the interviewee added. “Now we’re finally collecting data. It’s not perfect, but it helps us fight for what our people need.”*

This growing awareness—combined with Guam’s cultural values of care, kinship, and collective strength—could help form the foundation for more inclusive and community-informed disaster resilience planning.

## Research Purpose & Goals

My capstone project explored the experiences of community-based organizations (CBOs) and its leaders in Guam that support people with disabilities. Through a storytelling-driven, dialogue-based approach, I sought to understand how these CBOs navigate the realities of disaster preparedness and response, and what their stories might teach us about building more inclusive and equitable systems. Rather than starting from policies or frameworks, this project began with relationships—with those doing the work every day, often quietly and without recognition.



The stories collected in this research—shared in conversation, memory, and reflection—offered not only a critique of systemic gaps but also a testament to community innovation, care, and strength. The goal was not simply to document problems, but to amplify local knowledge as a way forward.

# Literature Review: Disability, Community Power, and Disaster Justice

As climate disasters become more frequent and severe, there's growing recognition among researchers of how important it is to include disabled communities in disaster planning—especially in places like Guam that have long been overlooked ([National Council on Disability, 2023](#)). But many of the systems we rely on today are still shaped by Western frameworks that often ignore the deep well of local knowledge, cultural resilience, and community-based experience ([Smith, 2012](#); [Hadlos et al., 2022](#)). This literature review looks at how ideas like decolonial theory, strengths-based thinking, and community-driven disaster risk reduction (CBDRR) can offer more grounded, inclusive ways to rethink how we prepare for and respond to disasters.


## Centering Indigenous Knowledge & Community Expertise

Linda Tuhiwai Smith's *Decolonizing Methodologies* (2012) critiques dominant research models that have long excluded Indigenous epistemologies. Smith calls for ethical, community-led research that uplifts traditional knowledge and resists extraction. While her work is based in Aotearoa with the Māori community, the framework resonates deeply in Guam's colonial and militarized context ([Tuhiwai-Smith, 2021](#)). Guam's disaster management systems—often administered through U.S. federal channels—rarely reflect Chamoru history, social structure, or cultural norms.

This project applies decolonial principles to examine the lived experiences of those navigating disability and disaster at the community level. Drawing from oral storytelling and dialogue-based interviews, it highlights the ways that local knowledge, particularly through leaders in the community, has helped fill systemic gaps in emergency preparedness.

## Community-Based Organizations & Localized Response

Community-based organizations (CBOs) serve as critical frontline responders for people with disabilities during disasters. Studies like Engelman et al. ([2022](#)) document how, following Hurricane María in Puerto Rico, CBOs provided culturally relevant support—coordinating wellness checks, distributing medical supplies, and translating resources—when government systems failed. Similarly, Wallerstein et al. ([2019](#)) and Tierney ([2014](#)) emphasize how CBOs are uniquely positioned to understand community needs, though they are often left out of formal disaster frameworks.



Despite these strengths, CBOs face barriers: funding constraints, lack of policy support, and minimal recognition in emergency plans ([Bailey et al., 2022](#)). In Guam, these challenges are magnified by the island’s geographic isolation and colonial status. My capstone contributes to this discourse by centering on the lived experiences of CBOs working within these systemic constraints.

## Rethinking Vulnerability Through A Strengths-Based Lens

Historically, disaster scholarships have framed disability in terms of vulnerability and dependency. Scholars like Gero et al. ([2024](#)) argue for a shift toward strengths-based models that prioritize agency, community capacity, and cultural adaptation. Their Pacific Community Resilience Framework integrates systems thinking to examine how social and infrastructural networks interact during disaster events.

This builds on work by Trogrlic et al. ([2022](#)) and Meadows ([2009](#)), who push beyond risk-based models to explore community agency and identify leverage points for change. In Guam, kinship care, neighborhood networks, and mutual aid are foundational to resilience—but often unacknowledged in formal disaster plans. My research uses these frameworks to examine how these cultural systems support residents with disabilities through crises.

## Community-Based Disaster Risk Reduction (CBDRR)

CBDRR offers a practical framework for applying strengths-based and decolonial thinking in disaster policy. Unlike top-down models, it centers local knowledge, co-production, and relationship-building in risk reduction efforts ([Shaw, 2016](#); [UNDRR, 2025](#)). In Guam, where family and village relationships often substitute for formal systems, CBDRR holds promise for disability-inclusive planning.

Key features of CBDRR include:

Community-defined needs and strategies

Inclusion of people with disabilities in every stage of planning

Integration of traditional knowledge systems

Identification of gaps in existing infrastructure and services

By incorporating CBDRR, this project bridges theoretical models with lived reality—mapping how grassroots strategies can inform systemic change.





## Building Community Power Through Story

Narrative inquiry provides a powerful counterpoint to quantitative and deficit-based research. Stories offer emotional, cultural, and social depth, especially in communities where oral tradition remains central. The Unseen Impact report ([Weber & Schlupkothien, 2024](#)) illustrates how narrative-based approaches illuminate the lived experience of disabled individuals navigating crisis conditions like the COVID-19 pandemic.

This capstone builds on that methodology, embedding storytelling into semi-structured interviews. Rather than extract “data,” the goal was to hold space for reflection, context, and cultural meaning. These stories helped surface not just problems—but the solutions already in motion within the community.

# Methodology: Relational, Reflexive, and Culturally Grounded

This project used a qualitative, decolonial, and participatory methodology grounded in narrative inquiry to explore how CBOs in Guam have supported people with disabilities before, during, and after disasters. It was shaped by the understanding that top-down, compliance-driven emergency management frameworks often fail to reflect local realities—particularly in communities navigating layered challenges like colonization, limited infrastructure, and systemic ableism. Instead, this study embraced relational and reflexive methods that center lived experience, cultural context, and oral tradition.

## Epistemological Approach: Decolonial and Participatory Roots

This research was rooted in decolonial and participatory epistemologies, which treat storytelling, cultural values, and community knowledge as valid and essential forms of expertise ([Hall & Tandon, 2017](#); [Tuhiwai-Smith, 2021](#)). Rather than seeking to "extract" data, I approached the work with humility—emphasizing co-creation, relational accountability, and community-led insight.

As someone who was born and raised in Guam, I brought cultural and linguistic familiarity to this project, which helped me build trust and rapport with participants. However, I also recognized my position as both an insider and an outsider—currently living off-island and not having lived experience with physical or sensory disability. However, I brought my own experience navigating systems as a person with a learning disability, which helped me empathize with participants and reflect critically on who is heard in policy conversations—and who is left out ([Dwyer & Buckle, 2009](#)).

This dual position required reflexivity: I maintained a weekly project diary through Omprakash where I logged challenges, shifts in interpretation, and emotional responses to the interviews. These entries were not just a log of activity, they became part of the analysis, reminding me to remain grounded in the community voices I sought to uplift.

## Theoretical Frameworks: Listening Through Layers

This study was shaped by **three interrelated frameworks** that supported a justice-oriented, culturally grounded approach:

- **Strengths-Based Resilience and Systems Thinking** ([Gero et al., 2024](#); [Meadows, 2009](#)): Instead of framing disabled individuals solely as “vulnerable,” this lens emphasized their role as active agents in disaster resilience. It also enabled me to analyze

how infrastructure, policy, and cultural systems interacted where CBOs have stepped in to bridge the gaps.

- **Narrative Inquiry** ([Riessman, 2007](#); [Weber & Schlupkothen, 2024](#)): This method centered storytelling not only as a form of data, but as a relationship. Through story, participants shared knowledge that statistics could not convey—emotions, meanings, cultural memory, and moments of transformation. It also aligned with Chamoru oral traditions and created a space where storytelling became healing, advocacy, and analysis all at once.
- **Critical Disability Studies & Intersectionality** ([Jean et al., 2023](#); [Plotner et al., 2025](#)): These frameworks guided my understanding of how disability, colonialism, poverty, age, and other factors compound vulnerability. They helped me examine how systemic issues like inaccessible shelters, inadequate transportation, and policy gaps disproportionately impact disabled individuals—and how those most affected are also leading efforts for change.

## Research Questions

My capstone was guided by two central questions:


1. What stories might dis/ability inclusion-centered community-based organizations in Guam share about their experiences with disaster management?
2. How can a storytelling-driven, dialogue-based approach inform the development of a more inclusive, equitable, and dis/ability-responsive disaster management system?

## Dialogue-Based Interviews, Reflexive Journaling, and Policy Review

This study used a multi-method qualitative design combining dialogue-based interviews, policy review, and thematic analysis. I began by identifying potential community-based organizations (CBOs) through online searches, agency reports, and public websites. However, most of these organizations had limited information online and few direct points of contact.

Instead, I relied heavily on word-of-mouth referrals through family and friends. In Guam, where information flows through personal relationships and community trust rather than institutional directories, these referrals were especially important. This method reflected the cultural value of *inafa' maolek*—relational care and reciprocity—and set the tone for the kind of research I wanted to do: respectful, personal, and grounded in community.

Once connected with the community leaders, I conducted **three semi-structured interviews** via Zoom in English. The interviews lasted between 60 and 120 minutes and were recorded with permission. I also took handwritten notes and marked timestamps when participants shared something especially powerful, emotional, or nuanced. Interviews were conducted informally,



often beginning with a conversation about personal background, values, and "why we do this work" before naturally transitioning into stories about disaster, disability, and community care.

## Ethical Considerations

Ethical integrity was foundational to this research, particularly given the sensitive nature of disaster response and the lived experiences of individuals with disabilities. Respect, transparency, and care guided every stage of engagement.

### CONFIDENTIALITY AND ANONYMITY

All participants and organizations were kept anonymous. Pseudonyms were used, and identifying details were removed or generalized to protect privacy. Data—including transcripts and recordings—were securely stored on an encrypted device with access limited to the researcher.

### INFORMED CONSENT AND VOLUNTARY PARTICIPATION

Participants received detailed information about the study's purpose and scope. They were assured of their right to withdraw at any time without consequence. Consent was obtained in written or oral form, depending on participant preference and accessibility needs.

### CULTURALLY RESPONSIVE PRACTICES

Given the project's focus on storytelling and lived experiences, participants were invited to review and approve any quoted material. The research was conducted with cultural sensitivity to Guam's Chamoru context, emphasizing reciprocity and respect. Findings will be shared back with participants and CBOs in accessible formats to support continued community advocacy.

By embedding these ethical practices throughout the process, the study honored the knowledge and dignity of those working on the front lines of disability in Guam.

## Policy Review

To provide background and context, I reviewed several key local policy and strategic planning documents, including:

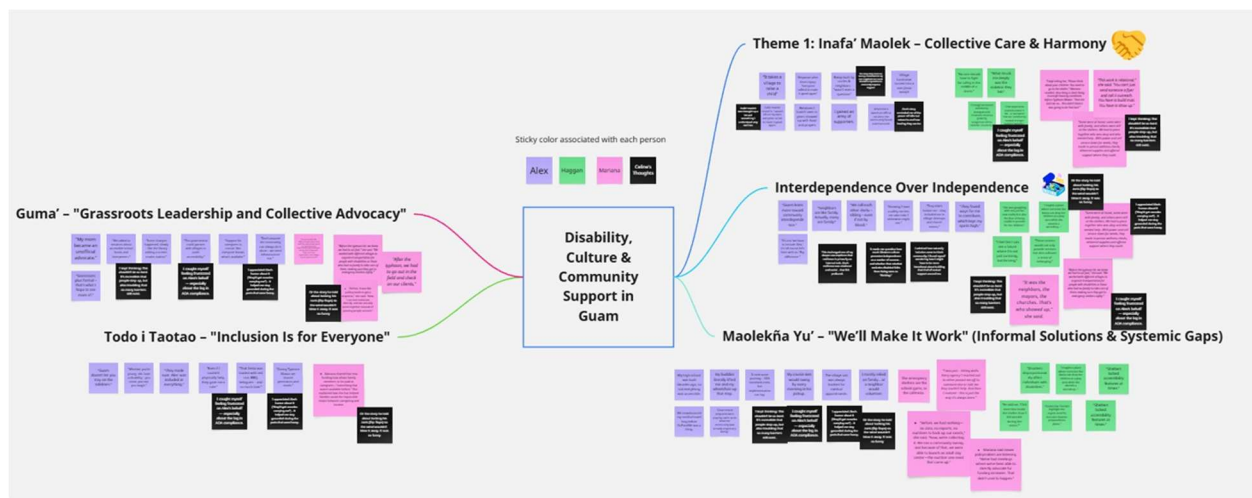
- [\*Guam Comprehensive Emergency Management Plan \(2013\)\*](#)
- [\*DISID Report to the Citizens of Guam \(2015\)\*](#)
- [\*Guam Hazard Mitigation Plan \(2014\)\*](#)
- [\*Guam 2024–2027 Four-Year State Plan on Aging \(Draft\)\*](#)

While not a central focus, this review helped me compare how institutions describe inclusion on paper versus how it is experienced by those on the ground. Several of these plans have not been updated in years, underscoring the need for more timely and inclusive policy revision.

## Thematic Analysis: Letting Stories Guide the Work

After each interview, I listened to the recordings several times and reviewed the transcripts in depth. I used a thematic and interpretative phenomenological analysis approach ([Nigbur & Chatfield, 2025](#))—highlighting phrases that revealed key themes, repeated words, emotional turns, or moments of humor and vulnerability.

Rather than coding in a mechanical way, I listened for meaning in the pauses, the laughter, and the stories participants said they had never shared before. I used a Miro board to cluster themes visually by color, creating sub-nodes under each major category. The five core themes—Inafa' Maolek, Che'lu, Maolekña Yu', Todo i Taotao, and Guma'—surfaced not from any software but from deep listening (Figure 3).



**Figure 3.** The Miro board captures five key themes from disability advocate interviews in Guam, illustrating community care, resilience, and grassroots responses to systemic gaps.

This process honored the central insight of narrative work: that stories are not just data, they are knowledge.



# Listening to What Holds Us: Stories as Findings

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This section brings together three interviews—each a window into the lived experience of those supporting disabled individuals in Guam. I spoke with Haggan, a disability advocate deeply embedded in grassroots work; Alex, a veteran turned community-based organization (CBO) worker; and Mariana, a social worker navigating both care work and bureaucratic breakdowns. Rather than extracting “findings” in the conventional academic sense, I offer these stories as they were shared—with reflection, humility, and the recognition that knowledge, especially in communities like Guam, is often held collectively.

Each participant brought a distinct lens to the intersections of disability, care, and disaster. These weren’t soundbites, they were whole stories. Their narratives revealed not only grief, exhaustion, and structural gaps, but also joy, strength, and connection. Interviews unfolded as dialogue-based conversations grounded in cultural respect and mutual exchange. I asked about their journeys into this work, about those who influenced them, and about what it really means to care for others when formal systems fall short. The answers surprised me—not just in their content, but in their intimacy.


What follows begins with narrative portraits—one for each participant. Then, it moves into five themes that emerged across conversations. These themes were not extracted from a coded rubric but surfaced gradually—in long pauses, shared laughter, and the moments when a participant would say, “*I’ve never told anyone that before.*” They are not conclusions. They are invitations to listen more closely.

The people I spoke with—many balancing caregiving with advocacy and lived experience with professional roles—highlighted not only the systemic barriers that persist, but also the strength of Guam’s cultural values like *inafa’ maolek* (restoring harmony through mutual care), *che’lu* (siblinghood), and *todo i taotao* (all the people). These values emerged not just as cultural ideals but as practical frameworks for how people survive when systems fall short.

This section reflects my commitment to amplifying community knowledge and cultural epistemologies through storytelling and relational methods. It shows that disability cannot be fully understood through metrics or checklists alone. It is shaped in everyday acts—through ramps built by neighbors, food shared after storms, and grassroots leaders who turn pain into policy change.

## Collaborative Analysis with Participants

A key part of my methodology was participant involvement in the analysis process. After highlighting meaningful quotes in the interview transcripts, I shared these back with each participant for review. I asked for their input, clarifications, or any quotes they preferred to remove or rephrase. This collaborative process reinforced the project’s commitment to ethical



storytelling and participant agency, ensuring that representation was accurate and rooted in consent.

## Emergent Themes and Cultural Framing

Through this process, five key themes emerged – each grounded in CHamoru language and cultural logic:

1. **Inafa’ Maolek** – Collective Care and Harmony
2. **Che’lu** – Interdependence over Independence
3. **Maolekña Yu’** – Systemic Gaps and Informal Solutions
4. **Todo i Taotao** – Inclusion Through Cultural Traditions
5. **Guma’** – Grassroots Advocacy and System Change

These phrases were not chosen arbitrarily. Several of them—like inafa’ maolek and che’lu—surfaced repeatedly across interviews, either explicitly mentioned by participants or deeply reflected in their stories and actions. I chose to use CHamoru terms not just to title these themes, but to honor the ways these concepts live in everyday language, relationships, and practices in Guam.


Rather than emerging from a rigid coding framework, these themes unfolded through careful listening, cultural interpretation, and an awareness of how meaning is shaped by both content and context. They reflect not only what was said but also how it was said—through pauses, shared laughter, and moments of deep reflection.

While conventional qualitative research often seeks generalizability, this project embraced specificity and relational meaning. These themes function less like isolated findings and more like a conversation among siblings or family members. They build on one another, overlap, and collectively illustrate how care, justice, and resilience are enacted within Guam’s disability community.

They offer not only critique, but direction—pointing to the ways communities are already leading the work of inclusion and reminding us that language is not only descriptive, but transformative.

### Interview #1 - Haggan

I had the opportunity to speak with a disability advocate from Guam who asked to go by the pseudonym “Haggan,” which means sea turtle in CHamoru. From the moment we began our Zoom conversation, her passion for community work was evident. She shared that her journey into advocacy began when she was just 14 years old, after Typhoon Pongsona tore through the island in 2002.



That storm, she told me, left her cousin—who had a physical disability—stranded in their home. Their family had no way to evacuate him safely, and no agency ever came to check on them. She remembered watching her parents scramble trying to find someone who had a truck, or any kind of lift. Eventually, it was a neighbor with a flatbed who helped them move him to a safer place.

*“No one should have to fight for safety in the middle of a storm,” she said—a line that stayed with me long after the interview ended.*

One of the most powerful moments she described took place during Typhoon Mawar in 2023, when she coordinated an informal evacuation for a wheelchair user who was trapped in his home. The roads were flooded, buses couldn’t reach him, and his relatives were off island. With emergency services overwhelmed, Haggan and a small group of volunteers stepped in with a borrowed vehicle and improvised a route to ensure his safety.

*“It was stressful,” she said. “But it reminded me that our real safety net is each other.”*



**Figure 4. Flooded roads from Typhoon Mawar – 2023. Photo by interview participant “Haggan”**

Throughout our conversation, Haggan shared the structural barriers people with disabilities face during disasters: shelters without accessible restrooms, emergency alerts that are unusable for those who are Deaf or hard of hearing, and shelter spaces that ignore the realities of mobility devices. She recounted advocating for a volunteer who used crutches to enter a designated shelter—only to realize no one had thought through how someone with mobility needs would safely navigate it.

*“We’re left out of the planning process,” she said. “So, we always end up having to make things work at the last minute.”*

Despite these challenges, what stood out most was Haggan’s unwavering belief in community. She spoke about *inafa’ maolek*—the CHamoru value of mutual care—as more than a concept. It was a lived practice. Neighbors checking on each other. Churches organizing rides. Volunteers finding solutions where systems failed. One story she shared involved a network of residents

coordinating rides for elderly and disabled neighbors to reach shelter—filling in the gaps left by formal response systems.

Talking with Haggan reminded me that disaster preparedness is about more than emergency protocols—it’s about trust, care, and relationships. Formal systems often fail to recognize the emotional and relational labor that people like her provide during moments of crisis.

*“It’s not just paperwork,” she told me. “It’s people’s lives.”*

As we wrapped up our conversation, I reflected on how sharing personal photos and opening up about my “why” had helped this dialogue unfold naturally. It created a sense of connection—a shared understanding of our love and passion for home. With Haggan, that sense of community was especially strong. We bonded over our experiences, our hopes, and the deep resilience of our people.

I was reminded of a CHamoru proverb my grandma used to say whenever things felt hopeless: *“Tāya’ mina’lak sin hinehūm”*— *“There is no brightness without darkness.”*




**Figure 5. Participant photograph of sunset a few days after Typhoon Mawar.**

That line stayed with me. It captured not only the heaviness of the challenges we discussed, but also the light found in Guam’s communities—especially in the quiet, determined efforts of those who show up for others again and again, storm after storm.

## Interview #2 – Alex

My interview with Alex—a disabled veteran and grassroots organizer—was one of the most moving conversations I had during this project. As someone who has spent time both on and off-island, I’ve always carried a deep sense of community that’s so central to CHamoru culture. But hearing Alex’s story, his journey through addiction, homelessness, and ultimately healing





through advocacy—brought that understanding to a new level. It also reminded me of how often community steps in where formal systems fall short.

From the moment we began talking, it was clear Alex loved telling stories. He didn't just answer questions—he painted vivid pictures. He told me about coming back home from military service in 2004, thinking there would be a safety net waiting. But instead, he faced silence, closed doors, and bureaucratic roadblocks. After his return, Alex struggled with addiction and spent several years experiencing homelessness. Because he didn't have a permanent address, he couldn't access many public assistance programs, not even veteran-specific ones.

*"When I came back home, I thought I'd have a safety net. But the reality is, when you're disabled, when you don't have a steady income, even your own island can feel like it's closing in on you. There were nights I slept in my car, nights I didn't know if I'd find a place that wouldn't just tell me, 'Sorry, we're full.'"*

He told me about a moment that changed everything—an older man at a shelter, a Vietnam vet, who gave him some tough love:

*"You got two choices. You either let this system grind you down, or you get up and fight to make it better."*

That stuck with Alex. It became a turning point. He realized he didn't want to just survive—he wanted to make sure others didn't have to endure the same struggle.

Over time, and with help from friends and community, Alex began to rebuild. Neighbors built him a ramp. His church helped modify his space. These acts of love—big and small—helped him move forward. Today, he works with a community-based organization that serves individuals with disabilities, helping them access stable housing, public benefits, and a path forward. As he put it, he helps people *"find a way through the mess."*

Our conversation turned toward disaster response. During Typhoon Mawar, Alex saw the same patterns again—people with disabilities being left out of planning, shelters unprepared, medical needs unmet. He recalled:

*"One woman—we'll call her Auntie Josie—she was on oxygen. The shelter had no backup generator, and her machine was running out of battery. The volunteers did their best, but no one had a plan for what to do. So it was the other people in the shelter—just regular people—who found a way."*

He described how one person ran to borrow a generator, another kept vigil through the night, and his wife—who is a nurse—stepped in to help. Someone else drove out for gas.

Yet, he also shared the immense power of community: the neighbors who built him a ramp, the cousins who modified his workspace, the countless small and large ways in which the people around him ensured that he wasn't just surviving but thriving.

*"Nobody sat around waiting for FEMA. We just handled it."*

They shared food, kept medicine cool, and cleared roads together. These moments, to Alex, are what define resilience—not protocols, but kinship.

He also described how, just before the most recent storm, he helped his **che'lu** (brother) reinforce his home while they were off island.

*"I went to my che'lu's [brother] house and used coconut leaves to block his window, so it doesn't break."*



**Figure 6. Coconut leaves used to shield a window before Typhoon Mawar. Photo by interview participant "Alex."**

It was a simple, powerful example of the quiet ingenuity that so many families rely on.

When I asked Alex what he wished that more people understood about the intersection of disability, disaster, and systemic neglect, he didn't hesitate:

*“People think disability just means a wheelchair or a white cane. But what about the veterans dealing with PTSD, the people with chronic pain, the folks who can’t work but don’t ‘look’ disabled? And what happens to them when a typhoon hits? Where do they go when they don’t have family here, or when the shelters don’t have the meds they need? We have to stop thinking about disasters in a way that only plans for the ‘average’ person. Because the people who need the most help are usually the ones left out.”*

As we wrapped up, he left me with one final message that I’ll never forget:

*"Don't be afraid to lean on your community. If you don't have one, build one. We don't survive alone."*

## Interview #3 - Mariana

Before my interview with Mariana, I had been reflecting on the intersection of disaster management and disability advocacy in Guam. Through my research, I already understood that organizations serving people with disabilities play a critical role in preparedness and response—but I wanted to hear from someone navigating the realities from within. Mariana, a social worker deeply embedded in this space, came recommended through a family connection. I was extremely grateful for this introduction—up until that point, I hadn’t had much success hearing back from people.


We scheduled a Zoom interview, originally planned for an hour, but the conversation stretched into more than two. The time flew as we moved between lighthearted moments—laughing over shared cultural references—and deeply personal reflections on burnout, systemic failures, and her unwavering commitment to the families she serves. It became clear that for Mariana, this work was never just about policy. It was about people, relationships, and the struggle to enact meaningful change in a system that often resists it.

## Informal Networks and Realities of Disability Services on Guam

One of the most striking themes in our conversation was the heavy reliance on informal support networks. Mariana described how many of her clients lacked consistent family or caregiver support, despite cultural expectations that family will always step in. In reality, some disabled individuals may be isolated—socially, geographically, and emotionally—which increases their vulnerability during disasters ([Engelman et al., 2022](#)).

*“I kept telling her, ‘Please think about your children. You need to go to the shelter,’” Mariana recalled, describing a client living in unsafe housing conditions before Typhoon Mawar. “And she told me no... She didn’t think it was going to be that bad.”*

Mariana also spoke about a personal breaking point in her career as a social worker. She recalled a case that pushed her to the edge, when she was desperately trying to find help for a client.



*“I was just... hitting walls. Every agency I reached out to either passed me off to someone else or told me they couldn’t help. And then I realized—this is just the way it’s always been.”*

It was a moment of painful clarity for Mariana. To navigate Guam’s disability services, it wasn’t just about knowing the right programs—it required persistence, advocacy, and relationship-building across a disconnected system.

## Strength in Community Before and After the Typhoon

Despite these barriers, Mariana emphasized the strength of the community—particularly in the days leading up to and following Typhoon Mawar. One of the most powerful stories she shared was about how her agency collaborated with local village leaders to coordinate transportation for people with disabilities.

*“Before the typhoon hit, we knew we had to act fast,” she said. “We worked with different villages to organize transportation for people with disabilities or those who had no family to take care of them, making sure they got to emergency shelters safely.”*

This type of grassroots mobilization played a crucial role in ensuring safety where formal planning can sometimes fall short.

Even after the storm, leaders, grassroots organizations, and everyday residents stepped up. Mariana recounted how communities came together to check on elders, share food and supplies, and help clear roads. After the storm, Mariana and her colleagues didn’t wait for instructions, they went out themselves to check on clients.

*“After the typhoon, we had to go out in the field and check on our clients,” she said. “Some were at home, some were with family, and others were still at the shelters. We had to piece together who was okay and who needed help...With power and cell service down for weeks, they made in-person wellness checks, delivered supplies and offered support where they could. “It was the neighbors, the mayors, the churches. That’s who showed up,” she said.*

## Signs of Progress and Hope

Even with these challenges, Mariana emphasized that change is happening. She highlighted several key areas where progress has been made:

**Increased Community Engagement:** “Before, no one even really knew about us,” she said of disability service providers. “But now, we’re out in the community more—at mayors’ meetings, coalition meetings, actually talking to people. Not just pushing paperwork.”

**Stronger Inter-Agency Relationships:** “Before, it was like pulling teeth to get a response,” she said. “Now, I can text someone directly, and we actually work together instead of passing people around.”

**In-Home Care Expansion:** Mariana shared that new funding now allows family members to be paid as caregivers—“something that wasn’t available before.” She explained how this has helped families avoid the impossible choice between caregiving and income.

**Data Collection is Finally Happening:** “Before, we had nothing—no data, no reports, no numbers to back up our needs,” she said. “Now, we’re collecting it. We ran a community survey, and because of that, we were able to launch an adult day center—the number one need that came up.”

**Policy Representation:** Mariana said newer policymakers are listening. “We’ve had meetings where we’ve been able to directly advocate for funding increases. That didn’t used to happen.”

Throughout our conversation, Mariana returned again and again to the importance of relationships.

*“This work is relational,” she said. “You can’t just send someone a flyer and call it outreach. You have to build trust. You have to show up.”*

Her words stuck with me. She reminded me that while policy is important, real work happens in the spaces between people—through trust, care, and persistence. Mariana’s interview, like the others, reinforced that inclusion is already happening in Guam—not just in legislation, but in the everyday acts of connection that hold people up when systems don’t.

## Thematic Synthesis: What Holds Us Together

As I listened to the stories shared in the interviews, five key themes emerged—each one deeply rooted in CHamoru cultural values and everyday lived experience. These were not abstract ideas pulled from coded transcripts—they were truths carried in memory, laughter, frustration, and deep care. Together, they reveal not only what’s broken, but what already works, what holds people together when systems fall apart, and what kind of future people are building anyway.

### Inafa’ Maolek: Restoring Harmony Through Collective Care

*“It reminded me that our real safety net is each other.” – Haggan*


Inafa’ maolek, the value of mutual care and restoring harmony, surfaced again and again—not as a slogan, but as a way of life. Haggan spoke about coordinating an informal evacuation during Typhoon Mawar for a wheelchair user, when emergency services couldn’t reach them. Roads were flooded, buses weren’t running, and relatives were away. She and a group of volunteers figured it out.

*“It was stressful,” she said, “but it reminded me that our real safety net is each other.”*

Alex recalled his neighbors after Typhoon Pongsona who cooked meals, shared coolers to keep meds cold, and cleared roads together. Mariana described how villages mobilized to transport residents with disabilities to shelters before a storm hit.

What emerged most clearly was that care is not something extra—it’s embedded in daily life.





*“That’s just how we do it here,” Alex said.*

When formal systems delayed, denied, or disappeared, kin, neighbors, and volunteers stepped in—often without training, funding, or recognition.

## **Che’lu: Interdependence Over Independence**

The word che’lu, meaning sibling, was invoked both directly and symbolically throughout these conversations. It reflects a kind of kinship that extends beyond blood, reminding us that resilience doesn’t mean going alone. It’s about being carried—literally and emotionally—through hard times.

For Alex, this meant leaning on friends and relatives to survive the aftermath of military service, addiction, and housing instability. For Mariana, it meant calling on colleagues and village leaders to help conduct wellness checks post-typhoon when phone signals were down. For Haggan, it meant being the one people called when no official channels would respond.

These stories offer a counter-narrative to dominant Western ideals of rugged individualism. In Guam, survival is a shared act. Resilience lives in reciprocity.

## **Maolekña Yu’: Systemic Gaps and Informal Solutions**

All three participants pointed to persistent gaps in Guam’s formal emergency management systems—from inaccessible shelters to miscommunication between agencies. But they also revealed the everyday creativity and courage it takes to “make it work.”


Alex told the story of carrying his uncle out of a damaged home in a wheelbarrow. Mariana described coordinating transportation for clients whose families couldn’t reach them. Haggan rerouted supplies and people through trusted networks built on years of grassroots work.

Maolekña yu’—a phrase that can be loosely translated as “I’m doing okay”—became a stand-in for this spirit. People shared oxygen tanks, checked in on each other, and made do with what they had, even when no formal support was in place. These weren’t exceptions. They were the norm. And they often came at the cost of burnout and quiet exhaustion.

*“We’re left out of the planning process, so we always end up having to make things work at the last minute.” – Haggan*

## **Todo i Taotao: Inclusion Through Cultural Traditions**

Todo i taotao, or “all the people,” reminds me that inclusion already exists in everyday CHamoru practices. From fiestas to village gatherings, people are expected to show up for one another—not because of legal mandates, but because that’s part of what it means to be in community.



Mariana recalled churches and mayors working side-by-side before and after Mawar. Alex described how no one in his neighborhood growing up was excluded from celebrations, regardless of ability. Inclusion didn't need to be explained—it was practiced.

This theme pushed me to rethink what accessibility looks like. It's not always about the ramp or checklist (though those matter, too)—sometimes it's the cousin who checks on you before the storm, or the neighbor who makes sure your meds stay cold. That, too, is infrastructure.

## **Guma': Grassroots Advocacy and System Change**

Guma', meaning home, anchors this final theme. While much of the work described in these interviews happened informally, each participant also called for bigger changes that come from within the community, not just from policy.

Haggan spoke about years spent pushing for representation in emergency planning. Mariana highlighted how agencies now collaborate more closely and how data collection is finally happening. Alex described his journey from surviving to organizing, and what it meant to now be someone who helps others “find a way through the mess.”

*“It's not either/or—we need both the pickup truck and the policy.” – Alex*

This metaphor captured it perfectly. Informal networks and formal systems aren't in conflict, they're co-dependent. Real change happens when lived experience is invited into decision-making—not as a token, but as a guide. That's how we move from surviving to rebuilding—together.

## Conclusion

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The stories shared by Haggan, Alex, and Mariana were not just accounts of what went wrong during disaster response—they were reflections of what was made right through *inafa' maolek*, deep-rooted community networks, and everyday acts of care. Each person brought forward a perspective shaped by lived experience, professional insight, and a shared refusal to accept a system that consistently leaves people with disabilities behind.

Across all three interviews, a different model of disaster preparedness began to take shape—not one built solely on policy or response protocols, but one grounded in relationships. In interdependence. In the auntie who checks in. In the church that opens its doors. In the cousin who rigs up coconut leaves to shield a window. These acts are not backup plans. They are, for many, the primary line of support.

*As Mariana put it, “It was the neighbors, the mayors, the churches. That’s who showed up.”*

From Haggan organizing grassroots evacuations when shelters weren’t accessible, to Alex recalling how his community kept each other fed after Typhoon Pongsona, to Mariana’s call for better interagency coordination—they all pointed to one truth: care is already happening. It’s just not always being seen or supported.


Yet, while community efforts are powerful, they cannot carry the burden alone. This project underscored that Guam needs both grassroots and institutional collaboration. Community-based organizations (CBOs) offer trust, proximity, and cultural fluency. Institutional systems bring reach, funding, and structural capacity. One cannot replace the other.

*“We need both the pickup truck and the policy.” — Alex*

This duality was echoed in every story. The strength of Guam’s communities is undeniable—but it must be met with systems that recognize, uplift, and invest in that strength. Policy must reflect lived realities. Emergency planning must move beyond standardization to include trauma, chronic illness, sensory and mobility needs, and the complex web of relationships that make survival possible.

This capstone did not set out to generalize or offer universal claims. Instead, it asked: *What becomes possible when we center the voices of those who live and labor at the intersection of disability and disaster?*

The answers didn’t come from checklists. They came in stories that carried grief, exhaustion, ingenuity, and hope.



And in every single one, the message was clear:

**We do not survive alone. We survive because of each other.**

It's time our disaster systems, our policies, and our advocacy efforts start reflecting that.

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# The Palisades: Examining the Resilience of the Community Post January 2025 Wildfire

By Jacquelyn Olson

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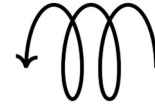
## Abstract



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This capstone project investigates the resiliency potential of the constituents of the Palisades status post the Palisades wildfire that began on January 7, 2025. Through a qualitative interview and attendance at local community meetings, I observed the different hurdles and challenges the community has and will face during their rebuilding and/or relocation stages. These observations can help determine the resiliency of individuals as well as the Palisades community as a whole. Therefore, this research may assist in laying the groundwork towards assisting in building resilience of community members, and potentially the Palisade community as a whole post wildfire.

# Introduction



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## Background of Study

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As climate change continues to grow at a rapid incline, wildfires similarly have grown significantly not only in prevalence, but as well as severity. But why should we care about the rate and spread of wildfires, especially when it affects some communities more than others? Well, one reason that should raise concerns is that the increasing rise in the atmosphere has increased the amount of regions that are more prone to fire. In addition, the decrease in access to fresh water, especially in locations such as Southern California, also has made communities more prone to wildfires and also decreases their ability to put them out. In addition to climate changes, wildfires affect individuals and groups that vary significantly in their socioeconomic and ethnic backgrounds. This means that no matter the connections and resources an individual has or does not have, they still are at risk of experiencing the effects of climate change, including but not limited to wildfires. Another reason to be wary of climate change, and thus wildfire risk, is the impact that it has culturally and socially for individuals and the communities in which they reside. Many pieces of history and culture can and will be lost to wildfires that can impact the wellbeing of a community as a whole. These places don't even necessarily have to be of historical importance, just simply places that can provide comfort, guidance, or any other important function/feeling for individuals and groups within a community. Examples of some places that may play pivotal roles in community are churches, museums, theatres and local mom and pop shops and restaurants. The local small businesses help to make the Palisades the community that it is, as it reflects the values and desires of the community as a whole and furthermore differentiates itself from other communities.

As I began my research project this past January, multiple severe wildfires erupted disrupting many communities and their constituents. Listening to the stories and experiences of individuals and groups affected, I was particularly drawn to the Palisades community and how the community is made up of many different groups, something that is often overlooked by mainstream media. One aspect that stuck out to me about media presence is the disconnect

between who resides in the community and the necessary resources needed to be supplied to the region in order to rebuild.

While many news channels focused on their being a major presence of wealthy individuals residing in the region, including Hollywood elite, they dismissed the foundation of the community, which all started with smaller homes for the working class. Despite many affluent individuals relocating to the community, there was still a good portion of multigenerational families residing in older homes in the Palisade community, who were disproportionately affected by the wildfires due to lack of fiscal resources. Despite gaps in the amount of resources available and accessible to everyday individuals, there are still a number of factors that contribute to the resiliency of Palisade community members post the January 2025 wildfire. Acknowledging these differences in affected communities and individuals can help us to establish more interconnected and generalized solutions that can be applied to all communities that have been affected by the fires.

To truly understand the complexity of the Palisades community, I think it is important to have an adequate picture of the history explored and illustrated as it can help build the foundation of how the Palisades community is resilient. This is also vital as it helps to paint a picture of who and what makes up the community. The Palisades was founded in 1922 by a Methodist group who was looking for a place to hold their summer camp, also known as a Chautauqua. While this summer camp had religious overtones, it also was reminiscent of a typical summer camp with activities such as stage shows, hiking and classes. By the 1930's, Chautauqua's were no longer being held in the community, and Methodist practices slowly began to disappear. Because of the quality of the undeveloped land and its close proximity to the ocean, the Methodist community decided to start to build a community for the working class in the region. This lasted for approximately a decade, before the Methodist group began to experience financial problems which were exacerbated by the Great Depression; due to their financial woes, outside developers began to utilize the cheaper land to build luxury homes for the more affluent. The Palisades quickly became a haven for individuals in show business, with many actors, writers, and filmmakers utilizing the space for work as well as their homes.

The purpose of this capstone was to examine the current factors in the Palisades that can contribute to its continued resiliency, despite outside influences that may try to counteract the factors needed to bring forth necessary changes. Holding interviews, examining articles regarding Palisade community rebuilding efforts, as well as attending local community meetings was utilized to create a model of resiliency. By examining the factors that influence the



Palisades, a better understanding of the Palisades resiliency can be illustrated, which can then be used to not only help in the rebuilding and relocation efforts for individuals and groups affected by the January 2025 wildfire, but also to help these groups and individuals to potentially prepare for future climate change oriented natural disasters, including wildfires. Not only does this capstone encapsulate the factors necessary for the Palisades, but it also can assist other communities that may be affected by wildfires, or other natural disasters.

## Research Question

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How do people in the Palisades experience resilience in the wake of the January 2025 wildfire?

## Review of Literature



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The traditions and cultural practices can be very important in prompting individuals and communities on their propensity to rebuild following wildfires. Some traditions or cultural identity can be viewed through multiple lenses including, religious practices, socioeconomic status, propensity for sustainable development, as well as need for ready access to art and history. In this literature review, I first studied the logistic reasons for relocation, or forced displacements, before analyzing the traditions and cultural identities that could further influence individuals to abandon pursuits to rebuild within the Palisades, and instead move and start up in a new community. I then examined the role of spirituality, religion and mental health and their role in establishing a sense of self and community; and, furthermore, how this sense of belonging can reinstate resilience within individuals and help them to stay within their communities after wildfires. Lastly, I touched upon the importance of art and history in building resilience for individuals within the affected Palisade community.

### **Physical and Governmental Factors:**

When examining the aftermath of wildfires, one aspect that is very apparent is the displacement of individuals from their homes. This is done, at least initially, to decrease the amount of health effects that individuals face after wildfires and removes them from harm's way.

However, displacement can happen for a significant amount of time following wildfires, and the amount of resources and social standing each individual/group has directly affects how long they can/will be displaced. The displacement of individuals is caused and exacerbated by a multitude of reasons. In the book, [Displacement following natural disasters can be a recurrent event, especially before the eventual rehoming of the affected individuals](#) (16). Constant displacement of individuals can lead to a feeling of insecurity which can affect their resilience and propensity to rebuild in their community. If displacement affects individuals so significantly, especially when forced to relocate many times, how can displacement be monitored so that individuals are not moved too far from their homes? [When examining factors of resiliency it is important to note that financial, social and political aspects need to be upheld and supported towards individuals who are less likely to have the means to support themselves.](#) This can help to bridge any gaps that are apparent in resources available to individuals who do not have enough in savings or investments to support a rebuild without outside financial assistance. I also think it is important for there to be an aim of transparency, especially in terms of the rate for rentals. For instance, there should be resources and potentially governmental pieces in place to help prevent price gouging from landlords, especially for those who are displaced from their homes due to the Palisades fire, or other potential natural disasters. Interviewing individuals from the Palisades allows for a better understanding of their thoughts on displacement and how different financial, social and political aspects have affected their decisions on whether to stay or go. I think that offering more insight into how price gouging affects everyday individuals might be more conducive in informing policymakers about the need to put balances in place to prevent this from occurring. This is why asking individuals, such as what I aimed to do in my research, is important as it can help to take the concepts of what is or could happen and give it real world instances and applications.

As we delve more into what determines who relocates and why, it is important to look into the backgrounds that each individual has and, furthermore, the access each one has to proper resources. [Individuals living in rental units were noted to be at a significant disadvantage, as they have less federal assistance available when compared to homeowners after wildfires.](#) This may be due to more fire-prone regions being populated by higher-income residents, as has been noted in the Palisades region. However, there are still low-income residents that also reside in these regions as well, but when they discuss this fact, they note that the difference between the individuals residing in high vs low-income regions is again due to the lack of resources to prevent fires, such as through fire safety investment, ability to afford or maintain fire insurance,

as well as not having the means to rebuild. I think one question that comes out to me is how can we place blame on homeowners/renters for lack of access to fire insurance, when many of the individuals' insurance plans were cancelled just prior to the start of the Palisades fire? In addition, how do we ensure that individuals are being offered the proper relocation and rebuilding assistance necessary for them to be able to remain within their communities? I think by asking individuals affected by the fires about their insurance coverage, or lack thereof, and furthermore the decisions or outcomes that led to their insurance state can reinforce the potential biases that are perpetuated in regards to individuals living in lower socioeconomic standings. By addressing the lack of access to the necessary resources, we can better illuminate the need for increased access and call to action the need for the government or other agencies to help cover the discrepancies based on class, race and socioeconomic standings.

One major cause of concern for the Palisade community, and something that may interfere with people's decision to rebuild in their community, is the [recent dropping of fire insurance coverage by major insurance companies](#). The quick removal of these necessary coverages left many individuals in distress, as they were unsure of how to get proper insurance coverage, especially as climate change and other factors have driven up the risk for wildfires. This brought many questions, mostly on the ethics of insurance companies and their refusal to provide help for individuals, especially those who have been paying for fire protection for many years. [Thousands of individuals were dropped by their insurance companies mere months before the Palisades fire with many major insurance companies citing that they chose not to renew fire coverage due to potential losses for the companies themselves](#). To counteract some of the inequity from the loss of insurance company fire coverage, the FAIR Plan (California Fair Access to Insurance Requirements Plan) was created, which provides basic fire coverage. The FAIR plan has taken on the responsibility of covering insurance for those in higher fire risk zones; however, [only 1400 homes out of 9000 homes in the Palisades were actually covered by this plan](#). Is the lack of coverage due to homeowners not knowing about the plan, or is the FAIR plan not applicable to all? [Representative Maxine Waters is noted to have started to a reinstate a bill called the Wildfire Insurance Coverage Study Act](#), that would help to analyze the areas that are at risk to wildfires, those who have been affected by wildfires, and most importantly the role that insurance company plays in the remediative and preventative efforts for wildfires. My research again involves going straight to the source and requesting information from the affected individuals; by asking the individuals who are directly affected by the Palisades fire, we can get a better understanding on how insurance plays a role in the lives of the residents. It can also illustrate the amount of access

that individuals have to insurance as well as to information regarding supplemental insurance policies such as the FAIR Plan, vs simply stating the statistics of who has or who does not have this insurance.

As noted above, insurance, especially fire insurance in this case, is an important factor for real estate in California, and the loss of insurance has played a major role in creating strife among California residents. With the continued loss of insurance, and the recent fires in Southern California, including Eaton and Palisades, there is concern about the financial capability for rebuilding. [It is important to note that the recent wildfires have incurred record level damages to infrastructure, most notably due to climate change.](#) Major insurance companies are noted to be fully capable of funding for these damages; however, despite their capability to fund for fire damages, they have refused to reinstate or provide fire coverage for many regions in California. One important aspect to consider about the Palisades and their resilience, is that they are part of the [WUI \(Wildland Urban Interface\). This means that they lack fire-resistant construction and wildfire mitigation.](#) which might have played a role in worsening the fires. With that being said, if individuals and groups within the affected communities had knowledge of the WUI and the need for fire resistant plans, could the fires have been mitigated easier? This made me question how the knowledge of the WUI and its role might affect the decision for individuals to remain within the Palisades? Would they remain if more fire resistance and mitigation services were readily provided and supported? My research aims to answer these questions so that the application of such policies such as the WUI are not interfering with the progress needed to maintain the fire-resistant needs of the community; and furthermore, ensures that everyday residents are aware of the policies that are in effect and how they indirectly or directly affect the health and maintenance of their community. By addressing these needs, it could further the research and ideas that have already been presented in the article mentioned above.

### **Spiritual and Mental Factors:**

Religion and spirituality are important factors and play significant roles in many individuals' lives. Keeping this in mind, we would be remiss to dismiss the role that it plays on if/how individuals rebuild their lives after wildfires. The importance of spirituality in Alberta, Canada, following the wildfire in the region, in the resilience of its members has been examined. It was noted that the spirituality in the region helped individuals to reestablish their lives within the affected community, as they had a strong connection to the land and the people who make up

the community. [Interviews were conducted with individuals from Alberta, in which they had community members define the terms \(such as faith, hope, and sense of gratitude\) that best represented the resources that were instrumental in allowing them to restore and rebuild their community following the wildfires.](#) One gap that I found within this article was whether or not financial support could dissuade individuals from remaining in the wildfire affected area, or will they remain no matter the financial costs or repercussions? [Mental health and the potential impacts that disasters, such as wildfires, have on mental health has also been discussed in correlation to the Alberta wildfires.](#) Knowing how individuals are affected by spiritual health in the Palisades could help to reinforce the ideas brought forth by the research performed in Canada, especially if spiritually is found to be an important factor in the decision for residents to remain within the Palisades area.

Moving forward with the idea of mental health, how does this factor influence the resiliency of individuals and groups within wildfire affected communities? In the article, [Significant PTSD and Other Mental Health Effects Present 18 Months After the Fort McMurray Wildfire: Findings From 3,070 Grades 7–12 Students](#), a mental health index/study was performed on students who were residing in the Fort McMurray Wildfire in Alberta, Canada in 2016. The study is an excellent example of how varying groups can be indirectly and directly affected by disasters; in this case, young adolescents were observed and their behavior and mental health after the wildfire were observed and later recorded. Again, as mentioned above, having similar questions asked to general members of the public could reinforce the ideas and findings presented in the research article regarding mental health after the Fort McMurray Wildfire. I think, in addition to studying children, studying adults and individuals from varying socioeconomic backgrounds within the Palisades could also be beneficial in furthering the research presented above by showcasing the severity of mental health problems that are caused by wildfires and the reasons why resources should be provided to better reinstate their sense of belongings that communities can be rebuilt stronger and more resilient.

### **Physical Health and Infrastructural Factors:**

In addition to mental health, some individuals may make decisions to relocate based upon their health, the health of their loved ones, and/or the general health of the community/environment. [In an article posted by Harvard School of Health, they discuss the potential health repercussions that individuals will face post fire due to exposure to the smoke](#)



[and the toxins that are left after the fires](#). In conjunction with this knowledge, they have launched The Los Angeles Fire Human Exposure and Long-Term Health Study, which will collect data over the next decade or so on the overall health impacts that the fires have performed on the Palisade community.

While I agree that this study is important, I wonder if the potential for health impacts will cause others to relocate from the Palisades? [Many of the health issues linked have to do with respiratory issues](#), which makes me wonder if people who are more prone to respiratory issues, such as asthma or COPD are more likely to relocate instead of remaining in the Palisades? Is there a way for health to be bolstered and supported in a way that supports the mass majority of the Palisades residents, so that they are able to have the opportunity to rebuild within their communities? Since the Palisade wildfire is so recent, it is hard for them to state exactly what health issues will arise and which groups will be more at risk to relocate because of these health risks. This is why my research into how individuals are responding to the wildfires, especially in terms of relocation vs rebuilding is important. Knowing exactly what is greatly disturbing and affecting the community members can lead to better research on the health effects the community is facing and the best ways that the community can be treated and future health effects to be mitigated.

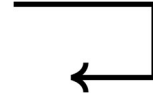
Another important factor in community rebuilding is the restructuring of the infrastructure present within the community. Implementation of green infrastructure can help to mitigate the risk of wildfire in the future. [An example can be seen in the Lahaina wildfire in Hawaii and how they have effectively put in climate conscious infrastructure to help diminish the risks and side effects natural disasters might have on their communities](#). Since the climate is very different in that region, how applicable could the infrastructure be for the Palisades? In affected communities, such as the Palisades, where a significant area of land has been greatly affected by the fires, can/will the government and potentially insurance companies in the green infrastructure needed to further mitigate fires? Or will they focus on building structures as soon as possible, without much care for the materials utilized? Understanding the role and impact of green infrastructure on the rebuilding of the Palisades can help us in understanding community and individual resiliency. If green, sustainable infrastructure is implemented and maintained, according to fire code, there could be less risks associated with living in wildfire prone regions, thus building community resilience. I think this is where my research could be greatly beneficial, as I asked the individuals within the community about their experience with infrastructure and what they want to see. In addition, I asked key stakeholders about their plans regarding

infrastructure, and if they plan to utilize fire resistant planning, as it could better reinstate the importance of climate resilient infrastructure.

### **Art and Historical Factors:**

Moving forward, art and history play a major part in the general makeup of a community, thus it would only make sense that these would also impact the resilience of individuals and groups alike. In the blog, [Los Angeles Wildfires and the Loss of Cultural Treasures](#), the loss of art and history was thoroughly discussed. They noted the importance of art and design in the overall wellbeing of individuals and communities, especially since these aspects work to build strong connections between community members. As mentioned earlier, feelings of connectedness between individuals and communities can help individuals to build resilience and help to remain within their affected communities. I did like how they mention plans to document artwork digitally and to find more ways to prevent and mitigate potential future fire damage to artwork due to the devastating loss they have endured in the Palisades due to the wildfire. I think that this is a step in the right direction for potentially mitigating the want or need for people to relocate for established art/culture, if they feel like it will be built back stronger and more resilient than it was before. I think art and history are an excellent measure of connectedness and sense of belonging within a community and wonder how this might translate to individuals affected by the Palisade wildfire, and how this might influence my research. I interviewed individuals and stakeholders within the community and to get their thoughts on art/history and the ways in which they would support fire prevention efforts in order to preserve current and future pieces of work. This would best support the article as it would demonstrate the importance of art and history for the community and the need for its preservation.

# Methodology



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## **Positionality and Epistemology:**

The positionality of my project comes from my personal experiences residing within California. I have previously lived in an undeveloped part of California, where fire risks were similar to that of the Palisades. I too experienced a wildfire while residing in that region; however, unlike the Palisades, the fire was quickly extinguished leaving most of the residents with their homes intact. Hearing the stories on the news made me want to focus upon what makes a community and their individual residents resilient after a fire. I had many questions as to what makes individuals remain within the affected community and/or their decision to relocate. I also wondered how the community in and of itself will or will change due to the fire as the community works towards rebuilding itself.

My capstone epistemology seemed to resonate more with a social constructivist approach rather than a positivist. This is due to the experiences of each individual and groups within the Palisade community having different experiences and factors that play an integral role on their ability to build resilience to remain within the Palisade community during and after the rebuilding process. The environment of the Palisades itself will play a significant role in the decision-making processes of the individuals affected; however, other important features such as interpersonal relationships, ties to the community culture/art/history, as well as the importance of health and quality of the rebuilding can and will influence resiliency of each individual/group. Knowing how different environmental factors as well as social constructs affect different individuals and groups can lead to a better understanding of the different ways in which resilience can be built up, as well as how resilience can be diminished. This also comes with an understanding that there is not one method or way of knowing that can and/or will influence an individuals or groups capability to remain and thrive within the community; however, having more intellect and knowledge available to these individuals and groups affected may help them in knowing the possible ways in which they can build resilience by understanding how others and their history influence their capabilities to build resilience.

## **Methods:**

As I endeavored to explore the Palisades community and the effect of the Palisades Fire of January 2025, I formulated the following question as a framework for my research: How do people in the Palisades experience resilience in the wake of the January 2025 wildfire?

The first method that was employed was through research on the general makeup of the community. By creating a better understanding of who and what makes up the community can help to determine the factors that make the community and their constituents resilient or not. I used articles based on the Palisades Fire as well as research done on other communities that have also been affected by fires (or other natural disasters), such as the fires in Alberta, Canada, to determine what potential resiliency factors are at play in the Palisades as well as potential positive and negative influences towards resiliency from communities that have rebuilt since being affected by fires. By finding the potential factors at play, and potentially gaps that have not been addressed, I was able to formulate potential questions that I used during my interview processes with community members affected in the Palisades.

The second method that I employed was by conducting interviews. It is important to not only utilize publications from the Palisades, but also to include outside research through inclusive interviews, as it helped to find a more broad and applicable view of the Palisades versus potential disjointed publications that focus on certain groups, such as the wealthy, vs the Palisades community as a whole. The disjointedness from other publications can be due to potential biases towards potential interviewees (i.e. based on race or socioeconomic backgrounds) and/or the prejudices held by major publications. As mentioned before, I constructed questions from my research prior to conducting my interviews; however, I formulated as few as possible so that the interviews I conducted could be as honest and unfiltered as possible. Some of the questions asked during the interviewing process were as follows:

1. Are there any factors (such as religion, art, history, and/or culture) that helped strengthen the community and/or their response to disasters such as the January fire of 2025?
2. Do the arts impact resiliency of the community, are there any notable locations or pieces of culture lost that you think can and/or will impact resilience?
3. Are there any previous community responses or examples of resiliency prior to the January 2025 fire?

These questions helped to guide the conversation during the interview process, while allowing for more true and honest answers to be provided. I opted for the interviewee to answer the questions as long as they thought necessary and edited some of the aforementioned questions during the interview process based upon what the interviewee wanted to discuss and what they thought was important to the overall Palisades community. This meant that I was able to address some areas that I wouldn't have previously thought of since I myself am not a resident. I tried to find individuals who were more connected to the community, such as a member of the Pacific Palisades Historical Society, to get a better representation for who and what makes up the Palisades community. By ensuring that individuals and groups from different backgrounds are being represented, I was able to present more balanced and representative findings of what factors are influencing individuals to leave their communities, as well as the factors that are helping them to feel comfortable enough to remain, rebuild and support their resiliency.

Due to the Palisades being closed due to the remediation efforts that are currently ongoing. I conducted all interviews and meetings through either phone calls or zoom meetings. While this may not be the most conventional means to build personal relationships, I found it easier to arrange with varying groups, thus allowing for more perspectives to be heard and recorded for both the purpose of this paper as well as for the community itself. I have opted to keep the names of the interviewees anonymous to allow for a more honest and open dialogue to be created.

The data was collected and analyzed through both theoretical and epistemological means, such as with the representation of the fire effects and community resiliency through a community map. The data was collected through those means as the Palisades were in the process of being remediated and studied, the ability for individuals to determine their capability to remain resilient and rebuild within their communities were still unknown. Factors such as insurance coverage can ultimately change the outlook of individuals and their ability to remain within the Palisades. Acknowledging the epistemological nature of resilience and the factors that have and can influence resiliency for varying individuals and populations can assist in building a more probable theoretical framework/likelihood for Palisade resilience. Furthermore, the creation of a community map of the vital and important places for the fire itself and that of the community helped to create a picture of the true devastation of the fire and therefore its true impact on the community. Presenting the data in model forms helped to illustrate the picture of resilience within the Palisades and the likelihood of the community being able to be rebuilt similar to the one that was there before. The research may not be indicative of a similar community; however, this may not mean that the community will be worse off, there have been many publications



discussing the new connections built between different community members, which may lead to a more connected, representative, and, therefore, resilient community.

# Results



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When examining community resilience, it is important to think about what makes up a community; thus, I created a community map to showcase some of the important places that were affected by the fires, as well as other places that helped to facilitate the resilience of the community. The first aspect I highlighted on the map was the initial starting point of the fire at the Temescal Ridge Trail. I thought it was important to highlight the start of the fire as it helps to showcase the spread of the fire and the direct impact that it had on the community. Some of the historical places that were impacted by the fire were the Palisades Charter High School, the Pierson Playhouse Theatre Palisades, Will Rogers State Park as well as the Topanga State Park. The Palisades Charter High School not only was a place of learning for many students but was also a cherished film site for many films, tv shows, and music videos. Just up the road from the Palisades Charter High School, the local community Pierson Playhouse Theatre Palisades was also lost in the flames. The theatre initially started as a small community group that would perform at various parks and locations, until the land for the theatre was donated by the Pierson group in 1975. The theatre served as an integral part of the community and involved both children and adults within its performances. As mentioned above, the Will Rogers State Park was affected by the fire, with a notable loss of the Will Rogers' Ranch House that was donated by his wife to the public in her will. The Will Rogers' Ranch House was notable for its horse trails and activities, bringing various community members as well as visitors to the Palisades community. Similar to the Will Rogers State Park, the Topanga State Park, also experienced significant cultural and environmental losses, including the loss of the infamous Topanga Ranch Motel, which was one of the oldest motels in Malibu. The motel was notable as it was used by writers as well as being as a film set for multiple tv shows and movies.

In addition to highlighting the places that were affected by the fires, I also wanted to highlight a couple significant places that have and can contribute to community resilience. The

[illegible]

Figure 1. Community map of the Palisades that highlights important places before, during, and after the fire in January of 2025.

In addition to the creation of a community map, I conducted an interview with Phil\* from the Pacific Palisades Historical Society. In the interview, my contact began by discussing how the Palisades was founded in 1922 by members of a Methodist group. He discussed how the community began its initial development for the working class, because of the quality of the

undeveloped land and its close proximity to the ocean. This lasted for approximately a decade, before the Methodist group began to experience financial problems which were exacerbated by the Great Depression; due to their financial woes, outside developers began to utilize the cheaper land to build luxury homes for the more affluent. The Palisades quickly became a haven for individuals in show business, with many actors, writers, and filmmakers utilizing the space for work as well as their homes.

When we discussed the culture of the region, it was revealed that the Palisades community is divided into varying groups/sectors. When I asked if it was possible to decrease the disparity between different groups/neighborhoods, I was told that it would be hard to accomplish due to many neighborhoods being separated topographically. An example of this is the Castellammare Village neighborhood, which is supposed to mimic Italy's Amalfi Coast, with homes being built along the hillsides in the Palisades. The homes not only reflected the culture of the region, but also the infrastructure, including long, thin winding roads. This design would later be a hindrance in time of evacuation, as there was only one road in and out, leading to major traffic jams and mobility issues. The roads were also extremely damaged due to previous landslides, making the evacuation routes even more difficult to manage. The Marquez Knolls and Highland neighborhoods also experienced similar evacuation difficulties, as they were reliant on only one main road for evacuations; however, their evacuation route was not as winding and secluded as the Castellammare Village neighborhood, as their main evacuation route was along the PCH, and not on a hillside. This reliance on a single evacuation route led to individuals being grid-locked on Sunset Boulevard and the police having to direct individuals to leave their vehicles and run to the water, in order to evacuate the area. This caused further issues for firefighters, as the road was then blocked for firefighters trying to reach the blazes. Eventually, bulldozers had to be utilized to help move cars so that firefighters and their equipment could get to where they were needed. My contact questioned why the potential evacuation issues were not previously examined and worked on prior to the fire, as Malibu, a nearby community, had faced a similar situation on the Pacific Coast Highway with the Woolsey Fire. He noted that until the Palisades Fire in January 2025, the closest the Palisades got to experiencing a major wildfire was the 1978 Mandeville Canyon Fire that touched the edge of the Palisades and burned down a few homes in the region. The Alphabet Streets are another community that was affected in the Palisades, its community members were once mainly working-class citizens; however, as more Hollywood elite moved to the region, the more the homes were being bought up and redesigned by newcomers. The designs of the new homes would change the overall look of the Alphabet streets, as their homes looked less and less cohesive as a development/neighborhood. All in all, each

neighborhood or group in the Palisades had a very distinctive look and design based upon the topography of the region and the time in which they were designed/developed which caused issues with overall infrastructure and affected the ability of many to evacuate safely. This discussion on safer infrastructure was discussed as well in the community meeting held by the Santa Monica Conservancy's entitled "The Way We Were: Shared Memories of a Village Lost."

When discussing the actual fire event within the interview, there were a few factors that were mentioned that made the community more susceptible to the blaze that began by Skull Rock in the Temescal Canyon. One of those factors was that the brush at the top of the canyon was overgrown and had not burned since the 1978 Mandeville Fire; the brush served as a catalyst for the fire and led straight to the homes of the region. The heavy winter of the previous year also contributed to the increased development and growth of brush in the Palisades; while having increased water in Southern California is mostly seen as a positive, the lack of water in this winter season made the brush exceedingly dry, making the region even more prone to fire. Another factor that made the community more at risk, was the fact that the homes in the region are built in very close proximity to one another, allowing for the fire to quickly jump from residence to residence. The representative stated that the fire affected one of the densest parts of the community first, the famous Alphabet Street, where 90% of the homes were destroyed. Alphabet Street was originally intended for the lower income class; however, over the past few decades the homes were being bought by more affluent individuals; most of the original one-to-two-bedroom homes were destroyed so that larger, more luxurious homes could be built in the neighborhood. These homes being larger than the originally made the neighborhood more susceptible for the blaze, as homes were even closer together, since plots of land were relatively small. Despite there being many homes on Alphabet Street being bought out, there was still a significant number of multigenerational families who resided in the original residences. A significant number of the people who resided in the multigenerational homes, were considered to be "land-rich," and thus may not have the financial or fiscal capacity to rebuild within the Palisades, as they could not have afforded to buy the homes outright due to their income. Due to the homes being extremely close to each other, and the streets being smaller than average street sizes, the community faced a "domino effect" of loss, with the fire not only jumping from building to building in one neighborhood but quickly jumping to others. For instance, from Alphabet Street, the fire quickly spread to Sunset Boulevard in the Huntington Palisades neighborhood. Sunset Boulevard was known for having even more upscale houses with more modern amenities/utilities than the older Alphabet Street neighborhood. However, despite the differences in amenities, they were still greatly affected by the Palisades Fire, with most of the

neighborhood being destroyed. In addition to regular housing developments, two mobile home parks located along the Pacific Coast Highway (PCH) were also greatly affected by the Palisades Fire, reinforcing the fact that money and prestige does not protect all individuals from natural disasters, such as wildfires. One of the most unfortunate factors that left the Palisades susceptible to the blaze was that the Santa Ynez Reservoir in the Palisades being empty for maintenance; therefore, there was no water available for firefighters to utilize in order to contain the flames and stop it from spreading at the rate and severity that it unfortunately took.

In the interview, we also discussed resiliency, and what they believed made the community resilient. The first case of resiliency that was discussed was the ability for the Getty Museum to survive the flames. This was due to the Getty being built cautiously to help it survive potential fires. In addition to resilient building of some important buildings, the community has had somewhat of a resurgence with groups and sentiment forming, such as the tagline “Palisades Strong” and the group Resilient Palisades. Different groups have begun to hold different meetings about how to rebuild the community and the ability to raise sentiment and funds. One thing that we questioned about potential resiliency was how proper and fair decisions could be made, when the different groups and neighborhoods have different needs and focuses. These varying needs and focuses might keep the different groups separated, instead of building the community closer together. As mentioned earlier, the reliance on one evacuation route could continue to be a major issue in terms of resiliency, especially if reconstruction efforts are not taken. In terms of individual resiliency, I asked what factors would greatly impact the ability for people to return to the community. One of the main reasons is the inability to afford to rebuild. Many insurance policies had tightened over the past few years, meaning that the policies in place are not adequate for rebuilding acts. Due to policies not covering the costs that have and will incur for rebuilding, individuals will likely have to utilize their savings (if they have any) and/or borrow money, in order to afford to rebuild their homes. Unfortunately, as it was stated in the interview, people with moderate or low income are expected to be pushed out of the community for economic means. The expulsion of the mid and lower classes means that the Palisades will again face a change in culture. The Palisades began as a small town, with folksy undertones with lots of mom-and-pop shops. By the early 2000’s more commercialized and chain businesses had begun to move into and be accepted by the region. This culture shift to a more commercialized and affluent community was greatly impacted and supported by the developer Rick Caruso’s building of the Palisades Village Shopping Center. This shopping center is similar to The Groves, however on a smaller scale. Unlike other smaller, older buildings, Caruso’s shopping center



survived the fire as it had fire safety features implemented in its developmental stage. The estimated rebuild time for the community is 3-5 years, as there are still major clean-up efforts that need to be taken before rebuilding can begin. While the rebuilding process is underway, individuals will have to reside in other communities, which makes them more likely to put down roots and make connections in whatever community that they have moved into. These community ties might make it harder for individuals to make the decision to move back to the Palisades, as they would have to give up the life they have reestablished over the course of 3-5 years. It was discussed that many individuals have already discussed their intent to move permanently from the Palisades, with some having already sold the land that their property was located. While some have decided to sit on their land, in hopes of getting a better deal for their property.

Phil\* brought up an excellent point during the interview that caused me to pause and consider my stance on resiliency. He stated that we are assuming that individuals would want to return to the Palisades at all. He stated that individuals might “see the fire as a hex” to the community and might make them “wary to return.” Could this wariness and hesitancy to return to the Palisades still mean that an individual can be resilient? Well, the answer is simply yes, as long as the member is working towards establishing themselves in the community and thriving in and of themselves. In addition, we discussed how the current political climate and the impact of the “current culture wars” were also brought up in the interview, and how these might make individuals more hesitant to put forth their money and resources to rebuild in the Palisades, when they can move and reside within another community, with potentially less risks. In addition, the budget of LA county also can play a major role in the ability for the community to rebuild as the city of LA has many budget measures to consider. This may mean that there are less funds available to apply the changes necessary, especially to infrastructure, that is necessary for the community to increase its resiliency.



Figure 2: Matches can be a meaningful source of data for my research on the resiliency of the Palisade community, as it can serve as a reminder of horrors they experienced as a result of the wildfire. It also can serve as a reminder of some of the media narratives that claimed that the fires were intentionally started. While matches can serve as a negative reminder of things lost; they also can serve as a sign of new hope and regeneration. Matches, as mentioned before, can be utilized in religious ceremonies which can help to increase senses of strength and resiliency within the community by providing a stronger sense of belonging to the community members. In addition to increasing a sense of belonging and community, matches can serve as an example that making changes to more eco-friendly products can decrease the risk of fire, especially in fire prone areas such as the Palisades. Matches, furthermore can prove that we don't have to give up on things that bring individuals comfort, such as candles and fires in contained locations so long as we maintain safe fire practices and have the knowledge on how to contain/extinguish flames before they become more disastrous for not only ourselves, but our community as well. Decreasing the use of lighters, through the switch back to matches, can also help decrease the prevalence and severity of wildfires by decreasing the amount of plastic produced and wasted through the creation of lighters. Thus, by continuing on with older traditional methods of fire and fire safety, we can improve our climate change efforts.

In addition to conducting interviews with members of the Palisades, I also attended the Santa Monica Mosaic - The Way We Were: Shared Memories of a Village Lost meeting, in which members of the community gathered together to discuss the aspects of the community they are missing and the hopes and steps that they wish to see and take in order to bring about resiliency.

They first discussed some of the important traditions for the community including the Pacific Palisades Garden Club's drought tolerant gardens and the Thanksgiving programs hosted

at the Corpus Christi Church, as well as the grandparents and kids story time at the Palisades Branch Library. These traditions and important aspects of the community were brought to attention by a previous editor of the Palisades Post, They mention covering stories of these important aspects and reminisce on the sense of community that they experienced when attending and witnessing these cultural practices and traditions. They also similar to Phil\* from the Pacific Palisades Historical Society, discussed the vast history of the Palisades, citing that the history of the Palisades was and is very important to the culture of the Palisades and is most likely a contributing factor in the resiliency of the Palisades.

During the meeting, it was discussed that the Palisades were like “the final cul-de-sac of LA.” What I took from this is to mean that this was the last folksy, down-to-earth community within the LA county region. As the previously mentioned interviewee, Phil\* mentioned the community has been ever-changing, and thus will most likely lose most of its charisma and smaller businesses due to the increasing pricing from the wildfire. This is especially a concern of increased pricing due to new developments already moving into the Palisade community as well as due to the influx of more affluent, wealthy individuals who have come and made new, more expensive renovations to the region, further driving up the price range of the homes in the community. That being said, the members of the meeting expressed their dismay and sadness towards the continued change of the community. Despite the changes being made to the community, some members did discuss how they are going to keep their livelihoods alive and note that there are some landlords that are working with small business owners, so that when the Palisades are open again in 3-5 years, they will have a place to resume their business, thus strengthening the community as a whole.

Despite the Palisades not being able to be completely rebuilt within the next 3-5 years, the community is already showing signs of resiliency. [The Theatre Palisades put on their first production “Crazy For You”, since the fire, that went on for two weeks beginning on February 28th, 2025.](#) The community was able to continue on with their theatre production, despite their local theatre the Pierson’s Playhouse burning down during the Palisades Fire, due to the assistance of local businesses, fellow theatre, and youth/school groups. This production was a beacon of hope that the Palisades would eventually resume its normal activities and furthermore serves as a sign resiliency by allowing for art and culture to be cultivated for all the community to enjoy, despite the event that occurred. One student from the article stated how “singing and dancing,” helps them to feel happiness and forget about the fire and its effects. Thus,

demonstrating how art, culture, and sense of community can help to build resiliency for the community and its residents.

### **Limitations:**

While I tried to ensure that polyvocality was achieved, there were some limitations to my study. The first is that I was unable to find a large number of individuals from varying regions of the Palisades to interview for this study. This means that there might be some voices that are not being conveyed in this particular paper; however, that does not diminish their impact on community and individual resiliency. Another aspect that limits this research is the fact that the research is conducted so soon to the actual event; therefore, there is more to learn in regards to community and individual resilience, as people's and governmental opinions can and will change as the Palisades begin to rebuild. In addition, there are long-term effects such as long-term health effects, both physically and mentally, that might not yet be apparent; thus, I was unable to properly assess these effects, despite them being important in determining resiliency. Additionally, while both my interviewee and the individuals from the community meeting both stated that fire-resistant building plans were being discussed, there was no direct mention of green infrastructure. This, however, could be because the plans and methods were not discussed yet at length with the general public as they were still in the discussion/planning phases of rebuilding.

## **Key Findings**

<b>Art and history are of vital importance</b>	The community has close ties with theatre, art, creative writing, etc. These avenues all serve to not only tie the community together but also allows for individuals and groups to heal and build resiliency post fire.
<b>The Palisades are everchanging</b>	<b>The community has undergone many changes within the past century and made great progress. This provides great hope that community will still be able to redevelop and grow post fire.</b>

**Infrastructure and governmental factors are still under review**

The infrastructure, i.e. roadways and fire-resistant buildings were still being discussed as the paper was being published; therefore their full impact could not be addressed. That being said, these factors that are being processed by governmental agencies are of vital importance to the community and are a common topic when discussing the ability and desire to return to the Palisades when it reopens in 3-5 years.

## Conclusion



The research above helps to define what it means to be resilient both for a community as a whole as well as their individual constituents, as there is no one direct path to becoming resilient. If one thing can be correlated is that resiliency is different for everyone; however, what I hoped this paper succeeded to do is to provide potential future help to other communities to build up their resiliency before, during and after natural disasters, such as wildfires, or any other disruptive nature. For the Palisades, I saw a few paths of resiliency, the first is for the community as it rebuilds most likely becoming more affluent in nature. Despite what others may think, this change shows that the community is truly resilient as it is able to adapt and change. For individuals sake of resiliency, individuals who are able to return and rebuild their lives within the Palisades add into the community resiliency. But, even if individuals decide to stay in the communities in which they have relocated, for any means whether it is financial and/or due to the connections built within newfound communities; they still show means of resiliency as they too are able to adapt to the changes that were unexpectedly thrust upon them.

Since the rebuilding of the Palisades is not set to complete until the next 3-5 years it is hard to determine the complete resilience of the palisade's community. What I have found thus far is that the Palisades community is known for undergoing many cultural shifts, from its being as a



small-town Methodist community to one that is more commercialized and affluent. From the interviews I conducted, many interviewees are predicting that the Palisades will lose even more of its cultural charm, such as mom-and-pop shops, due to the increasing wage gap and the cost to rebuild. There is some hope for some smaller businesses who are culturally important, as there are a few landlords that are working diligently to help these small businesses to return to the Palisades. There is some hope that developers, such as Rick Caruso, who has built some of the newer commercial buildings in the region, is working/planning to help with the designs and construction of the general Palisade community buildings, namely home developments, and plans to utilize their experience with fire resistant building protocols to increase safety across the board. This creates hope that all individuals may have the ability and right to safe homes, and hopefully at a cheaper rate, since individuals/groups with prior history and expertise with fire-resistant buildings within the region are at the forefront of the development process; therefore, less research and development on building protocols should be needed. Furthermore, despite some individuals not being able to return or choosing not to return to the Palisades, all community members have the capability to demonstrate resilience. This is because they still may have the means to build community ties, uphold spirituality, and work towards maintaining their health and happiness. All in all, I think the resiliency of the Palisades community and its members will continue to develop over time as the Palisades begin to be remediated and rebuilt. I only hope that the resiliency of this community helps to serve as a beacon of hope for other communities that are affected by wildfires or any other natural disasters.

## Next Steps

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Some next steps for potential researchers, community members, or any other concerned party are as follows:

1. Discuss with council members and governmental agencies regarding any potential concerns about the rebuilding process. I.e. if there are concerns about the health and safety of the land after the remediation and rebuilding process, as well as the infrastructural changes made.
2. Uphold and build community relations, whether it is with old or new traditions and cultural practices. Maintaining close ties with fellow constituents can help to build up individual as well as community resiliency.

3. Allow time as individuals to build up and maintain one's own mental health and/or spirituality. By being able to maintain a good mental health, one has the capacity to also build resiliency, as they are able to bounce back and recover at a faster rate.
4. Don't be afraid to embrace change. While the fire, or any other natural disaster, can and will invoke many changes and emotions, allowing it to deter one from reaching their own potential can and is detrimental to the success of the individual. Instead of allowing fear to take hold, embrace with other local community members and potentially enact positive changes, such as greener and/or more fire-resistant building, than what was previously possible or available.

\* **Note:** To maintain confidentiality, no names of the name Phil was used as a filler to maintain the individual's identity confidential.

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## Mosaic Pollinator Gardens

### ABSTRACT:

Colony Collapse Disorder (CCD) has devastated bee populations in the past, and with the ever-shifting scale of climate change, it threatens to decimate populations once again. There are many factors that contribute to CCD, such as industrial agriculture, agrochemicals, industrial beekeeping, poor nutrition, and pathogens. This research investigates the question: What is preventing the implementation of pollinator gardens that would benefit both human and pollinator health in the unused spaces of Denver, CO? By utilizing a multi-system approach that includes social, environmental, and infrastructural analysis, this project aims to identify structural and systemic barriers to such implementation. As part of the project, I propose Mosaic Pollinator Gardens- a design of pollinator gardens that will bolster pollinator health, while also having broader sustainability goals related to waste, water, energy, food, and social justice.

### Cultivating Change: An Introduction to CCD and Pollinator Gardens

*Colony Collapse Disorder* (CCD) in Honeybees has been a looming threat since the term's inception in the mid-2000s. While the persistence of CCD has been slowly improving, this threat could spell disaster for the ongoing food shortages throughout the world in combination with current socioeconomic, political, and ecological happenings. If there is another catastrophic case of CCD, food insecurity will run rampant throughout the world. As [defined](#), “Colony collapse disorder (CCD) is an abnormal phenomenon that occurs when the majority of worker bees in a honeybee colony disappear, leaving behind a queen, plenty of food, and a few nurse bees to care for the remaining immature bees”.

Pollinator gardens have seen a lot of buzz recently as a way to help local pollinators, but by implementing specific sustainable practices, my idea of mosaic pollinator gardens can help in taking this buzz to the next level. These gardens would be constructed in areas that have seen neglect, such as abandoned lots, roadside areas, or even the space between a sidewalk and the street. This is to account for the [health benefits](#) that bees obtain from existing in an urban environment while also addressing the social issue of the ‘luxury effect’. [Baldock et al.](#) state that the ‘luxury effect’ happens in higher-income median neighborhoods, where the abundance of flowering plants means better pollination. By situating these gardens in areas with lower-median income, all people in urban areas could reap the benefits of strengthened pollination. The importance of protecting our pollinators cannot be understated; they alone are responsible for [pollinating 87% of our leading food crops](#) worldwide. While that scale is large, this project's primary area of study is in Denver, Colorado as it is my current home, and a great place to study the health of bees in both an urban environment as well as rural.

Bee health is not the only benefit of these gardens, though. Through proper implementation, these gardens can address cityscapes like Denver's issues with industrial waste, poor agricultural practices, and water management. Issues like deconstruction vs. demolition of abandoned



facilities would allow for accessible materials required to build the gardens, averting industrial waste that would otherwise go to a landfill. The use of harsh pesticides, such as [Sulfoxaflor](#), and synthetic fertilizers used to boost agricultural production in the form of nitrogen are practices that are extremely detrimental to agricultural production, as bees are one of the many species that suffer from Sulfoxaflor, and that [nitrogen production in crops is strengthened by bee pollination](#). Colorado is no stranger to improper water management, and by implementing certain stormwater captures in or near the gardens, they could sustain themselves without intruding on the city's demand for water.

## **Crisis to Conservation: A Literature Review Worth the Buzz**

Colony Collapse Disorder has always been a topic that I wanted to research more. The first step of this was looking into what causes it; this initially brought me to the TedTalks of Marla Spivak, a well-known icon in the field of beekeeping for her activism in protecting our pollinators and her ongoing research within the University of Minnesota for the cause. Marla does an amazing job of presenting the concept of CCD. This introduction to Colony Collapse Disorder, as well as the importance of bees as pollinators to our society, provided many of the framework-developing questions that I needed to ask myself. One of the first questions was defining Colony Collapse Disorder. [One Study](#) by Dennis vanEngelsdorp highlights one of the biggest challenges with CCD, and that is there is not one specific factor that contributes to the disorder, but rather a combination of many. The many factors that can contribute to CCD include pollution, climate change, pathogens, traces metals, pesticides, and industrial agriculture that relocates bees.

One of my [favorite journals](#) to explore by Maggie Shanahan, highlights how industrial agriculture and industrial beekeeping are major factors contributing to CCD. Shanahan brings attention to the practices of mono-crop farming, agrochemicals, and the massification of colonies as major stressors that contribute to colony loss. Shanahan has worked closely with Dr. Spivak in the past and pushes for a much more drastic change to protect our pollinators by dismantling our current food system.

Instead, I wanted to present a solution to tackle those stressors that cause Colony Collapse Disorder, while also being feasible in any area without making total changes to current place systems. In their [peer-reviewed article](#), Ziska et al. explain that global CO<sub>2</sub> levels are negatively affecting the proteins available in pollens, which are one of the primary food sources for bees. The connection to planetary health and bee health here was clear and highlights how climate change is really playing a pivotal role in these issues. While we can always make more pollen through more flora, it does not particularly answer the question of alternative ways to increase protein levels.

After examining [the journal](#) by Jachula et al., habitat diversity became a central point for increasing bee health within my own solution. The extent of this study was done only in Poland, but it became the basis of what I would deem Mosaic Pollinator Gardens. Fox et al. presented an [article](#) that would further cement my idea by providing insight into how urban apiaries and the biodiversity surrounding them have a significant impact on the health and survival of those colonies.

## Where is the Why?

Connecting bee health to human health can be done through a historical perspective. May Berenbaum [presents a very compelling historical lesson](#) of humanity's ties with bees thousands of years ago but also takes us through beekeeping practices into the present day. While honey has always been a commodity provided by bees and [contributes immensely to human health when ingested](#), Berenbaum also presents the idea of Honey Laundering, in which transshipping and relabeling of honey in order to avoid tariffs opens up the discussion about how valuable the commodity is. Some other really great ideas presented in this are that certain manmade hives actually increase the risk for pesticide residue in hives as well as how the expansion of monocrops and genetically modified crops reduce pollen and nectar sources for bees. While the journal covers a lot of important information, the biggest takeaway is our society's value of honey.

Returning to Marla's TedTalk, she presented what our grocery stores would look like with and without pollinators. With that in mind, [the article done by Jachula et al.](#) presents more numbers. This does well to present the argument for the cost and monetary values of pollinators. In the article, it is presented that pollination has an annual estimated worth of 153 billion euros and that pollinators contribute to 87 leading food crops, which constitute 35% of crop production. While it's common to see bees at work in our gardens at home, crop production is key in understanding food security globally. [This journal by Marcelo Aizen and Lawrence Harder](#) stoked the flames as to why we need to do more for our pollinators. The pace of growth for honeybee colonies and agricultural demand are vastly different, with agricultural demand outpacing bee populations quickly. The authors warn of a potential pollination crisis in which we will not be able to pollinate the crops we need to support global food stocks. One issue that I do have with this journal, though, is its age. Published in 2009, I would be curious to see if their predictions are on track or if new initiatives and regulations have changed the trajectory. I found [this article](#) posted by the USDA that relates to the previous topic, highlighting that bee populations are growing, but they are producing much less honey as a sign of their deteriorating health. This study was done much more recently, in 2023.

Lucas Garibaldi et al. [present a really important factor](#) in not just honeybees used in industrialization but also wild pollinators and how they can tremendously improve the crop yields for local farmers. Wild pollinators are able to increase the fruit set of crops by twice the amount that honeybees in industrial agricultural settings do. This article alone had me imagine a mosaic of bees, both wild and industrial, as a part of the gardens I would envision. [Philip Kiefer doubles down](#) on this idea that wild pollinators need to have more protection and that the industrialization of bees cannot be our sole reliance on pollinating crops.

Not only can the quantity of crops be increased, but their quality as well [as provided by Wu et al.](#) in their study on soil nitrogen and apple quality. This study also provides ample reason to lessen our use of synthetic fertilizers, as nitrogen can be offset through proper pollination practices. This is a double win, as these [fertilizers can contaminate the water cycle](#), which also ties into our approach to planetary health. [A similar study was done in Argentina](#) and highlights how important bees are for fruit-exporting countries' trade.

## Creating a Solution

Knowing the importance of industrial bees, native and local species, and habitat diversity, the image of gardens consisting of both native and non-native species of flowering plants that could bolster bee health came to fruition. [In a paper by Bleidorn et al.](#), we are told that bees don't suffer in an urban area; they thrive in it. This paper also brings up the fact that other species of insects thrive as well. The idea of urban apiaries is only [solidified in the article](#) by Tew et al., who provide evidence of the success of urban beekeeping. This article does well in saying that urbanization can still pose a threat rather than dismissing the negative aspects of industrialization. In [the final paper](#) about urban beekeeping, authors Baldock et al. bring up the term called the 'luxury effect' in which higher income median neighborhoods typically yield better pollination due to an increase in floral presence. A tie into Social Justice is found here, and how these gardens, if implemented in lower-income neighborhoods, could lessen that gap in pollination while also giving the people there access to gardens that their community could possibly not afford. In their journal, [Balasubramanian](#) states that "Food, water, sanitation, and shelter are basic requirements for human survival, but all four are getting harder to access for low-income communities in developing countries, because of climate change and institutional failure to help to adapt to it". Implementation of these gardens could see that at least one of these requirements, in the form of vegetative pollinator gardens for food access, could be addressed.

As the image of these gardens comes to life, connections to waste, water, and energy became apparent. [Stormwater capture](#) was among the first ways to implement more sustainable practices into the Mosaic Pollinator Gardens. [This journal](#) by Laura Sisco et al., which conducts a study of using Air Conditioning condensate in order to sustain a rooftop garden, was important when conceptualizing these gardens in the urban locations of Denver, CO, as many cities do have concrete jungles. This type of innovation contributes to the scale that these gardens could hold. Grandiose buildings in the middle of a city could have these pollinator gardens sitting on top of them, and no one would be the wiser. Water that would have otherwise been waste now feeds the gardens.

Waste is a large component of this study. When thinking about stakeholders and who could actually implement these pollinator gardens, the fear of cost is always an issue. Even though our waste is part of the problem for bee health in the [form of trace metals](#), waste could also be the solution to where the materials for these gardens come from. In the book [Waste Management and the Environment VIII](#), there is a segment on the 'Orto in Campania', which is a garden located in conjunction with a shopping district in Southern Italy. It is made with reused materials from building materials that would be disposed of. With the ideas of [Deconstruction vs Demolition](#), which is the idea of slowly deconstructing buildings in order to repurpose the materials vs the fast destruction of a building and the materials being sent to a landfill, as well as the passing of [Denver's Ballot 306](#) in which requires apartment complexes, restaurants, office buildings, and other businesses in Denver to offer recycling and composting services, the primary materials used to construct these gardens can come from repurposed industrial waste. Going back to the study done by Garibaldi et al., which highlights the process of Bee Trucking, colonies of bees are literally trucked in with semi-trucks to pollinate a certain crop at a specific

interval. Implementing these gardens could significantly reduce this destructive process, as it also contributes to the [climate change](#) that is killing off bees.

## **Trends and Gaps**

The biggest trend for this research is how much scientific research supports the need to protect the health of bee species, and how beneficial it can be. Whether we are talking about the profit margins that come with the increased yield of crops, the amount of honey produced, or the general food security that bees provide, it seems like everyone who approaches the topic of Colony Collapse Disorder understands the severity of keeping them safe. Another trend that is noticed, which is not too pertinent, is the time and place of these studies. Some of the most impactful, like Jachula et al., and Wu et Al. were done ten years ago, in Poland and China. Some of the newer studies done, such as Laura et al., focused on innovations that can be done to move forward in a green world. This trend is interesting as it separates a time of research from a time of experimentation. It seems like the present is Marla Spivak's call to action from 10 years ago.

There are a few gaps in this research. One of these is the trace metals discussed by Shanahan and Osterman et al. While substantial research highlights bees' success in an urban environment, it still begs the question of what to do about the trace metals that are already plaguing the colonies that currently exist and how increased urbanization can still make more of these metals exist.

Another large gap in this research is the voice of local farmers. While I did [find one article](#) that was directly tied to shaping farmers' knowledge of pollinators, to hear more from farmers about how industrialization has shaped their farming practices and why keeping pollinator gardens close by is not already a significant trend for them would help validate this study further.

## **My Contribution**

I hope that with this feasibility study, more companies, individuals, and government authorities will understand how easy and beneficial it can be to implement these gardens. I am also hoping to give more of a voice to a group of people who seem to be at the center of all this without having much of a say: farmers. It seems that while a good amount of the research that I have presented throughout this review talks about farmers and our reliance on their agriculture, there is not much of them speaking about pollination.

## **Cultivating a Framework: Methodology for Implementing Pollinator Gardens**

### **Questions**

The first question that needed to be answered for this project was what factors contribute to Colony Collapse Disorder (CCD). This was necessary when thinking about possible solutions, and while the term has been prevalent for some time now (since the late 2000s), there have been varying answers as to what causes the phenomenon.

After learning about what causes the phenomenon, it was necessary to ask how we can help improve the health of pollinators. While there are many ways that can theoretically be approached, practical solutions that require little to no funding were sought after. This meant that gene-splicing, selective breeding and other scientific methods were off the table. Instead, a focus was created on the methods used in the past, considering how traditional agriculture would have practiced this with modern twists.

Finally, to cement the idea, the need to ask how this project of improving pollinator health can go beyond that one idea. What other benefits are there to this?

## **Epistemology**

Epistemology plays a very important role in this project, rooted in pragmatism. Pragmatism highlights practical applications and emphasizes the usefulness of knowledge and is rooted in real-world applications. This allows the project to tell the story of bees through a historical lens while also looking at modern day issues and utilizing knowledge through research to develop possible solutions.

As for my positionality, I am asking myself what I do not know and how I can find out. My position in the world, as a man raised in a first world country, forces me to think about those who lack the privileges that I have had. Sure, I can delve into the world of scientific journals and research papers to see what the facts about CCD are and how to improve bee health, but those journals will never tell me about the experiences behind the people who dedicate their lives to the health of our pollinators. What do those voices have to say about my project? What do the farmers whose lives depend on the use of synthetic fertilizers and pesticides think about a more sustainable approach to pollination? Do they value the security that comes from these synthetic fertilizers, or do they look to improve the health of their products and consumers? While I struggle to grasp some of the morality of these situations, these questions cannot be answered easily. I think epistemology is helping me connect my current research, which is grounded in scientific study, with stories of how we got to this point in the first place and how we can move forward.

Furthermore, epistemology aids in the big connections between this project and resonant factors, such as water consumption for agriculture and food security. While we may think that having a surplus of food may mean more security, without proper storage, transportation, and costs, food security can quickly become a food desert. The position of my epistemology lies in positivism and discovering objective knowledge that will help move the world towards a more sustainable and healthy future for all.

## **Theoretical Framing**

The Theoretical Framework has changed over time. The initial framework was this: identify the problem, think of a solution, and ask how this solution could improve more than just the initial problem. While this simple framework is a great way to build the basis of the Capstone, it does lack in quite a few components, particularly the human side of the issue. The appeal to humanity cannot be understated when constructing solutions to our complex problems, including this one.

Although collected data thus far serves as an amazing conduit the inclusion of personal stories and experiences will make the conduit shine.

## **Moving Forward**

A vital element of this project is through qualitative interviews. The interviewee is Marla Spivak, who has contributed to previous research. While she may not present a new voice to my project, her insight into the feasibility of the project is crucial. The next group of people who add a new voice to my project is that of local farmers who rely on pollinators. While the information previously acquired does much to say about how farmers can reap the benefits of sustaining pollinator health, these research papers do nothing to the human side of these farmers. The human side of the farmers meaning their story; how did they become farmers and/or why? Are there specific reasons that they are pursuing a more sustainable approach to agriculture or is it more beneficial for them to use a more industrial approach?

The next group of people who were wanted for an interview would be that of the local beekeeping associations in the Colorado area. While the project is focused mainly on the Denver Area, it would have been beneficial to hear the voices of more than those in the locality for insight into the topic of protecting pollinator health. Bringing in their stories will also bridge the gap between my novice side of the conversation and their more experienced side, and they may offer valuable insight as to how to take this project from a feasibility study to fruition in the future. While I was unable to secure interviews with these people at the time of publishing this paper, they will play a pivotal role in expanding this research into possible proposals in the future.

The final group interviewed, which worked better as a community map, would be people who live in lower-income neighborhoods and those who live in higher-income communities. This part of the process connected to the ‘luxury effect’ described throughout my capstone and offered insight into how those communities perceive my intentions. Gentrification is a hot topic in the Denver area, as many communities of color have faced in the past ten years, and this social aspect of the project is sorely missing.

Field notes and photo journaling was also an important part of my methodologies. Field notes allowed me to actually visit sites where community mapping was done to see how these areas looked, felt, and operated in person. Photo journaling helped to capture the ideas presented in this project.

## **How to Generate Conclusions**

The hardest part of presenting what has been learned about pollinators will not be the scientific evidence but rather presenting the arguments that can be made in opposition to my project. While there is a desire to support this project to the best of my abilities, I must step away from what I know and ask how an opposing party would view this project.

With that being said, I find it extremely valuable to use the lens of epistemology for this exact purpose. It is like trying to win a debate and finding the flaws or counterarguments in my



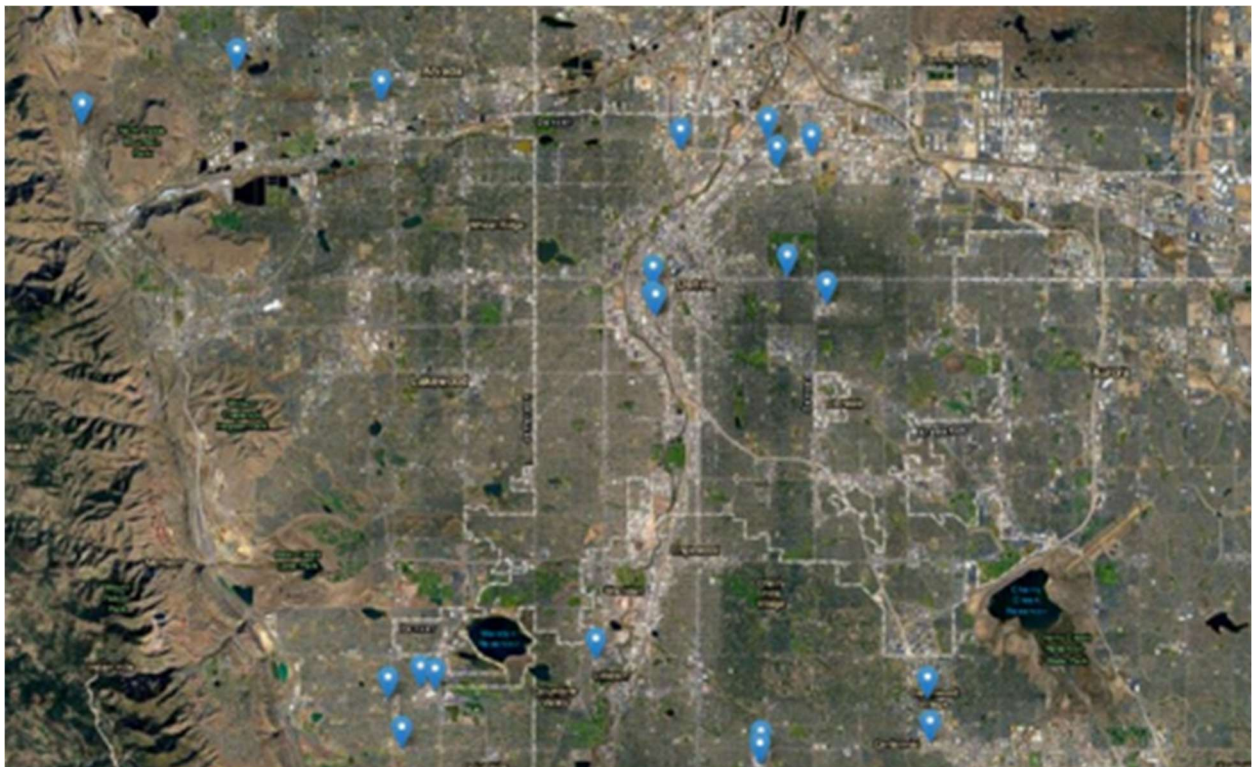
project. Even if those flaws are apparent, how can I present them to an audience in a way that makes them seem less than what they are or counteract them altogether?

## Results and Discussion: Examine the City, Examine the Hive

After finding the research necessary to pursue the idea of Mosaic Pollinator Gardens, the next step was to utilize community mapping to understand some of the social issues lying behind these Gardens. Combining the ideas of [Bleidorn et al.](#), [Baldock et al.](#), and [Denver's Ballot 306](#), the city of Denver was mapped to imagine how the success of urban bees, the lessening of the luxury effect, and the idea of Demolition vs Deconstruction could be implemented with Mosaic Pollinator Gardens.

The beginnings of mapping started with urbexology.com, which is a website that utilizes Google Maps and is made for Urban Explorers to tag their most recent visits. While the function of the site does not necessarily fit in with the drive behind this research, it does well to point out locations that one would not have seen on their normal routes through the city. The urban explorers can then comment on the facilities, with many of them discussing if there is security in the area (which is an indication to me that someone still cares about the facility in some form) or if there are patrols by local authorities (which tells me that there are tax dollars going into monitoring abandoned places).

The image below shows the websites and where the facilities are pinned, most of which being abandoned shopping centers or similar buildings.



While the above site serves as a favorites list for Urban Explorers, it does not scratch the surface of how many buildings are abandoned. According to [Westword](#), the amount of abandoned buildings is on the rise, and last year consisted of 127 total. The article focuses on the owners' responsibility to either maintain the condition of the homes or go through the proper process to demolish them.

Yet, after doing some more digging, it seems like this is not always the case. The article by [Business Den](#) below is a great example of the dichotomy between these property owners and the cities' employees.

In this article, Kiely Wilson details how he has been begging the city to demolish the two buildings (shown below) that he owns on the popular Colfax Avenue. After a tragic fire, the city told him he had two options: repair or demolition. He chose demolition. After putting in the permit for demolition twice, he was rejected both times. The demolition must be approved by Denver's Landmark Preservation Commission, and because of the building's historic status, they refused. After getting together with his neighbors to express their concern with the building, as it became a hotspot for criminal activity, and despite the public's support, the council still voted no.

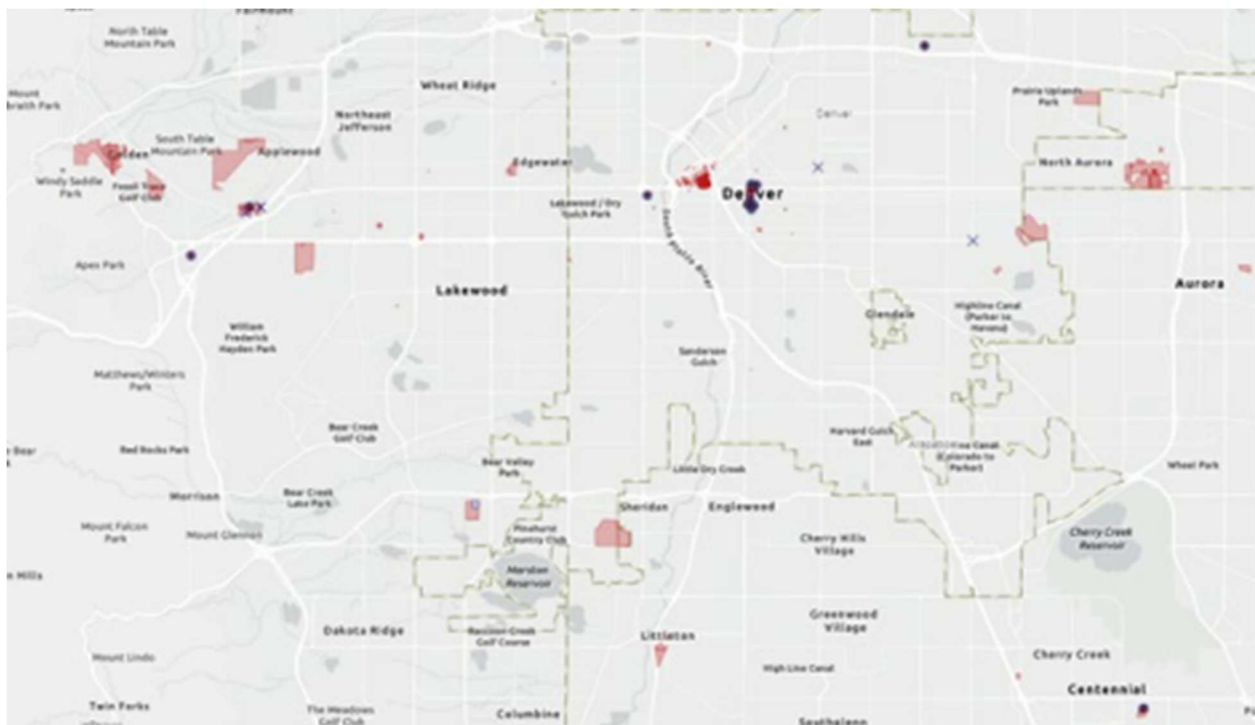
The people's concern for their health is justified, as these abandoned places can catch fire or even explode with the proper neglect, as shown below.



What is more interesting is that while the city continues to neglect the needs of private property owners, it does well to keep track of its own parcels and unused lots. Taken from <https://osa.colorado.gov/state-architect/vacant-facilities>, the photo below is their own GIS mapping of underutilized areas. While private facilities are mentioned on this map, Kiely Wilson's two properties are not listed. There is clearly a disconnect between the city and the people when it comes to abandoned facilities. To me, it seems like a battle for the preservation of culture and progression toward the future.

Denver is no doubt a progressive city when it comes to sustainability and fighting climate change, but from these prioritizations on historical buildings, it feels as if there is a mix of wires being crossed in the city's future. It is impossible to have progress without change, and by implementing an entire council for historical preservation, as well as climate change and resilience, a constant clash of ideas does nothing for the people of the city. Denver's priorities are scattered, and while there are a trove of reasons to protect the history of such a great city, there must be ways of implementing that history into the progress Denver so greatly desires.

It also feels as though Denver is prioritizing the voice of those who can snatch up massive amounts of private property for housing complexes, without addressing the housing issues that are already existing like the population of the homeless, and these abandoned buildings.



Through this community mapping methodology, we can better understand where these problems of abandoned lots and homes come from and why implementing new development is being held at a standstill. It also gives us insight into where future pollinator gardens can be planted.

The next methodologies used in this study consisted of taking field notes and a photo essay. Field notes occurred in two different locations in Denver, CO; Five Points/RiNo and Englewood. RiNo (River North Art District) and Five Points are very important to Denver's history and its connection with People of Color. Historically, RiNo was strategically placed next to the Platte River to assist in the industrial era's boom for production. It contained many factories, warehouses, and railyards. This meant the area was very utilitarian. In the mid-1900s, the area would see neglect as the industrial boom began to fade, and many of these areas were abandoned.

Five Points, located just south of RiNo, was the more residential part of this community, with almost 90% of the African American Community living there in the 1920s. It quickly became a cultural and entertainment destination, highlighting jazz and blues music and nicknamed “The Harlem of the West.” Englewood is home for me. I am on the cusp of both neighborhoods, and while my apartment is not quite the high-rise of the RiNo district, many similar complexes can also be found here. This part of the city does not have as much cultural significance to POC but does face many problems with homelessness and poverty. What is amazing is the drastic change in setting in a small drive. One minute, you are in the illustrious neighborhood surrounding the vibrant University of Denver; the next, you are surrounded by concrete and asphalt, with only the noise of trains and cars and an abundance of fast food.

These neighborhoods were chosen as they contain derelict buildings and have had histories of being lower-median income, which is one of the factors considered with the luxury effect of pollinators. The luxury effect refers to the more frequent presence of pollinators in neighborhoods due to more flowering flora, which occurs in neighborhoods that have more income.

While gentrification has become a buzzword in recent years, RiNo has a notoriety for it. Many of the historic landmarks or buildings are sat next to towering apartment complexes, which offer little to the cityscape besides their size. From notes gathered in both areas, new apartment complexes were a massive trend. Demolition of historic buildings in both locations led to massive booms in the housing market. Many of these apartments are touted as ‘luxury’ apartments, with new move-in deals to get people in the door. Both neighborhoods tote their proximity to the historic districts near them while coincidentally taking away from their history. Both neighborhoods also have apartment complexes close to either industrial areas or railroad tracks and various industrial facilities. There is a clear separation between historic homes and new apartments. It is as if there is a divide where the city is no longer the rich and lush place that most people want to live in, and instead, it aims towards housing for those who can only make it month to month. These complexes are... soul-sucking in a way. They leave little to be desired. While the apartments are nice and well-furnished, stepping outside of them feels like being a pawn in someone else's game.

The rampant gentrification was utilizing the historical context of an area to line the pockets of those who could afford to build massive housing complexes in these areas. Manuel Aragon has a wonderful two-part article titled [Ghosts of a City: How Denver's Affordable Housing Crisis is Driving Out its Artists](#). Aragon is a voice for all artists being driven out of their historical homes and demonstrates the importance of preserving culture. He outlines how Denver is the second worst city in the US for gentrification, and many of the people have been displaced by their beloved communities due to this.

So, how does this all connect to pollinator gardens? Aragon also presents solutions for gentrification in the second part of his article. While some are strictly aimed at artists, two of the seven proposed solutions could fit nicely with implementing these gardens without the drawback of gentrification. The first is the Preservation of Cultural Landmarks and Local Businesses. I imagine this could have been very effective in Northern RiNo, where there was a history built around the industrial boom and the role that POC played in building the city up foundationally



and economically. Rather than allow the facilities to rot and sell the land to the highest bidder (the apartments), the crumbling ruins could have been taken down and the area marked as historic, keeping pieces of history in a sort of outdoor museum that is encapsulated in a pollinator garden.

Similarly, Aragon proposed Public-Private Partnerships. This is very similar to the above-mentioned proposal, with more pushback from the local government to preserve cultural heritage with the help of local businesses.

The next methodology used for this project was observing a qualitative interview. Hearing from an expert in the field of beekeeping serves as an important foundation of this project; why are pollinator gardens so beneficial in the first place? While I was unable to secure an interview with her, Dr. Marla Spivak has done many over her tenure in the field of entomology. [The specific interview](#) was with Fredrick Dunn, who is well known in the beekeeping industry. While the interview starts in a typical fashion, it leads to Dr. Spivak's current work on Propolis, also known as 'Bee Glue.' One interesting part of this research is her describing her work with Maggie Shanahan, where they observed colonies that were being 'trucked' and compared the propolis to their own stationary hives. The stationary hives had fresher Propolis, an important tool for keeping bees healthy. Bee glue is also a sought-after commodity for its medicinal properties.

Dunn then poses a question that is extremely relevant to this study, in which he asks if Backyard Beekeepers are contributing to the health of native bee species. Her answer is that it depends on the goal of the beekeeper. If their goal is to help bee populations thrive, the best answer is to plant habitats for them.

Dunn then follows up by asking about 'treatment-free' beekeeping, in which the bees are left to their own devices. Dr. Spivak makes it very clear that in our current day in age, bees must be tended to and treated or the colonies will fail.

Pesticides were another important topic they covered, and I would have loved to discuss it with Dr. Spivak. They engage in a bit of discourse about current loopholes in our agricultural systems, in which treating seeds with certain pesticides before planting does not qualify legally as pesticide application, yet it is still detrimental to the health of pollinators.

The final interviews that I observed were those of farmers. The [European Innovation Partnership Project](#) interviewed four farmers, Andrew Burgin, James Kelly, Jenny Kelly, and Kim McCall about what they are doing to increase biodiversity on their farms and protecting pollinators. Not only do these interviews give a voice to the farmers that are highlighted in this project, much like the interview with Dr. Spivak gives this project a foundation by highlighting why protecting our pollinators is so vital.

Andrew Burdin, who is a farmer near the capital of Ireland has a farm that mainly consists of staple crops such as wheat, barley, oats, and peas. He explains that he was a pretty 'typical' farmer for most of his life, that is utilizing industrial means in order to maintain the farm. The recent shift towards regenerative agriculture has helped to improve his farm. Burdin installed

grass margins around his various fields, but they are anything but grass. These margins consist of native species of flowers, which require no pesticides and no fertilizers to flourish, and only need to be maintained once a year.

James Kelly takes this idea a step further. Also hailing from Ireland, this tillage farmer has created natural meadows within his fields, planting native species of flowers as well as trees to encourage biodiversity. Much like Burdin, these meadows require no pesticides or fertilizers and serve as a haven for pollinators.

Jenny Kelly, unrelated to James, maintains a dairy herd of 350 cows, and gives us insight to the animal side of farming. 15 years ago, she began to sow clover into her grazing fields, which is an excellent source of feed for the cows, as well as being great for pollinators, and helps to fix the soil. Many modern-day lawn-enthusiasts are making the switch to clover as well rather than standard grass for these reasons. She also mentions how she moved her fences a half of a meter in, which is a very marginal loss for her, but allows for solitary bees to nest around her farm without being disturbed by her herd.

Kim McCall is also a cattle farmer but demonstrates how small changes like the farmers are doing above can lead into an entire environment that is regenerative and sustainable. His farm has not sown a single seed in over 80 years but is rather the natural environment that would exist there without human interaction. He explains how different forms of natural vegetation synergize with each other, and all he must do is make sure his cattle are grazing at certain locations at certain times.

For me, this interview demonstrated how pollinator gardens can shape the future of our urban lifestyles as well as demonstrating how eager farmers in more rural areas are to abandon our current industrial agriculture complex of monocrop farming and reliance on synthetic fertilizers and pesticides.

Pollinator gardens may seem like a small step for cities to implement but serve as a catalyst for greater change in the future. As urban agriculture becomes more and more popular, having pollinators exist in these environments will become a staple in any progressive city. As such, these gardens will provide for those around them.

### **Tying It All Together: What Could the Future Look Like?**

With there being clear evidence of the benefits that come from increased pollinator health, it feels as if it is an obvious choice to implement more pollinator gardens. The city of Denver is struggling to address many issues in its path towards a more sustainable future, but the implementation of pollinator gardens can help with these issues.

Abandoned buildings need to be addressed by the city, and one way of making sure that history is preserved while also moving toward sustainable goals is through deconstruction processes. The materials of the buildings can be repurposed. In fact, the materials could be used on that same site to construct a historical pollinator garden, something that tells the story of the people there, much like what could have been in the historical RiNo district. These gardens could



showcase the materials and bring a sort of living museum to the area, one that preserves history while also creating its own.

Pollinator gardens could serve as a steppingstone for future food forests in an urban environment and promote people to benefit from the increased pollination. This could be simple backyard gardening, to beekeeping of their own, in which local businesses could see products made locally from the honey, bee glue, and beeswax that comes from their flying friends.

Urban farms that are created in conjunction with mosaic pollinator gardens also serve to bolster the community through social gatherings. During harvest, the community could come together to show what has been grown from inviting bees to live in closer conjunction with us, and to make our concrete jungles feel just a bit more alive.

While this project focused on Denver, Colorado, the research done can be utilized in a much bigger scope as well. As seen in the interviews with Farmers from the European Innovation Partner Project, protecting pollinators can extend further than just our urban example of Denver, CO. Many of the rural communities in America could benefit from having designated areas on their farm that are meant to serve as a haven for pollinators. With the amount of monoculture farming that occurs in the US, pollinators could strengthen the biodiversity of native landscapes while also improving the yield of these crops. Furthermore, the practice of trucking in bees to keep up with monoculture farming, which pollutes the air from emissions, could be lessened to connect to a larger scale of planetary health.

With how much of the urban population worldwide is exposed to the consequences of climate change, whether it be food security or lack of available housing, urban mosaic pollinator gardens can act as a beacon of hope to those who are suffering from social injustices.

Through proper policy implementation, these gardens could very well be self-sufficient. Water that would be necessary to the success of these gardens could be harvested from stormwater, and new practices such as HVAC condensation, meaning that even our vast skyscrapers in the largest cities could be home to swathes of pollinators.

The gardens themselves could be manufactured from recycled materials from deconstruction, as proposed in Denver for this project.

In summary, this research was meant to explore existing barriers that are preventing the implementation of mosaic pollinator gardens in Denver, CO in spaces that could both support pollinator health while also addressing broader sustainability and social justice issues. By using a multisystem analysis, it became clear that while the benefits of these gardens are well supported through scientific research, the biggest obstacle is in the fragmented governance of the chosen urban environment. The conflicting priorities of Denver's sustainability initiatives and the battle between historical preservation have created tension between the city and its people, while also making certain strides towards sustainable progress halt to a standstill. The concept of these gardens was created as a way to bridge that tension but ultimately depends on a collaborative effort with the cities differing councils, and support from the communities.

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# Building the Forest Garden Planner

*By Matthew Nease*

## Our Story Begins

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Agriculture has followed the same path as most industries in this modern capitalist world, prioritizing profit over all else. Environmental concerns ranging from pesticide and herbicide use to fuel use from tractors and transports have taken a back seat to optimizing for increased production. Food forests serve as a sustainable alternative to this Eurocentric view of farming, and though largely lost to time and colonization, they've been around for millennia. Food forests, also known as forest gardens, are an example of permaculture – sustainable growing practices that focus on self-sustainability of the land by relying on the natural properties of plants. In order to help facilitate sustainable farming and bring back food forests, I ask the following question: What challenges do people new to agriculture face in starting to build a food forest (also known as a forest garden), and how can a website for food forest planning in the United States support beginners in growing their own food?

## The Trouble with Industrial Agriculture

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What most people in the developed world today see of agriculture is large single-crop fields, plowed in straight lines and harvested by giant tractors designed for the job. This monocropping, or single-crop farms, is one of the biggest problems facing our world right now. This practice has had a hand in almost every ecological disaster there is. Soil that is forced to grow a single crop is quickly depleted of its nutrients, leading to the use of artificial fertilizers in order to maintain a certain level of growth. These fertilizers are washed into our streams and lakes, leading to the destruction of aquatic life and damage to humans and ecosystems alike. Single-crop fields also attract more insect and critter problems, leading to the use of pesticides with similar detrimental effects. Ecological diversity is reduced with each new monoculture farm, further exacerbating these issues. We are using about [one third of Earth's land area](#) and [70% of its freshwater](#) for agriculture. While desertification due to climate change continues to



reduce arable land and freshwater sources, agricultural demand remains on the rise, and we can't continue with the monoculture farming practice we have. In addition to the negative ecological effects of monoculture farms, they present serious environmental justice concerns. Not only do monoculture farms not care for the land at all, but they also remove people from their place in the food production chain and caring for the land. In addition, they perpetuate environmental racism and the capitalist treadmill of production, ultimately leading to worse lives for all.

## Food Waste and Food Inequality

Modern industrial monoculture farming presents serious environmental justice concerns, depleting the land of nutrients and perpetuating the capitalist treadmill of production, ultimately leading to worse lives for all. Monoculture farming isn't better for humanity or nature in any way except for productivity and profit for the few.

Even with the higher productivity that monoculture and industrial techniques allow per given acre of land, we can see that this does not actually help feed more people. We produce enough food to feed everyone today, but unequal distribution and waste leads to vast food inequality. Around one-third of all food the world produces never gets eaten, wasting an amount of land larger than China and about 45 trillion gallons of water every year, not to mention the additional greenhouse gas emissions from the additional production and subsequent waste. There are many reasons why food never makes it to those in need, all of them due to our system of capitalism built on greed. Around one third of food waste happens before the food even leaves the farm, because that food is deemed to be more costly to harvest and distribute than profitable. The largest amount of food waste comes from consumption, though, where it goes bad in the hands of those who don't need it.

Food inequality leads to food insecurity for the people of underserved communities, which can have serious negative impacts on their physical and mental health, well-being, and success at school and work. A community food forest would remove the need for people to rely on Big Agriculture to get food to where it needs to be, instead making use of the land already around them and not a nightmare of profit driven logistics networks.

## Colonial Gardening Methods

Part of the problem lies largely in the content on food growth that is made available to people. There are an endless number of articles and web pages describing colonial European gardening as the only type of gardening or food harvesting possible. In some cases, it may be a simple case of the authors not knowing about food forests as an alternative. In others, perhaps all their experience lies in "traditional" gardening and they have no interest in breaking out from the neat boxes in neat rows. In still more cases, these articles are merely planted by some corporation in

order to get people to buy more fertilizer, pesticide, or annual seeds. I have seen very few alternatives to this dominant narrative.

## Dominant Trends: Viewing Through the Lens of Capitalism

Of the food forest content I have been able to find, I have not found any examples of them being labeled as a bad thing. This stands in stark contrast to the many articles I've found about modern industrial agriculture. The closest I've come is papers detailing how food forests "may not be competitive when the opportunity cost of land and labor increase," or how the amount of people a given hectare of food forest can support is "somewhat lower than previous assessments," both of which assume a capitalist mindset of profit over sustainability.

While I can appreciate the desire to address the questions that capitalist leaders will inevitably have when assessing the viability of food forests, that is not a system in which they will ever truly thrive. When scaled up for the needs of multinational corporations, even small differences in food production per acre will make big differences to the company's bottom line, while the needs of a single community or household are much more tolerant to lower production for the sake of sustainability and futureproofing. Food forests aren't just potential competition for capitalist enterprises – they are capitalism replacements.

Even educational articles, such as National Geographic's "The Art and Science of Agriculture," are written entirely through the lens of a western colonial understanding of farming and gardening. It makes no mention of forest gardens, assuming a single accepted way of agriculture by claiming that farms allowed nomads to instead stay close to their "fields." This article does ultimately discuss issues of sustainability and food justice with industrial agriculture, but it fails to bring up one of the best solutions to farms' current lack of biodiversity – food forests.

## Going Back to Food Forests

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Food forests will never produce as much as a monoculture farm pumped full of fertilizers and pesticides and plowed and harvested by giant machines. That's not the point. The point is that our current system of agriculture is bad for the planet and bad for the humans on it, and we need to turn to sustainable replacements, especially ones that we already know work. Monoculture farming is a very Eurocentric view and far from the only way to cultivate food.

Long before these industrial farms were a thought, ancient engineers worked with the land around them, rather than trying to bend it to their will. The methods of the Forest Garden kept ancient civilizations fed for millennia, until colonial powers cleared those forests in favor of their own medieval forms of agriculture. We can learn from the lessons of the indigenous and the mistakes of the colonists, though, and start creating our own food forests again. The modern

agriculture and health industries have a host of issues with waste, energy use, social justice, and sustainability, but these issues can be remedied by transitioning to food forests as the primary means of agriculture.

Food forests can help optimize a space to produce many unique and useful foods and medicines. Food is one of humanity's primary needs, and there are many who don't have enough access to it. With a community food forest, and very little ongoing maintenance, those less fortunate can be supplied with much-needed protein, fat, and carbohydrates. The exact contents of the forest can then be tweaked to maximize the needs of the community (i.e. Incorporating more proteins and even fauna). The benefits of a food forest also don't end with food and medicine. If designed and managed appropriately, they can include space for activities, shade, education, and volunteering opportunities.

In order to help facilitate the spread of food forests as an alternative to industrial agriculture, I have begun to build a website that helps users design and plan their own food forests with the land they have access to. In my efforts to make this website as helpful as possible, I surveyed the general population and spoke with permaculture experts, gathering data from each to find out what is most important to people when creating or expanding their own forest gardens. This feedback will help me understand better what to prioritize while building my forest garden planner website. I hope that it will open the gates to other people who may be interested in starting their own food forests but lack the knowledge and expertise to do so. As both a software engineer of 13 years and a millennial who has witnessed the societal shift from in-person to digital social interactions, I hesitate to propose yet another technological solution to a problem that isn't technical at its core. However, my approach is also fundamentally different to that of the current strata of technological oligarchs who design their products to pull people away from the world around them and into their digital world in order to maximize page view time, ad exposure, and consumerism. My forest garden planner will be built as a tool to help others be more effective with their time outside in their own forest gardens, promoting a lifestyle built around nature and not our screens.

## Food Forests of the Past

One of the best (and largest) examples of food forests I've found mentioned in the literature is the Maya Forest Garden. It is discussed in detail in [\*The Maya Forest Garden: Eight Millennia of Sustainable Cultivation of the Tropical Woodlands\*](#), as well as several other articles, like [\*Modern tree species composition reflects ancient\*](#)

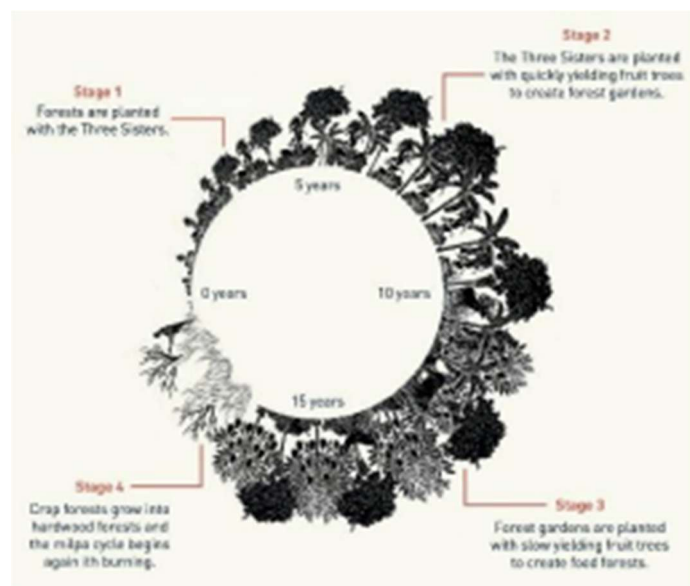


Figure 1: The Maya Milpa Cycle, [Maya Forest Gardens | SUGi](#)

### Maya “forest gardens” in northwest Belize

and Lessons from the Maya Forest Garden. The Maya established a cycle known as Milpa, in which they would plant a combination of annual and perennial plants to provide for them throughout the cycle. This typically started with the “three sisters”—squash, maize, and beans and ultimately ended with a fully self-sustaining food forest. These forests required no fertilizer, irrigation, or other input, and would continue to provide for the people for centuries, as we’ve seen from parts of the Maya forest gardens that have been abandoned for centuries. After a couple decades of growth, though, actively managed forest gardens would be harvested for their hard wood and burned to start the cycle again with fresh nutrients.



Figure 2: Menominee Reservation Satellite Image, Menominee Forest Keepers - American Forests

There are many other good examples of food forests of the past that have survived to this day, such as those of the Pacific Northwest, or the Menominee reservation in present day Wisconsin. The forest gardens of the Pacific Northwest weren’t initially recognized as a kind of managed land, either by the European colonists who cleared and plowed that land to mimic what they knew, or by researchers who came to visit the abandoned but untouched tribal land later. Since forest gardens “don’t fit conventional Western notions of agriculture, it took a long time for researchers to recognize them as a human-created landscape at all.” Forest garden designers can mimic the natural biodiversity of the land around them, while still optimizing the space to be functional for human needs. The Menominee tribe continues to showcase this reality today, with their 235,000-acre reservation showing dark green from space, with 93% tree cover. The tribe has been able to run a successful

logging business of high quality woods for 170 years, while continuing to cut less than they grow each year. With this method of sustainable management, the land will continue to provide for centuries, in stark contrast to modern industrial farms.

## The Growing Food Forest Movement

There are currently over 85 reported food forests being actively maintained in public spaces in the US, with the most successful displaying a community-driven approach. Some successful projects include Boston Food Forest Coalition’s, for which the city adopted innovative zoning and permitting ordinances to support it, and Tucson, Arizona’s “living pantry.” The Tucson food forests (there are now multiple) make use of the over 400 native food-bearing trees, and indigenous techniques such as Ak Chin runoff farming, in which plants are located to take advantage of some of Tucson’s million gallons of storm water runoff that is otherwise drained away each year. These plants provide nearby residents and wildlife with food, including fruit, nuts, and protein-rich mesquite seed pod flour, as well as much-needed shade and cooling power from the Tucson heat.

Food forests are also spreading in other areas of the world to help smallholder farmers break away from the monoculture paradigm, such as with the work Bio Gardening Innovations is doing [in Western Kenya](#).

Farmers there are being taught a more holistic approach that cares for the soil and plans for the rain cycles, allowing them to produce a variety of higher quality foods for sale at the market.

[Women in Odisha, India](#) are also returning to their indigenous ways, by reclaiming land that had turned to extractive forest management practices established under British rule. These women stood up to their governments to restore the previously existing biodiversity to the now arid and damaged plantation land, despite officials telling them that running the land as the plantations did would make them more money.

It is nice to see people turning down the promise of “more money” in order to do what’s better for them and the planet in the long term. Other cities have balked at the amount of long-term maintenance required for food forests, ignoring nature’s ability to naturally sustain itself while continuing to pay their exorbitant bills for non-native lawn maintenance. I hope word can continue to spread of successful food forest projects that may help quell existing fears of maintenance costs.

## Food Forest Design Concepts

There are a surprising number of resources available for food forest design help, in forms ranging from [web classes and one-on-one consulting](#), to [books](#), to [TikTok video series](#). These different classes and resources usually draw from different combinations of personal experience, academic research, or indigenous knowledge, trying to distill and pass on that information. While most of it is very good and useful information, the problem is that the benefits can really only successfully be learned through hands-on experience. We can talk about food forests endlessly, but nothing will change until we start making them again, and that prospect is HARD. Personally, I’m very appreciative of all the resources already out there, but as someone who has never grown my own food, I also know that it’s not enough to actually get me started. The real trick is to try to continue lowering the barrier to entry until (ideally, and far down the road) it’s easier for people to get involved with a food forest than it is to go to the grocery store.

“EVERY GOOD GARDEN IS A WINDOW- INTO THE INDIVIDUAL MIND OR MINDS OF ITS MAKERS, OWNERS, INHERITORS, OR INHABITANTS, AND, THROUGH THEIR STORIES LAYERED ON TOP OF ONE ANOTHER, A WINDOW TO THE COLLECTIVE MIND, OUR COMMON EXPERIENCE.”

Wade Graham, 2011

American Eden: From Monticello to Central Park to Our Backyards: What Our Gardens Tell Us About Who We Are



For those willing to do their own research and designs, though, these resources contain a lot of great information with useful design checklist items, including sun exposure, altitude, climate, topography, rainfall, and of course plant placement. My goal is simply to make this process more accessible and less labor-intensive.

## Plant Properties

Most of the resources I reviewed include plant properties among their advice, often including examples of “guilds” of plants known to work together. They might also include lists of plants that are edible, medicinal, beneficial insect attractors, nutrient accumulators, or nitrogen fixers, sometimes including additional details such as canopy/height, ideal soil condition, sunlight requirements, USDA Hardiness Zones, crop yield, or harvest schedule. Some books don’t make mention of food forests at all but still contain a list of useful plants and their properties, such as [their medicinal uses](#).

This is all data that I would love to include in my own plant database for use with my website. There is a LOT of useful data to include, for a lot of different plants, and it will likely require some manner of crowdsourcing to be able to gather it all, but the various books and references I’ve found so far should provide the ability to at least get started with a forest garden.

## Enter the Food Forest Planner

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At the beginning of the program, the capstone project that I had in mind was to create a community food forest nearby. While I still believe this to be a valuable endeavor, by helping a local community reduce its reliance on centralized industrial agriculture (or worse, artificial foods), there were a few reasons I decided to pivot partway through to making a website for food forest planning instead. Firstly, I don’t have any skills or experience in creating a food forest, or even a garden for that matter. Secondly, for the sake of this program, it would have been hard to measure the results of my efforts in such a short time frame, when it could take decades for a food forest to be grown to maturity. Thirdly, I don’t have any personal connections to cities or other organizations that would reasonably give me the ability to start planting a community food forest on some public land. Lastly, I do have 13 years of professional experience in software engineering and web programming, and I want to start using that experience for good. I’m still very interested in food forests and how to make one, but now I believe that the best use of my experience would be to build a website that helps everyone design their own. In this way I can still spread the idea of food forests, but with a much larger reach, and hopefully into the hands of others who DO have the skills, expertise, and desire to do something with this new tool.



In my research so far, I haven't yet seen a tool for people to use that allows them to design a food forest specifically for the land they're building on. As I mentioned before, there are plenty of guides, classes, and even consultants making their services available to help people with their food forest design. Likewise, there is plenty of data about plants scattered around the internet, but not in an easy-to-digest database that can be pulled from. However, as it stands now, creating a food forest still requires a lot of thought, labor, and trial and error, and most people just aren't willing to invest these things along with huge amounts of their time and even money for an outcome that is both years away and not guaranteed.

A website that allows others to input information about their land and test out different plant arrangements and combinations will be an invaluable tool that I hope will lower the barrier to entry to many more people or organizations. It will draw on the lessons of those who came before, while making use of modern tools and technology to bring about a more sustainable future. My goal with the food forest planner website is to make the whole process from start to finish accessible even to people who know nothing about plants to begin with, like me. If I, as an absolute beginner, can manage to successfully create a food forest and begin harvesting its food for meals by using this website, then I will have succeeded in my goal.

## Indigenous Wisdom

With my new goal in mind, I began to focus my research question around how to build the most helpful and most inclusive website I can. Ideally this would mean first interviewing people who have experience with food forests, either from personal experimentation or from knowledge passed down from ancestors, as would be the case with indigenous peoples such as the Maya who manage food forests today. It was a challenge to contact these groups – indigenous peoples who live among food-producing nature are not known for their active internet presence – but I reached out where I could. I also reached out to the authors of various articles in which they discuss meeting with indigenous people to discuss their food forests. While direct communication would be most ideal, it may not be realistic, especially if there is a language barrier. There would likely still be much to gain from second-hand knowledge of the ways of food forests, if they could relay to me some tidbits of wisdom that came directly from the source. I know what data I would put in today from my research so far, but my approach would be coming from a viewpoint lacking in nuance that ultimately may not mesh with how nature actually works. I am not in touch with the spiritual aspect of food forests, and what little I do know about growing plants came from modern western teaching full of reliance on fertilizers, irrigation, and pesticides. My knowledge is lacking in indigenous wisdom from the days before European colonialism.

## Pain Points from the Masses

Incorporating this wisdom would be very important in helping the website to accurately portray and aid in creating food forests, but the next most important piece is lowering the barrier to entry for those who have no experience with food forests at all. For this, I planned to survey a wide range of people who either haven't heard of food forests or haven't made it to the point where they created one. The survey was aimed at getting at their biggest pain points in getting started and assessing whether and how a website designed for this purpose could help them. My goal with this survey was essentially to develop my feature roadmap. The results would help me focus on the features that people felt would help them the most and push off features that they didn't see themselves using into future releases (or not at all).

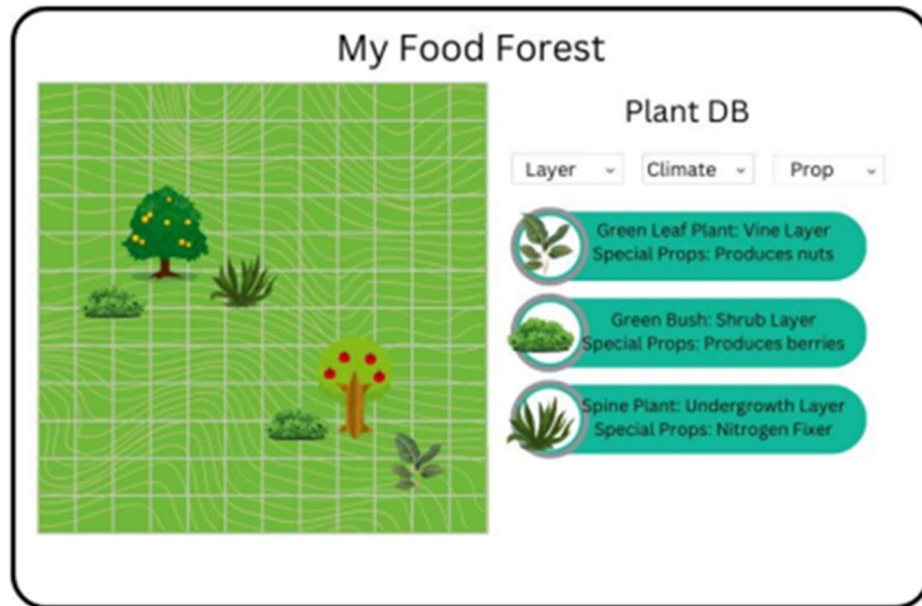
## Building the Website

Lastly, my methodology included actually building the website. While it's not yet ready for public release, I intend to have a demo to show in the coming weeks. Later, with a little more work and a full prototype, I can continue to gather more data from people interested in using it. Specifically, I'd like to find out how easy the interface is to navigate and how it differs from what they may have imagined or hoped for. I of course would want to be alerted to any bugs in the code, but also to any features that were expected but are missing.

I am currently most proficient with Ruby on Rails as a backend coding language, and I have started to build up the website with that. For the frontend (user interface), I plan to keep it simple for now and use Turbo for Rails. As the website grows and its capabilities expand, I may consider incorporating a JavaScript framework to help bring those capabilities to life. Until then, it would be best to focus on a minimal viable product (MVP) without needing to struggle to get the two layers (frontend and backend) to communicate with each other.

With Ruby on Rails, I can create a model for individual plants and populate any relevant data for each one in the database, making it easy to display that list and let users add those plants to their own food forest. I envision a page showing their current forest layout along with a list of plants and their properties, with the ability to filter them on various properties.

I need to also set up the ability for users to create their own profiles and be able to save their food forests to it, so that they can come back and modify it as needed in the future. Other features, such as a community blog with user feedback, for example, can continue to be built up on this and other pages, but I imagine this to be the main feature.



Early Design Mock of Forest Garden Planner

In the end, I'm not even sure if all the data points that matter can accurately be captured and represented in a digital food forest on a computer, but I hope the website can still get to a point where it's a helpful tool, even if maybe lacking in some areas. If by making this website I help remove enough obstacles for a few more people to create their own food forests, it will still be a win for the world.

## Real World Applications

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I ended up extending many different branches throughout the course, with some of them budding to fruition, some blooming beyond what I expected, and others dying out.

### On the Hunt

I wanted to find a food forest near me to visit, but unfortunately, they are not very common in my area. I reached out to some owners of their own private food forests, but didn't hear back. The public food forests I found were not really food forests, but rather "edible gardens" that didn't necessarily adhere to the practices of permaculture or sustainable growing. The ones I found did seem to be community managed, which can be a tenet of permaculture, but unfortunately, they didn't exist anymore. Regardless, I wanted to see what had come of them now, so I ventured out to the last known locations of Irvine's Incredible Edible Farm and Incredible Edible Garden.

Both were projects of the Second Harvest Food Bank, which tasked itself with growing fresh produce to feed the hungry. As I approached the coordinates of the old farm, though, what I



found stood in stark contrast to this ideal. The whole area was fenced off, with a single unmarked road leading off the highway, that for research's sake I decided to drive down and document. The individual storage areas that I drove past on that road were all gated off, and their chain link fences covered in green privacy mesh. Beyond many of those initial gates and fences was a variety of construction equipment and porta-potties. As I ventured further down the road, I saw that most of the lots belonged to landscaping companies. I found it ironic that space for sustainable growing of community food had been replaced with machinery for vanity landscaping. Landscaping is a big industry today, with installation costs for individual yards costing an [average of \\$12,825 nationally](#), and ongoing maintenance costing \$252 per month. For homeowner associations and municipal governments, the cost only goes up from there. This all leads to a landscaping industry with [a market size of \\$153 billion in 2024](#), employing over 1 million people across 661,000 businesses. While there is certainly some necessary maintenance work to keep trees from falling on

houses and other damaging natural occurrences, most landscaping work is simply to make spaces look “nice,” often involving fertilization, irrigation, and trimming of non-native plants. Imagine if that money went instead towards [the 47.4 million people](#) living in food-insecure households.



Towards the end of the road, I came to a fenced-off habitat reserve area, and I really wasn't sure how to feel about it. On the one hand, it's great that the city made efforts to block off an area for natural habitat. On the other, it felt pretty dystopian to be here at the end of a road surrounded by industrial storage, next to what used to be a place for humans to commune with nature. We need to protect nature from people, yes, but from the machines and industries that we've created, and not from hungry people looking for healthy and natural food.



At the end of the road, I experienced one last reminder that the common person was unwelcome, seeing boats and recreational vehicles behind a locked fence with barbed wire. Those in power decided this land would be better used as storage for their frivolities than as a source of food for those in need.

While I never encountered security on my short visit, I had a definite feeling that I would be considered unwelcome if I did.

After leaving the “farm,” I decided to make another trip to the former site of the Incredible Edible Park, which based on dates of articles I found seems to have been the predecessor of the farm. There really wasn’t much to see though. The area was completely paved and built over as a business park near the Metrolink station. As a final insult to injury, though, they added fake grass along the road, deeming it to be a more convenient solution than edible foods. The Incredible Edible Park had fully transformed into the Incredible In edible Business Park. The city of Irvine is continuing to expand, with new residential and commercial construction found all along my drive. It could be argued that Irvine is more committed to getting people access to food than the average city, but none of the new construction I saw involved food for community members.



## Professional Perspectives

Since food forests originated with indigenous peoples, I really wanted to include their voices in this project. I hope in a general sense I have, by trying to keep their ancient practices alive in



this mechanical world, but I was not able to get in touch with any active tribes working with food forests, either directly or through any academics who have worked with them.

### Farm Visit

I did, however, get the chance to visit a local hobby farm and ask some questions. When I asked the farmer about the one thing he’d like to see on a food forest planner website, he said a way to filter plants by climate zone,

telling me how frustrating it was to find a good plant he wanted only to later find out that it's not in the right zone for him to grow. I was surprised at this answer, since to me this seemed like an obvious first feature that I don't know how other sites have overlooked, and frankly a relatively easy one to implement. It shows me just how much room there is for simple innovations to greatly improve the lives of farmers and gardeners.

This farm was a 3-acre lot that belonged to an old coworker of my fiancé's mom. It had more of a focus on animals than I would expect the average food forest to, but it was still interesting to see how everything worked together. They had chickens, turkeys, and goats, for producing eggs, milk, and meat. Their manure was used to fertilize their various plants, including garden beds of various vegetables, trees in their orchard, and grape vines in their new vineyards. They also had an aquaponics system set up (though damaged from recent winds) where the water from their Koi Pond, with nutrients from the Koi, would be cycled through various plants grown without soil, before returning back to the Koi as nutrients for them.



I asked if they'd researched food forests or companion plants that could be planted around their trees to make a self-sustaining ecosystem around them and remove the need for adding fertilizer from their animal droppings. They replied that they'd looked into it but ultimately wanted to keep the area around their orchard trees clear of weeds, which would be more difficult with other plants growing around them. I kind of got the idea that it was more of an aesthetic desire to keep the ground of their orchard clear, which at the expense of just moving some manure around the yard 1-2 times a year was worth the cost to them.

**"SELF-SUSTAINABILITY IS A LIE. IT'S SOMETHING YOU CAN NEVER ACHIEVE COMPLETELY ON YOUR OWN. IT IS ONLY POSSIBLE IF YOU ARE PART OF A LARGER COMMUNITY OF PEOPLE WHO ALL CONTRIBUTE DIFFERENT THINGS."**

**- HOBBY FARMER**

Our conversation moved more into the topic of self-sustainability and how long they could survive on their own in a post-apocalyptic scenario. While they'd fare much better than the average person, they estimated they'd still only have about 6 months of runway. It takes a lot of work for one household to raise plants and animals, and even then, there's a time limit on how long they'll last before new seeds, hatchlings, or feed would need to be ordered.



Beyond just food concerns, there are so many different components to consider, like water, clothing and shelter. It's unrealistic for one 3-acre farm to both produce and process all materials needed to survive long-term. Community is essential to survival.

## Conversation With a Permaculture Professional

While seeking input for my survey, I got a comment on my post from a professional permaculture designer with concerns that my experiment may turn people new to permaculture away if an automated system ends up telling them something that's wrong. I followed up on this comment, interested in learning more about their position, and ended up scheduling a phone call with them to chat. What I wasn't prepared for, though, was that they actually wanted to work on this website with me for a share of equity in the company. I was expecting to just ask a few questions for the sake of this capstone project, but what I got instead was a potential business partner

"AS A PROFESSIONAL PERMACULTURE DESIGNER MYSELF, MY INPUT IS THAT PERMACULTURE CAN'T BE AUTOMATED. IT IS IMPOSSIBLE TO MAKE A GOOD DESIGN WITHOUT CONSIDERING ALLLL THE FACTORS, AND A KNOWLEDGEABLE HUMAN MAKING THE JUDGEMENT CALL"

- U/RISENFORTRESSDAWN

who's an expert in permaculture. We're still hashing out an official collaboration agreement, but I think their permaculture expertise will be a really good complement to my software engineering expertise for this website. Also, knowing that somebody else in the field believes in this project enough to want to be a part of it is a great motivation for me to keep going.

## What Beginners Want

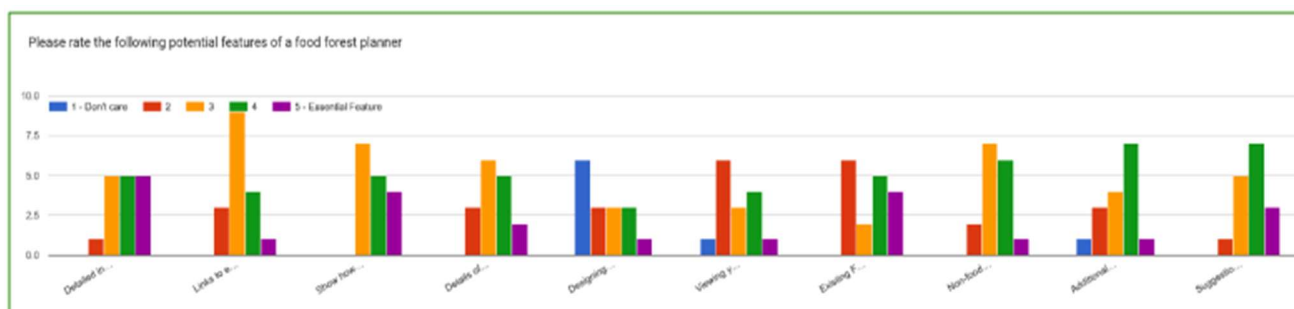
While I really value the expertise and opinions of those who work with plants for a living, I also wanted to make sure I got input from the general public who may not have as much experience. Beginners, after all, are who I plan to gear my site towards.

For this, I put out a survey. I sent it out to friends and family and posted on the permaculture and forest gardening subreddits as well as our MESH slack channel. I asked questions intending to find out the main pain points people faced when thinking about growing their own food and what features on a website might help them most. The survey ultimately received 18 responses, with respondents coming from a wide range of agricultural abilities and a diverse spread of geographic regions.



Most people were primarily interested in growing food for themselves and their families, but about 1/3 wanted to grow for their communities. The vast majority felt that a food forest planner website would have an impact on their ability to grow their own food.

On potential features I listed, respondents were most interested in detailed plant properties, showing how well-balanced their garden is, and suggestions on where to start and what to add next. They were least interested in AI to help design the garden for you, viewing their garden in 3D, and existing food forests near them to get involved with.



There were also additional suggestions given in the free-form answer boxes. These included seeing expected food yield in each year, what to look out for in terms of weeds or pests, how to use compost, and alternative gardening strategies like hydroponics. Users also shared what's stopped them from growing their own food so far, and those responses mostly fell into the categories of lack of space, not knowing the cost, and wanting information specific to the user's climate zone (or even microclimate based on specific topography).

## The Forest Garden Planner, Coming Together

I gathered all of the above research to help inform what is needed for my website, but at the end of the day, I am hoping to offer a real service in the form of a website that is useful not only for individuals, but also for city and housing community planners, so that they can easily incorporate edible and sustainable design.

## Competitor Sites

While researching potential solutions for plant data online, I was somewhat surprised to find out how crowded the digital gardening space already is. I had previously done research looking to find existing food forest planners and came up empty. It wasn't until I was trying to find specific data on plants that I ended up coming across references to existing garden planning tools. At first, I was a bit disappointed that I missed these earlier, and honestly a bit demoralized from continuing on my own project. As I dug deeper into each of the sites I found, though, I realized that there are still gaps that I could fill with my own site. I've summarized those findings into the below table.

Table 1: Existing garden planning sites

WEBSITE	KEY FEATURES	LIMITATIONS
<a href="#"><u>Garden Planner</u></a>	<ul style="list-style-type: none"><li>• Full-featured for traditional garden beds</li><li>• Plant details, spacing, planting/harvesting calendar</li><li>• Companion plants info</li></ul>	<ul style="list-style-type: none"><li>• No focus on permaculture</li><li>• Limited details on companion benefits</li><li>• Designed for annual planting</li></ul>
<a href="#"><u>VegPlotter</u></a>	<ul style="list-style-type: none"><li>• Basic interface</li><li>• Plants are removed after their harvest cycle</li></ul>	<ul style="list-style-type: none"><li>• Limited features compared to Garden Planner</li></ul>
<a href="#"><u>Gardener's supply</u></a>	<ul style="list-style-type: none"><li>• Corporate site with garden supplies and basic information on plants you add to your garden</li></ul>	<ul style="list-style-type: none"><li>• Conflict of interest as a retailer</li><li>• Lacks sustainability focus</li></ul>
<a href="#"><u>Organic Backyard Gardening</u></a>	<ul style="list-style-type: none"><li>• Personalized plans and resources available</li></ul>	<ul style="list-style-type: none"><li>• No digital design interface</li></ul>
<a href="#"><u>PermaPeople</u></a>	<ul style="list-style-type: none"><li>• Mission aligns with permaculture</li><li>• Crowdsourced API database</li><li>• Permaculture marketplace</li><li>• Garden log and planner</li></ul>	<ul style="list-style-type: none"><li>• Early-stage development</li><li>• Clunky interface</li><li>• Missing features like layout evaluation and swales</li></ul>

PermaPeople caught my eye the most. I like their mission and what they're doing to achieve it, including making their crowdsourced plant database available for public use. As a result of posting my survey around, I actually ended up having a conversation with the creator of this site, who encouraged me to check out their planner to see if it would fill the need of what I was hoping to create. I let him know where I thought it was lacking and where I saw mine going, and we had some good back and forth conversation about it. They started their planner in 2021 but have been working on it only off-and-on as volunteers, leading to a useful planner but geared

towards more advanced users. Ultimately, he recognized that there was plenty of room in this space to build cool things and was happy to collaborate with me in any way.

I was tempted for a moment to walk away from my project knowing that this already exists, but I do believe my project still has something to give to this space. In short, I don't think any of the existing options out there have enough handholding for what I'm looking for. I still found myself either overwhelmed with the options and not knowing what to add next or where or underwhelmed with the lack of data and features. In most of the existing cases, I'd be willing to bet that the websites were started by people who already had gardening experience and built their sites around their own needs and wants. I'm somewhat uniquely situated in that I also want to build a gardening website of sorts, but I don't have any gardening experience to bias me in any given direction. As such, my focus is really going to be on beginners, and on getting more people into growing their own food, rather than helping veterans keep track of already-successful gardens. I want to make it as easy as possible for people with absolutely no experience to be able to successfully manage their own food forest.

## The New Forest Garden Planner

With all this in mind, I'm drawing from my research question to form the mission statement of my new company: *"We are creating a website for users in the United States to support those new to agriculture with building a food forest to grow their own food sustainably."* Throughout the MESH program I had primarily been using the term "food forest" over its synonymous alternative "forest garden." As it turns out, however, the domain [foodforestplanner.com](http://foodforestplanner.com) was unavailable for direct purchase, and after trying out a number of other combinations of words, I ended up buying [forestgardenplanner.com](http://forestgardenplanner.com) (though nothing is deployed there yet).

I've begun development of the site, getting some of the initial infrastructure and page views set up, but there is still a lot of work to do. I started pulling data originally from PermaPeople, with the intention of providing a user feedback portal to update their crowdsourced database. The data I was collecting is presented below in Table 2. After initial discussion with my potential new business partner, though, I may end up going a different direction with what I save for each plant and how I present it. At any rate, this initial data should help me complete a simple demo to show in the coming weeks.

Table 2: Plant properties to include in the Forest Garden Planner database

Field	Description	Why I'm including it	Example Data
Description	Free-form text description field	For users to read plant details as desired	"Squash, also known as Cucurbita moschata, is a plant that is native to the Americas. It is commonly used in gardens and farms for its edible fruits..."
USDA Hardiness zone	Where, geographically, a plant can successfully grow	This will be the top-level filter applied for every user so they only see plants for their area	[any number 1 – 13 and letter a or b]
Layer	What layer of a food forest this plant occupies	This stands in for more specific data points like light and water requirements to keep the planning simple for beginners	Ground cover, Herbs, Roots, Shrubs, Tall trees, Trees, Understory, Vines
Utility	What this plant can be used for (eg. food, wood, insect repellant)	Shows why a plant might be useful to include, and helps the site point out what may be lacking	Animal feed, antifungal, Attracts butterflies, Attracts hummingbirds, Attracts insects, Attracts pollinators, Biomass, Bird feed, Bird habitat, Candles, Carbon capture, Coppice, Cover crop, Crafting, ...
Spacing	How close to other plants of the same type this can be planted	Will help the website determine if a user's layout is too scrunched together for optimal growth	...40cm, 45cm, 50cm, 60cm, ...
Width	How wide this plant grows to be	Makes it easy to show plant width in the user's planner	3 feet, 6 inches, ...
Native to	Which country or region the plant is native to	Likely a stretch goal / future feature, but I'd like to allow the user to, in addition to Hardiness Zone, be able to filter by native plants	Afghanistan, Alabama, Alaska, Argentina Northeast, ...
Warning	Any negative effects a plant can have	Important, especially for beginners, to know negative effects to look out for	Diarrhea, don't touch, frost sensitive, invasive, ...

## Into the Future: Sustainable Forest Gardens

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Food forests certainly aren't the only sustainable alternative to industrial agriculture, but they are the most exciting to me. I spend most of my time in the digital world and returning to ancient practices that not only encourage people to get outside but also reduce their reliance on Big Ag excites me. If you feel the same way, I hope my future website can help you achieve that vision for yourself or your community. While I'm still in the very early stages of building this website, it feels like one of the first steps on my long journey towards building a more sustainable world, by helping others pull away from the unsustainable mechanized industrial farming industry and towards their own sustainable forest gardens.



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# Balancing Complexities in Urban Tree Planting

Leah Jou

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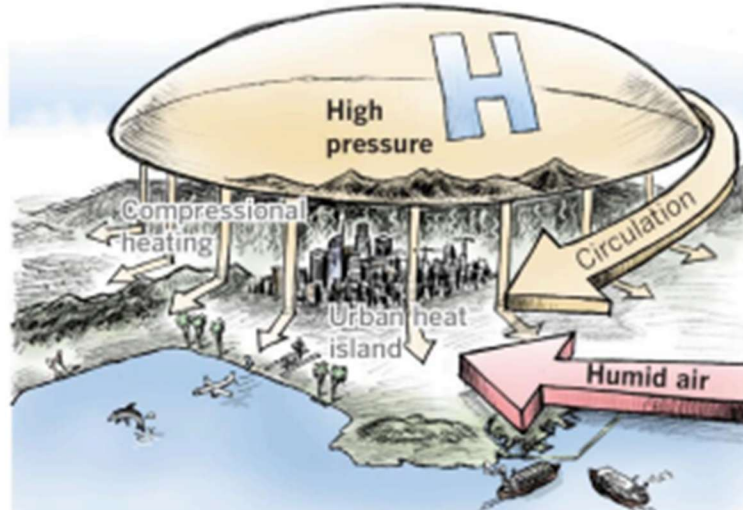
## Abstract

One notable consequence of climate change is the urban heat island effect. This involves the higher temperatures, pollution, and consequential negative health impacts that urban areas face, exacerbated by global warming. An important effort for combating the negative impacts is tree planting. LASAN Tree planting program is one group involved in tree planting in the city, a grant focused program dedicated to providing canopy cover to disadvantaged communities historically lacking shade and greening efforts. While much of the literature discusses the importance of urban tree planting, and argues for certain efforts in different sectors, it does not realize the comprehensive challenges at play. My research project aims to convey how an environmental solution as simple as planting trees involves a much more complex consideration of other interests. Despite a passion for providing shade equity in the city, the program deals with a variety of interests that many may not realize exist in order to achieve their goals. My research question is: how does the LASAN Tree Planting Program navigate the complexities of competing interests? Through interviews, research, and work observations, this work discovered that there are intersecting environmental, political, and social interests that the Tree Planting Program must balance in order to meet its goals.

## Canopy Cover As Heat Mitigation

The urban heat island effect is just one of the many consequences worsening and resulting from climate change. This involves the much higher temperatures, pollution, and negative health impacts that urban areas face in the hotter seasons. While climate change is already warming the planet, urban areas are especially vulnerable to extreme heat due to the lack of green spaces, and the heavy presence of heat generated activities and absorptive surfaces. The city of Los Angeles is one of the major urban centers subjected to this experience. In fact, “in the Los Angeles basin, the geographic area most impacted by urban heat island effects has more than an [80 percent overlap](#) with the area most affected by ozone pollution” (CalEPA, 2012). This is an issue as it results in greater emergency room visits and overall cardiovascular and respiratory issues. There is also an increased need for energy usage further contributing to climate change. This is especially a problem in disadvantaged, disinvested communities of the city that may not have air conditioning and adequate green spaces in their neighborhoods, thus suffering extreme temperatures. In fact, “Latino/a and Black communities are 21% and 52% more likely to be at risk of heat related health problems, due largely to characteristics of the built environment” ([Sheridan et al. 2024](#)). Vulnerable populations also may be more susceptible to the negative health impacts from the urban heat island effect, such as the elderly, children, and those without access to proper health care.

Figure 1. Graphic depicting causes and factors of urban heat island effect



One effort to help with this issue is increasing canopy cover throughout the city. Planting trees has a multitude of benefits to the environment and public health. For instance, “trees reduce surface and air temperatures through shade and evapotranspiration”, as well as sequester carbon ([Rendon et al. 2024](#)). They also provide other ecosystem services such as reducing pollution and stormwater runoff. Trees help to improve not only community aesthetics but [health impacts](#), as “low residential tree canopy is associated with increased risk of hypertensive disorders of pregnancy” (Tiako, 2021). Through the ability to lower temperature by about 10 degrees Fahrenheit and provide a wide range of other benefits to communities, increasing canopy coverage is an imperative measure to address the heat island effect that is exacerbated by urban landscapes, made of materials that absorb sunlight more than rural landscapes.

The City of LA Sanitation and Environment (LASAN) Tree Planting Program is one City initiative that works to address this issue in Los Angeles through urban forestry measures. The program is under the Department of Public Works: Bureau of Sanitation and Environment, specifically in the Sustainability Division of the department. The Tree Planting Program is one of many groups, organizations, and departments in LA involved in tree planting. It is grant funded and has the goals of planting trees and thus increasing canopy coverage in disadvantaged, low-income areas that historically lack shade and are in most need of the benefits of such greening. The program recognizes that “roughly 20 percent of the city’s total canopy is concentrated in just five census blocks, containing only 1 percent of the city’s population” ([Salabert, 2022](#)). The LASAN Tree Planting Program thus works to improve the built environment through urban forestry while addressing environmental justice.

### Introduction

Planting trees may seem like an initiative that is generally supported, and a simple effort that certainly a City Public Works program can easily implement. This capstone project aims to reveal, however, the challenges that may go unnoticed about urban tree planting measures, and the variety of perspectives that actually complicate the issue. My **research question** for the project is: how does the LASAN Tree Planting Program navigate the complexities of competing interests? I explore the ways in which they are required to navigate the political and ecological

factors to achieve their intended goals and tree planting outcomes. I thus aim to convey how an environmental effort as simple as tree planting must take many factors into account and deal with conflicting interests, through the case study of the LASAN Tree Planting Program.

Through interviews with key stakeholders, online research, and observations in my day-to-day work from field days and meetings, the project discovers the complex factors the program must take into account, how this affects their work, and how different interests are balanced in order to meet the goals of the organization. The insight from an LASAN Tree Planting representative as well as one from the non-profit organization City Plants largely contributed to the insight collected on the various detailed examples of priority differences and the resulting challenges or ways this is balanced between organizations. The project argues that there are a multitude of sectors that lead to tree planting challenges, whether it is bureaucracy and funding issues, or the competing priorities of different City departments, partner organizations, and other stakeholders. It discovers there are various concerns and interests with community members who may refuse a tree, as well as a large misalignment at the federal level. The project thus aims to employ a more comprehensive lens to the topic of urban tree planting challenges to fill the knowledge gap of existing discussions of the issue.

## **Addressing the Gap**

Much of the literature surrounding the topic of urban forestry describes complexities and calls for various urban tree planting strategies focused in one sector. However, my project aims to bridge these together to provide a more comprehensive view of competing interests that affect the complexities the LASAN Tree Planting Program experiences. I analyze the ecological and political elements that the literature describes, highlighting the gaps that my project will fill and bring together. I also discuss areas of the literature that do not recognize some of the efforts of the LASAN Tree Planting Program that actually address their various concerns or recommendations.

### **Ecological Discussion**

Some authors argue for an increased need of native species in urban tree planting. For instance, [Tartaglia and Aronson](#) argue that native plants are more beneficial than non-native species, providing higher faunal abundance and diversity, and other ecosystem services. They claim that native plants should be “prioritized in urban horticulture activities” (Tartaglia and Aronson, 2024). The article does recognize, however, several arguments for the use of non-native over native species in urban horticulture, including non-native plants’ adaptation to urban habitats, ability to increase biodiversity, and provide the same or better ecosystem services than native species. While it discusses a good variety of ecological reasons that non-native plants may be used rather than native for urban landscapes, it does not take into account the political restrictions or challenges that affect the ability of planting native species and result in planting non-natives. My research project will thus examine the complexities the LASAN Tree Planting Program faces when trying to balance regulations, logistics, and community interests, in order to expose the further difficulties of implementing increased native species in tree planting, despite the program’s interest in doing so. [Jang and Woo](#) also argue for an increase of native tree species, while analyzing the variety of challenges that affect the survival of native trees in urban environments. The authors convey ways in which native species may be superior to non-native species, such as through ecosystem and regulating services, but similarly do not consider other



factors that urban tree planting programs have to navigate that ultimately affect this interest, such as spacing guidelines set by other city departments. My research project aims to recognize the importance of native species for urban tree planting; however, it also illustrates the challenges that affect such interests through the efforts of the Tree Planting Program. It more comprehensively examines the complexities of urban tree planting in navigating ecological, political, and social interests that complicate the effort to plant native trees.

### Environmental Justice

Other authors focus their arguments for urban forestry on increased equitable access to nature, taking a community justice approach. For instance, [Cruz-Sandoval et al.](#) state the multitude of factors that contribute to the uneven distribution of trees and green spaces in urban landscapes. Although their argument for increased equitable access of trees in urban landscapes aligns with the goals of the Tree Planting Program, it does not consider the difficulties of addressing this issue given restrictions that a tree program may face, such as a lack of funding and interest from other actors that affect the ability of the program to plant in disadvantaged areas. While it is already difficult to secure funding for environmental efforts, grants and interest catering to equitable urban greening are even more rare or competitive, making it difficult for small Public Works Tree Programs, despite having jurisdiction, to easily increase equitable tree planting. The article researches and analyzes the case study of the distribution of trees in Guadalajara, illustrating the clear differentiation between two parts of the city. It examines the neighborhoods in the city, characterized by the richer inhabitants in the west compared to those much more deprived in the east, with images of street trees in two areas to illustrate the stark contrast of greening. These results are comparable to the shade disparities found in LA, with lower income communities lacking tree investments compared to richer areas of the city. These authors explain the lack of the city's Public Works department's focus on equitable tree planting projects, or "criteria for selecting the areas where they were planted" ([Cruz-Sandoval et al., 2020](#)). My research project will contrast this with the LASAN Tree Planting Program, which in fact has equitable tree planting goals and efforts but must compete with other interests to illustrate the importance of an environmental justice approach and get the funds and support for it to actually occur. Thus, I aim to reveal further difficulties beyond passion for implementing and advocating for an environmental justice lens in tree planting.

### Education

Another sector that authors argue for in urban tree planting initiatives is education and outreach. The article by [McPherson et al.](#) argues for the importance of city trees and their benefits, while recommending various strategies for cities to take to increase the net benefits. One recommendation they make is that "educating the public as to the importance of selecting long-lived, high benefit-producing trees, and enforcing a planting ordinance with approved species for different planting locations are strategies that could pay dividends in the future if implemented now" ([McPherson et al. 2005](#)). While the article points out the importance of community education and outreach to improve tree planting efforts, it does not take into account addressing more diversified community interests or uninterest in having a tree. My research project will utilize the analysis of the Tree Planting Program to acknowledge other community interests that affect educating the public and acquiring their support in urban tree planting. It is important to acknowledge the much more dynamic interests that are involved in urban tree planting decisions and outcomes, and thus the article's discussion leaves a gap about the

complexities with education and outreach efforts for tree planting initiatives. The argument also leaves out smaller details such as grant restrictions that limit the capacity of outreach efforts, as my project will highlight. The bulk of the article also includes strategies that are more ecological, such as knowledge of age structure, species composition, and ecological services that can inform urban forest management. My research project's analysis of the combination of complexities that result from competing interests will therefore help to bridge the various sectors together for a more comprehensive view.

### Community Dynamics

[Carmichael and McDonough](#) discuss different communities and political dynamics of street tree planting efforts, specifically in Detroit, Michigan, tied to residents' refusal or disinterest in trees. They identify the important point that "power dynamics between participants in urban and community forestry efforts can be a key reason for resistance to tree-planting efforts" ([Carmichael and McDonough, 2018](#)). This discussion is critical to consider, especially given that other pieces of literature do not examine it, however my research project aims to portray the ways that the Tree Planting Program actually works to address this. It will dissect how the program implements outreach efforts and inclusion with the community for its tree planting projects, but also ways in which this is still difficult to achieve given the values certain community members may have. It can thus reveal the strategies which would be helpful for strengthening the relationship between community members and urban forestry or project management workers. Further, by combining this conversation with the ecological complexities involved, the project can provide a holistic view of the more detailed factors and competing interests that are involved in the Tree Planting Program. This article further discusses the power dynamics between a non-profit tree planting organization and city residents, which can differ from the results of my analysis of the City of LA Bureau of Sanitation Tree Planting Program, given its unique position with several government actors and competition between departments that would not apply to non-profit organizations. The project can thus fill in the gap of understanding the complexities faced by local government tree planting initiatives given public perceptions of power and ability for certain efforts.

[Sousa-Silva et al.](#) argues for several approaches to better planning and integrating urban tree initiatives. The article includes seven principles for improving the success of tree planting projects, such as community engagement on tree planting and maintenance, monitoring tree losses, addressing the inequitable distribution of tree canopy, and connecting initiatives with long term management ([Sousa-Silva et al. 2023](#)). In my discussion of how the Tree Planting Program navigates the complexities of competing interests, it will include the various strategies of how it addresses some of these principles already. My research project will thus be informative on examining how the Tree Planting Program implements some of these practices, as well as expanding on the discussion of how achieving these is challenging due to other factors that affect these goals. The article includes some challenges of urban forest management but does not establish the more complex relation between smaller ecological, political, and community complications that are present in tree planting projects, such as those experienced by the LASAN Tree Planting Program.

### Bridging the gap

The various pieces of literature reviewed all consider strategies to implement in urban tree initiatives, or argue for certain efforts. Through this literature review I recognized the trend of the articles focusing mainly on one sector to discuss urban forestry strategies or challenges. While ecologists recognize the importance of biodiversity efforts, they do not discuss the political restrictions and community challenges that are relevant. Similarly, whereas justice advocates understand the significance of providing equitable greening, they do not discuss the larger power restrictions of factors such as available funding and different department values that would also affect these efforts. While the literature fails to show the connection between a greater variety of interests that would affect urban tree planting initiatives, it may also make the assumption that City Public Works initiatives have jurisdiction or more power to make these ecological, community, or political strategies and efforts that they argue for. They may not realize how a program is bound by competing interests, whether it is federal, local, or community actors, despite the program having passion for implementing such strategies. My project can therefore help to contribute to this knowledge gap and provide further insight into the restrictions and factors that prevent the tree planting decisions that the literature calls for.

The literature reviewed discusses important urban forestry practices and difficulties that should be considered, however, by bridging these conversations together my research project will provide a more comprehensive view of the differing complexities that are involved in the LASAN Tree Planting Program due to competing interests. It will consider the ecological, political, and community challenges that affect the efforts of tree planting, and how the program navigates such factors to produce their outcomes. It will also dissect the ways that the program is already addressing some of the recommendations and strategies that the pieces of literature argue for implementing in urban tree planting, or the challenges they face in ability to do so. This can lead to further research of the effectiveness of the strategies or how to alter them to implement it in other city tree planting projects. The research project will hopefully fill in these knowledge gaps and provide greater insight through the analysis of the LASAN Tree Planting Program. Through interviews and observations with a variety of stakeholders, such as City project managers, urban foresters, contractors, and community members, the project can contribute to providing further understanding of the true complexities of urban tree planting and how one program navigates them. It will analyze the different sectors that the Tree Planting Program must work with, and how this is navigated to successfully carry out the functions of the program.

### Methodology

To approach my project, I considered my unique position as an Environmental Specialist for the LASAN Tree Planting Program. The insight leading to my results consisted of interviews, meetings, and observations from my work that constitute qualitative data. The qualitative approach was more effective since my research question involves more analysis of processes and relationships rather than statistical outcomes or numerical data. My position allowed me to gain day-to-day insight from a variety of experiences with stakeholders and the knowledge that coworkers and others shared with me, along with other online research that I conducted.

I found that including interviews may be beneficial for my project as a way to compare answers between two individuals, one with strong knowledge and experience with the Tree Planting Program, and one with the perspective from a non-profit partner organization that works closely with the Tree Planting Program. Although I wanted to have a greater variety of

interviewees, a lack of responses and ability to interview from several individuals led to the more narrowed down perspectives from interviewees that my project includes. The individuals, however, are key informants from their relative groups. My interviews were semi-structured, as I found it valuable to have a list of a few questions to guide the conversation and provide some structure but allow room for follow up questions and personalization depending on the interviewee and what examples or insight they provided.

I further wanted to include insight and data from casual conversations, meetings, and discussions that related to my research question, as I found such anecdotal data to be just as important as traditional quantitative data. Although not organized interviews, the conversations help to include a variety of perspectives that helped form a more comprehensive understanding of my capstone project question. I supplemented this with other online research of websites and articles that revealed certain different interests or values that affect the Tree Planting Program.

The combination of interviews, research, field observations and meetings or other first-hand experience from my position as an Environmental Specialist constituted the insight gathered to address my research question: how does the LASAN Tree Planting Program navigate the complexities of competing interests? This methodology ultimately allowed me to explore the knowledge gaps of the reviewed literature, and the various restraints and strategies of the Tree Planting Program due to complexities in multiple sectors and certain values they have to consider.

## **Dissecting the Interviews**

I found there to be three main themes when comparing the responses of my two interviewees, in an attempt to address the question: how does the LASAN Tree Planting Program navigate the complexities of competing interests. The first interview conducted was of a representative from the non-profit organization City Plants. This organization is a well-established group involved in greening Los Angeles, with a variety of tree-related programs. They are also a close partner with the LASAN Tree Planting Program, and thus the interviewee (Stakeholder X) was a key informant of the organization, with experience and an understanding of the relationship between the two groups and urban tree planting. The second interview I conducted was with a key informant of the Tree Planting Program (Stakeholder Y), an individual with many years of experience and knowledge of urban forestry, the program, and various tree planting challenges.

The questions asked of the two individuals slightly differed, and are listed as follows:

City Plants:

1. Can you explain your role as a collaborator with the LASAN Tree Planting Program?
2. How do you feel about the alignment of City Plants' priorities with those of the Tree Planting Program?
3. What challenges do you/City Plants face that make it difficult to meet the goals involving collaboration with the Tree Planting Program?
4. How does LADWP and their interests/priorities affect City Plants?

5. What difficulties do you face with the need to collaborate with such a variety of groups? How is this navigated? How do the challenges span multiple sectors?

#### LASAN Tree Planting Program:

1. Can you explain your role in the Tree Planting Program?
2. What strategies does the Tree Planting Program utilize when there are conflicting priorities with residents, other City government departments, or non-profits/contractors?
3. How does the Tree Planting Program balance its goals with the interests of those it collaborates with or depends on?
4. How has the program had to adjust plans due to opposition, lack of support, or logistical challenges?
5. How do the challenges span multiple sectors?

When comparing the responses of the two interviewees, although there were some differences I also found similarities and grouped the ideas into three main themes:

1. Bureaucratic and funding complexities
2. Conflicting priorities between stakeholders (LADWP, StreetsLA, Planning)
3. Community challenges

#### 1. Bureaucratic and funding complexities:

The bureaucratic structure of the City of LA, and the related requirements, limitations, and relationships are a factor discussed by Stakeholder X. They explain how City Plants is a non-profit affiliated with the City, but not an actual department, stating “being a department of the City limits you in terms of what you can agree to”. City Plants thus has more flexibility in seeking funding and partner opportunities. Stakeholder X explained that the organization provides match trees for LASAN Tree Planting Program grants and works together to apply for funds and support each other's efforts to bring more canopy cover to the City. City Plants, however, is funded by the Los Angeles Department of Water and Power (LADWP), which leads to certain limitations that in turn affect the Tree Planting Program. A difference in values from this department is discussed in the next interview theme. Since City Plants is not in the City’s budget and relies on LADWP for funding, they seek to secure additional revenue streams, leading to challenges to consider for the Tree Planting Program given their reliance on City Plants and their capacity as well. Stakeholder Y from LASAN also discusses the difficulties in bureaucratic and funding complexities. With the program being grant-funded, even once awarded a grant project the proposal must go through a lengthy and complex process through the City to get approval and actually begin work. Although maybe not as strictly examined as other environmental projects, the program must navigate how to best narrate their grant application and why it should be awarded and approved, catering to different groups' interests. One strategy mentioned by Stakeholder Y is emphasizing benefits in proposals to stakeholders that align with that individual or group’s own goals, in order to more easily garner support and approval. For instance, highlighting the outcomes of a tree planting project with the past Mayor’s Green New

Deal plan and goals. The two organizations' reliance on funding from their prospective sources ultimately affects the way the Tree Planting Program must navigate certain interests, whether it is a specific aspect of tree planting, or environmental efforts at all.

Figure 2. City Plants truck with adoption trees



## 2. Conflicting priorities between stakeholders:

### **LADWP:**

The two interviewees discussed various examples of the stakeholders they collaborate with, and how a difference in interests or priorities affect their work. Stakeholders X and Y discussed an example with LADWP, both conveying the idea and importance of balancing criteria and goals from others in order to meet the tree planting mission.

The LADWP is a different department within the City government structure, often seen with greater power and funding than other departments. Their efforts relate to and affect the LASAN Tree Planting Program, as they fund City Plants, a partner that works closely with and helps the Tree Planting Program as well. Being the department focused on electricity, however, LADWP is found to have more priority over energy efficiency and the reduction of energy consumption. Stakeholder X explains, “LADWP has a mission and focus of being wise with energy efficiency dollars that they are providing”. While they also champion tree planting in the city, their prioritization over energy saving is a factor that affects both City Plants and LASAN.

City Plants is unable to provide or approve a large amount of “non shading” trees to the Tree Planting Program, due to the interests and priority of LADWP to fund “shading trees” instead. This decision occurred after a rate payer advocate complaint, arguing that funding should go towards shading trees in order to lower energy use and electricity costs. This, combined with the functions of LADWP and commitment to lowering water and power costs to residents in LA, leads to the restrictions they put on City Plants to provide non shading trees. Stakeholder X explains that City Plants funding ultimately comes from rate payer money, thus the rate payer advocate oversees the dollars spent and can affect how the organization is able to operate, such as if it finds certain items they want the money to be spent on.



Such “non-shading” trees, however, can be simply street trees around parks or parking lots that just do not provide shade over a building, but still provide canopy coverage over sidewalks of high foot traffic areas or parks in disadvantaged communities. Thus, the LASAN tree team sees the benefits of non-shading trees in some cases and their importance. This is especially given the wide variety of the benefits of trees, besides lowering energy costs, like contributing to the importance of increasing urban canopy coverage and shade equity and improving public health. The Tree Planting Program uses grant projects to plant trees in disadvantaged, low-income communities in need of shade. The ability to provide such canopy cover in certain locations is thus complicated by the priorities set by those such as LADWP, given the types of trees that City Plants is approved to provide to the Tree Planting Program. LADWP’s interest in shading trees exemplifies their value of cost and economic factors over more ecological interests such as increasing canopy wherever possible, even if they support environmental efforts.

The Tree Planting Program must thus navigate the difference in priorities between various departments, however, and how they meet their grant goals and requirements, or how they seek out viable tree sites on marking days.

On the DWP website, there is not much information on tree planting efforts or their partnership with City Plants, but rather redirections to City Plants or other pages. The information that is on the [website](#) focuses on energy efficiency and cost savings, including the following statements: “Trees save energy by shading homes and buildings, allowing air conditioners to use less kilowatt hours to keep our homes and businesses comfortable” (LADWP, 2024). It also states “shade tree programs continue to provide a cost-effective component of LADWP’s energy efficiency portfolio” ([LADWP, 2024](#)). This explains and exemplifies DWP’s greater interest in funding for shading trees, compared to City Plants and LASAN’s recognition of the importance of non-shading trees, and the need to work around these priority differences. It reveals the complex policy dynamics at play with urban tree planting, through the example of the relationship between City Departments.

### **StreetsLA:**

Stakeholder Y discussed the certain priorities and values of the Public Works Bureau StreetsLA, and how this affects the Tree Planting Program. This Bureau is responsible for tree planting and maintenance in the city as well, along with street and sidewalk repairs and other maintenance concerns. The Urban Forestry Division (UFD) of the Bureau works with the LASAN Tree Planting Program on projects.

One challenge the Tree Planting Program experiences are the extensive spacing requirements for tree planting set by UFD. While they are generally reasonable as safety measures, Stakeholder Y mentions that they are also “sometimes over restricting”. This ultimately affects the Tree Planting Program’s ability to plant in certain areas or meet the requests and needs of community members and other tree planting organizations. They also explain that StreetsLA is general funded, so whenever there is a budget crisis they are consequently at reduced capacity, leading to making reactive policies rather than proactive. For instance, with not enough staff to keep up with tree trimming and maintenance, this may be seen as linked to requirements of how far apart street trees need to be from one another. Stakeholder Y points to “practicality coming in instead of what’s really best for the City”. Therefore, the interest in StreetsLA in lowering job responsibilities, due to budget constraints that also may be out of their control, is an interest that clashes with providing as much canopy coverage as possible. This

illustrates another area of interest that one must consider when dissecting urban tree planting challenges.

The prioritization of safety from StreetsLA also results from the reality of the budget affected by lawsuit potential, or litigation and liability problems. Stakeholder Y explains that there are many lawsuits the City deals with involving safety hazards with sidewalks and trees. Thus, this leads to a prioritization of safety rather than what is ecologically or sustainability optimal, and “defensively planting rather than innately planting”. The resulting guidelines and difference in interests is ultimately a factor the Tree Planting Program must navigate, taking what they can get and balancing such interests to meet their mission of providing shade equity in communities most in need.

Stakeholder Y discussed another example of different department values, involving the Planning Department. They explained a recent situation surrounding tree sites that the Tree Planting Program marked in Highland Park, which were already sent to a partner organization to do the planting and concrete cuts after permit approval. Concrete cuts are made when there is not an existing planting strip for a tree, and instead the sidewalk is cut for a new tree well. The sites needing concrete cuts, however, were not approved by the Bureau of Engineering (BOE) due to the area being a Historic Preservation Overlay Zone (HPOZ). The Planning Department protects these designated sites with restrictions for construction and renovation activities, in order to preserve the cultural, architectural, and historical look of certain areas deemed these HPOZs. The Planning department’s prioritization of preserving and restricting modification of these areas, even if it involves green infrastructure such as tree planting, conflicts with the ability to meet ecological interests of providing certain trees to that community. The Tree Planting Program navigates this complexity by moving forward with the trees that will not need concrete cuts, given the complexity, time, and confusion that may be involved with having to get additional permits and support for approving all of the tree sites. They balance this with the number of sites that were not approved as well, which in this case was only 5 out of the 15 trees. This decision ties in with Stakeholder X’s comment of working within parameters, taking what you can get, and considering “how to fit your goals into theirs or vice versa”. This example further conveys the variety of competing interests that are not discussed in the current literature surrounding urban forestry challenges.

The interviews with the two stakeholders reveals the detailed complexities of competing interests that one may not realize are involved in urban tree planting efforts. It is clear that there are thus many factors and restrictions that affect the Tree Planting Program’s efforts.

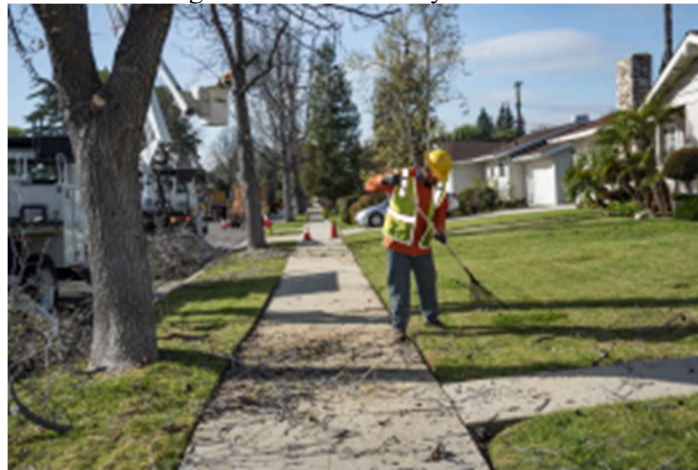
Figure 3. StreetsLA Urban Forestry Division



### 3. Community challenges:

Both of the interviewees also voiced the challenges of dealing with the various interests or disinterests of residents. Having both come across resident refusals of a tree, they explain that this disinterest may occur due to multiple reasons. The most common rationale is concern about maintenance. Some residents do not have trust in the City that the trees will be maintained but rather left a mess in their neighborhood affecting aesthetics or causing a hazard. This is often due to a history of problems with the City and the disinvestment in their community, thus a perception that is challenging to change. As both City Plants and the LASAN Tree Planting program work in traditionally underinvested communities, Stakeholder X also explained how some residents may be more concerned about their job, housing, or safety of their children, leading to a disinterest in trees being planted that they deem will instead add to responsibilities of cleaning up a mess. The Tree Planting Program often navigates this disinterest and a strong tree refusal, although still having jurisdiction to plant, by canceling that tree site. This is deemed as an effective decision, to prevent investment of time and resources in aiming to plant and keep a tree alive that will only be damaged and die if there is passionate disinterest in the tree, whether of the resident near that site or another member of the community harming it. Others point out the potential for a mess and required care they would have to do, without being educated on the multitude of benefits of trees or that they will not have to be responsible for watering the trees. The interviewees both discuss the strategy of doing outreach and education that makes it easier for the community, explains how they can get involved, but does not require extensive participation that they may not have capacity to do.

Figure 4. Urban Forestry Division



Additionally, Stakeholder Y discussed the instance of refusal from trees planted in front of businesses, where the owner is concerned about the trees covering their signage. The Tree Planting Program thus tries to consider this when marking tree sites, and “depending on the signage they may have, finding a tree that would be up and over it, higher”. This again exemplifies the strategy of making adjustments to meet the mission of the organization and adapting to the different interests of others.

Stakeholder X spoke to the importance of utilizing tactics such as providing quick, key information, and inviting community members to be a part of the solution rather than coming as a savior of the community with a directive approach that amplifies power roles. Stakeholder Y discussed similar ideas of community education that does not overburden residents but takes

their concerns into account and makes it easier for them to receive the same tree benefits that other more historically privileged communities get to experience.

The different interests of community members exposes yet another sector that the Tree Planting Program must strategically navigate in order to meet their goals. Figure 5. Community member carrying a tree.



The results and insight from the interviews examine a comprehensive view of the different competing interests and priorities that affect the Tree Planting Program. From bureaucracy challenges to the regulations set by other departments, and a variety of community concerns, the program must utilize strategies to balance such interests to successfully meet their objectives.

## **Disaster Recovery**

Another relevant difference in prioritization results from the recent LA wildfires. In January 2025, LA experienced a wildfire disaster affecting mainly the Palisades and Altadena and displacing many communities. Recovery for this disaster has thus been largely highlighted in the media and within stakeholders, becoming a top priority for the City and other groups involved. The interests consequently surrounding recovering LA affect the Tree Planting Program. For instance, many of the new grants and funding opportunities available are catered to disaster recovery and wildfire related efforts. The Tree Planting Program must thus strategically narrate their efforts to fit the grant application interests, and work to convey how tree planting relates to disaster recovery. They focus on portraying how tree planting efforts are important for the recovery of the City and are needed given the wildlife that was destroyed through the fires, to get support from various stakeholders.

The wildfires further affect the program in regards to their reliance on partners and contractors. Many of the non-profit organizations that the Tree Planting Program works with were affected by the fires in various ways. Whereas staff was at reduced capacity due to some workers personally affected by the fires, the work from the organization as a whole was also reduced due to their need to work at food banks or disaster recovery centers. Thus, some of the work for the Tree Planting Program was slowed down, or paused, due to the inability of partners to prioritize such projects.

Current events such as the wildfires are another example of the complex factors that affect urban tree planting efforts, and thus leading to navigating the prioritization of disaster recovery.

## **Federal Misalignment**

Through observations, anecdotal discussions, and research, I examine the difference in priorities at the federal level that affect the Tree Planting Program. The LASAN Tree Planting Program manages several grant funded projects to be able to plant trees in the city, all of which are focused on increasing canopy cover in disadvantaged, low-income communities. The grants help pay for the labor, maintenance, outreach, and other necessary resources for urban tree planting.

BeLeaf in Equity is one of the several grant projects the program is taking on, being unique since it is Inflation Reduction Act (IRA) funded through the U.S Forest Service. The program was awarded this grant under the Biden administration, and it is the only federally funded grant project the program is working on. With the administration change, however, a difference in interests and abrupt executive orders have negatively impacted the BeLeaf in Equity grant project. Earlier in the year, the Trump administration directed a freeze on IRA funding, impacting numerous projects across the country in a wide range of sectors. The federal prioritization of moving away from Diversity, Equity, and Inclusion (DEI) and the halt of federal funding/support for IRA projects thus affects the BeLeaf in Equity grant. The Tree Planting Team, although has not received a specific directive to cease all activities, thus began to deal with a multitude of uncertainties that affect what work they can do on the project, how, when, or if they can move forward with the project, the activities of their partners, and more. Through my work observations, I found multiple examples of such uncertainties and consequential challenges that reveal the effects of political interests at play.

The Tree Planting Program initially planned for an Arbor Day event in March that would involve tree planting by the community, with sites for the trees already marked and necessary concrete cuts completed by one of the partner organizations, Los Angeles Conservation Corps (LACC). However, the Program had to make an executive and strategic decision to no longer plant those intended trees. The watering would be funded by the grant money, but because it is uncertain whether that will be cut or that there will be no reimbursement, the program made this decision to avoid adding living structures to the community that will potentially just die. To pivot, they relied on another partner organization, City Plants, to provide a smaller number of match trees, in order to still proceed with the event and provide the community with trees and a resource fair.

Due to the possibility of funds being cut at any point, the program also discussed how spending should occur in the near future. Out of caution, they decided to draw down as much money as possible on outreach supplies before an actual cut on funding directive to the BeLeaf in Equity project, as those materials are a one-time purchase that would not need the security of long-term funding over the next few years as did actually planting the trees.

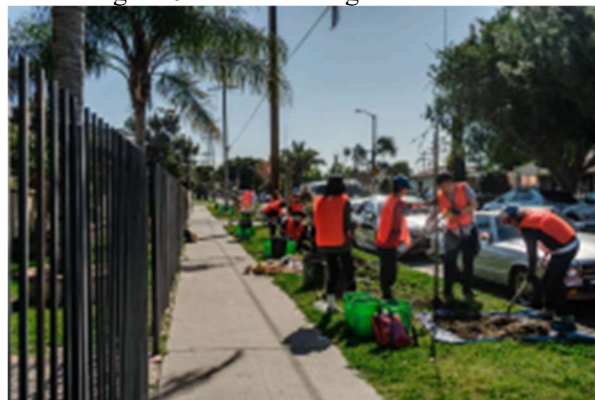
The clear division of the goals and priorities at the federal level compared to those of the Tree Planting Program also leads to the strong likelihood that there will not be any additional federal grants for such urban forestry projects. This forces the program, entirely grant funded, to rely on state or local grant opportunities. The program thus has strategized seeking out such opportunities and possibilities in the case that the BeLeaf project activities are cut.



Due to the bold and quick action of the Trump administration, it is clear that the misalignment at the federal level remains a challenge for the Tree Planting Program, causing them to formulate the most effective strategies surrounding continuous weeks of uncertainty. Although the executive order has caused much confusion, worry, and tension within the program and its partners, they aim to remain as optimistic as possible, as well as cautious in order to best proceed and meet their goals of continuing to provide canopy cover to disadvantaged neighborhoods. The Tree Planting Program and its partners also have worked to continue supporting each other as best they can, as other non-profit organizations and their projects have been hit hard with the federal halt of funds as well. The culture surrounding this has been met with a shared frustration, understanding, and passion for the ability to plant trees in communities most in need. Whereas the federal priorities do not align with those of the Tree Planting Program, this group and its partners appear to be more strongly aligned with their concerns and interests given their common goal and commitment to greening the City.

The difference of priorities at the federal level exemplifies another layer of complexities that the Tree Planting Program must consider. While the values at the federal level do not currently align with those of the program, they work to seek out other ways to still achieve their tree planting goals.

Figure 6. Crew working on street trees



## **Summary**

It is clear that the LASAN Tree Planting Program must navigate a variety of interests in different sectors, which ultimately provide restrictions and challenges, and affect how they operate in order to achieve their goals. A prioritization of energy efficiency from LADWP dictates restrictions to certain tree planting, as well as the interest in safety from StreetsLA and the tree planting guidelines that result from that. The program also experiences community challenges and a difference in prioritization from residents refusing, disinterest, or concerns about trees being planted in their neighborhoods. The program must educate and involve community members in a way that encourages participation in the process but does not overburden residents.

The Tree Planting Program deals with those who are enthusiastic about tree planting and have interests in native species or other ecological recommendations. However, they must also communicate the restrictions the program is bound by, even if interests align, and educate on why considering other factors is important. With schools interested in greening their property, the Program's inability to plant in areas besides the public right of way is met with efforts to provide



shading to the perimeter of the schools instead, or a partnership for tree adoption events with other organizations the program works with.

It is evident that urban tree planting is needed, especially to combat the effects from the urban heat island effect in cities such as Los Angeles. It is important, however, to understand the complexities that come with such efforts, and the need to balance values and restraints from various actors. My research project thus aims to bring the discussed literature together and provide insight on how to navigate the complex factors by examining the case study of the LASAN Tree Planting Program. It can help to inform other urban forestry programs on challenges they should consider and potentially lead to further discussion of how to better balance or cater to different interests in order to increase urban canopy cover, provide shade equity, and achieve more support for urban forestry efforts.

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# **Balancing Water Sustainability and Tourism: Challenges and Solutions for Golf Courses in Oahu, Hawaii**

Elizabeth Florido

## **Abstract**

Not only are environmentally friendly travel options vital, but they are also sensible since they offer an example for regions facing similar water constraint issues. This article aims to answer the research question: How can golf courses on Oahu balance their residents' and community needs and interests and withstand water sustainability challenges? This article provides an overview of the complexity of water sustainability in Oahu's golf tourism industry. This sector contributes extensively to the island's economy but also burdens the environment. Through a comprehensive analysis of the perspective of stakeholders like golfers, golf course owners, Indigenous activists, residents, policymakers, and tourists, this study analyzes golf tourism's multiple water resource impacts. This research addresses golf course maintenance as an example of environmental consequences, high water consumption, chemical runoff, and social and economic tensions resulting from local water needs for golf tourism. This study reviews existing literature and conducts interview(s) to develop innovative sustainable practices, ingenious irrigation systems, native plant landscaping, and recycled water use to mitigate these challenges. This underscores the need to engage communities, reform policies, and be culturally sensitive in order to attain a fair balance to water management, on the one hand, supporting tourism and, on the other hand, local welfare.

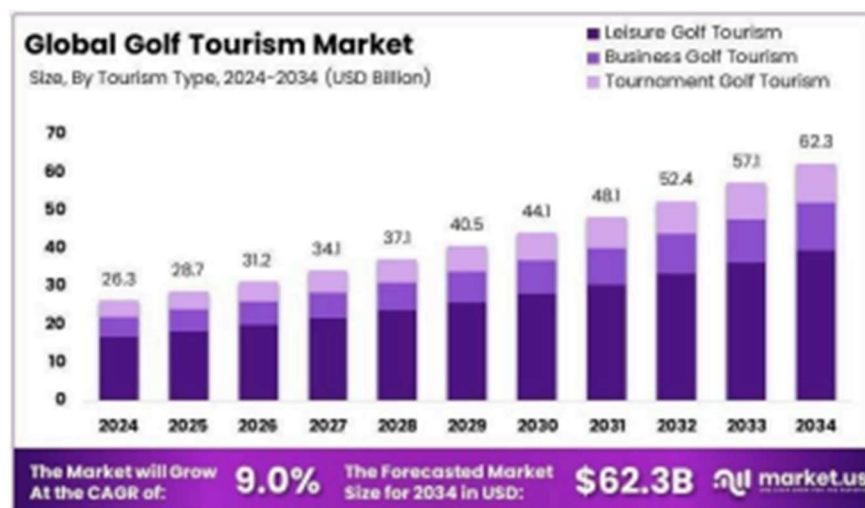
## **The Current Landscape: Economic Benefits of Tourism in Oahu**

Well-known for its beautiful nature and thriving tourism industry, Oahu in Hawaii is a tourist paradise. According to [Hawaii Tourism Statistics \(2023\)](#), Oahu, the island with the most visitors in 2023, had 9.66 million visitors. The sector is responsible for nearly 100,000 jobs, one in four of the total employed in hotels, restaurants, and recreation such as golf courses. World-

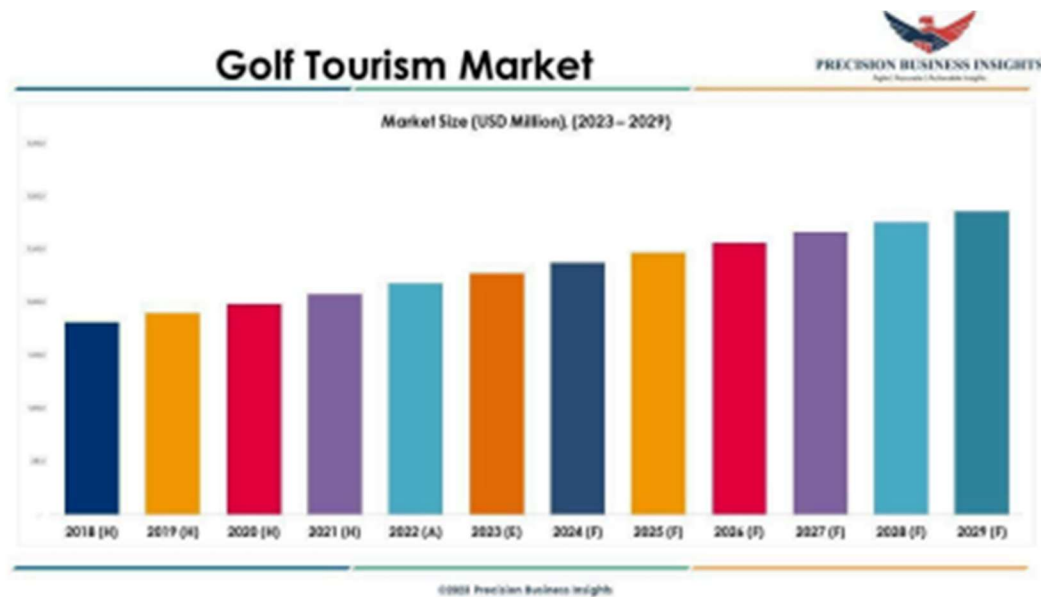
class courses such as Ko Olina, Turtle Bay, and others contribute significantly to golf tourism, with the expectation of world-class conditions and high-spending visitors. Millions gush into the local business, from family shops to large hospitality chains, resorts, restaurants, and recreational activities connected to golf. However, there is a price to be paid for all this economic boon.

As it is, that same sector generating the rich prosperity on Oahu is also pulling at the same limited Oahu freshwater resource, with the annual use of 66.5 million gallons by golf courses ([Gopalakrishnan & Cox, 2003](#)). Tourists who come to the island to enjoy its pristine beaches and lush landscapes are often unaware of their environmental effects, especially regarding water usage. Much water supports hotels, restaurants, and recreational activities aimed at tourists, and golf courses are among the most significant consumers, as shown in Graphs 1 and 2. An average of 66,515 thousand gallons of water per year was reported by a 2003 study by [Gopalakrishnan and Cox](#) for golf courses in Hawaii. Locals, particularly during prolonged droughts, struggle to cope with shortages in water supplies, which have been exacerbated by the heavy water usage needed for atomic energy generation, as emphasized by the 2014 Hawaii Sea Grant. This, in turn, causes regulations on water use to have a more significant effect on locals than visitors, increasing social and economic tensions.

*Graph 1: Global golf tourism ([Golf Tourism Market, 2025](#))*



*Graph 2: Golf tourism market growth rate ([Prem, 2023](#))*



In the luxury nature of golf courses, the need is especially apparent to balance tourism with local water demand. Within the islands of Oahu, where most of Hawaii's population resides, prolonged droughts have forced people out of their comfort zone and the expenses of keeping groundwater supplies viable, as [Frazier et al. \(2022\)](#) highlighted. What is happening here speaks volumes about the need to develop sustainable water management practices for golf tourism that can save the environment and maintain the well-being of communities.

Accordingly, this paper asks: What strategies can golf courses in Oahu utilize to incorporate sustainable water management to meet environmental and social needs in an environmentally and socially acceptable way? The irony lies in the complexity of ensuring the economic benefits of the state's golf tourism and the responsibility to protect the precious resources of Oahu's water supply. This research will explore innovative solutions like intelligent irrigation systems, native plant landscaping, and recycled water to determine ways of minimizing the environmental footprint of golf courses and building collaboration with local stakeholders. Therefore, the end goal is to propose actionable recommendations to guarantee the long-term profitability of the golf industry and Oahu's water resources while protecting the well-being of residents and maintaining Oahu's natural beauty for future generations.



## The Problem: Water Scarcity and Inequitable Distribution

As emphasized by the 2014 Hawaii Sea Grant, this high water demand becomes very concerning when considering the recent increase in duration and severity of drought periods, forcing residents to follow stricter water restrictions and increasing costs to maintain groundwater supplies, as indicated in Table 1.

*Table 1: Water Use Data for Hawaii in 2015*

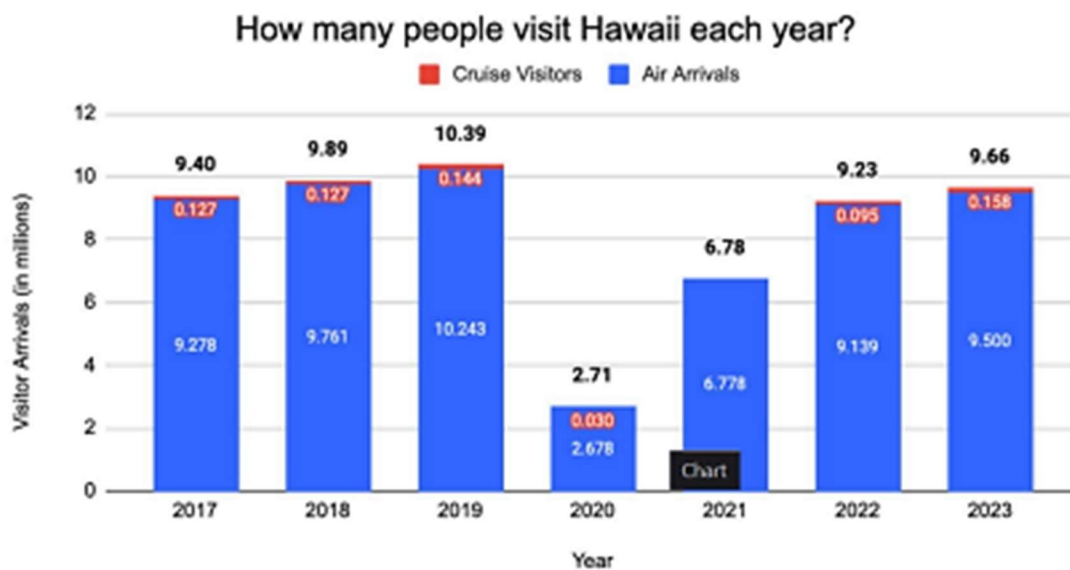
The total population of the area is thousands	1431.603
Public Self-supplied groundwater withdrawals fresh in Mgal/d	252.31
Public self-supplied surface water withdrawals fresh, in Mgal/d	14.61
Irrigation Total Consumptive use fresh in Mgal/d	322.63
Irrigation Golf course in Mgal/d	193.78

The question of Oahu's sustainability is partly a tension between the economic benefits of water from golf tourism and the environmental costs of that water. Golf courses do well in terms of revenue generation and employment. Still, their water usage generally does not prioritize conserving the environment when wiping away water for aesthetic and operational reasons. This imbalance will unduly burden local communities that use the same water resource for daily survival, agricultural activities, and the cultural spectrum of society. For example, the [Hawaii Tourism Statistics](#), 2023 highlighted that residents experience higher water costs and restrictions during droughts, while golf courses rarely deviate from operations with little or no change. The dynamic of this underscores the requirement for a more democratic mistrust among those needed for water management besides just residents, businesses, and policymakers.

The problem is compounded by tourism being a cornerstone of the island's economy. In 2023 alone, 9.66 million tourists wandered Oahu island, many of them to its highly lauded golf courses, according to [Hawaii Tourism Statistics](#), as shown in Figure 1. This influx of visitors

does help the local economy, but it increases the need for water and puts an intensity on the island's finite resources. The problem is to balance the economic benefit of golf tourism and the extended run water availability for residents and ecosystems. Unless there is an effective intervention, it is possible that the perpetration of golf courses in overusing water could end up causing irreversible environmental degradation that could harm not only the island's natural beauty but also its cultural heritage and people's well-being.

**Figure 1.** <https://roadgenius.com/statistics/tourism/usa/hawaii/>



This issue cannot be addressed with a single method, such as innovative water savings technologies, community engagement, or policy reform. For example, [Gopalakrishnan and Cox 2003](#) underscored strategies to reduce water waste on golf courses, including adopting innovative irrigation systems and utilizing soil moisture sensors and climate controllers. Likewise, native plant landscaping in nongame areas and recycled water use for irrigation could also reduce water consumption from the courses. Nevertheless, the implementation of such solutions is not easy. Barriers to meaningful progress are high upfront costs, resistance to change, and absence of awareness among practitioners towards sustainable practices.

Consequently, the issue of water sustainability in Oahu's golf tourism industry is a microcosmic problem shared by island communities across the globe. It emphasizes the need for a partnership between economic growth and ethical stewardship between social and

environmental equity. Addressing golf course water consumption practices in coordination with key stakeholders on Oahu can lead to a sustainable tourism model where the health of people and the planet are a priority. These complexities and possible answers would guarantee the long-term sustainability of Oahu's water resources, support the tourism economy, and protect the homeowner interests in Oahu, which is what this study seeks to explore.

The article follows a structured approach to address this question. A literature review on existing research regarding the environmental impact of golf courses, community perspectives, and sustainable tourism practices will be presented first. The methodology section will entail how the research will be conducted, including virtual ethnography, secondary data analysis, and stakeholder interviews. The results and discussion section will present the findings from multiple stakeholder perspectives and the space for sustainable practices. The article concludes with a summary of the results and recommends actionable suggestions for sustainable water management in golf tourism served by Oahu. This study aspires to contribute to protecting Hawaii's precious resources and ensuring that golf courses can be sustainable in the long term by integrating environmental stewardship with cost-saving practices. I will share my experiences through this case study, aiming to provide insight into the intricacies of water sustainability in the tourism sector of Hawaii to set an example for novel and eco-friendly solutions for the environment and the local community.

## **Tourism and Water Consumption**

*Figure 2: Tourism in Hawaii (WATG, 2020)*



Hawaii depends on tourism as a significant economic core, but tourism is also an economic thoroughfare that swallows up a lot of natural resources, specifically water. According to [Becken \(2014\)](#), tourism in Hawaii has primarily blamed the overconsumption of water on hotels, resorts, and golf courses for being among the most significant freshwater users. Moreover, [Gössling et al. \(2012\)](#) further point out that tourism has worsened the water crisis, which has burdened local communities with shortages. This type of study gives general but no specific views of the problem, such as golf courses.

Golf courses were identified by [Gopalakrishnan and Cox \(2003\)](#) as the primary water consumers. Still, recent data did not exist on how these golf courses have adjusted to imposed drought and water restrictions. The worsening drought conditions in Hawaii, according to Hawaii Sea Grant, 2014, make it essential to understand the role of golf courses in this crisis. [Kiefer and Felton \(2025\)](#) also point out that recreational facilities, including golf courses, consume the most water in Honolulu and ask how sustainability and resource allocation are possible.

The results of water shortages are wide-ranging, affecting agriculture, private water supplies of homes, and native ecosystems. This highlights the necessity for increased research on water consumption in the tourism sector in cases of high-water use, in which one needs to look at golf courses.

## Environmental Impact of Golf Courses

*Figure 3: Map of golf courses on Oahu ([Times, 2025](#)).*



Environmental considerations in golf courses make golf courses environmentally intensive enterprises that use high water and apply fertilizers and pesticides. Not only do these practices cause water scarcity, but they also contaminate water, forcing it to pollute and affect the local ecosystem and community. In [Chang \(2023\)](#), chemical runoff from golf courses is discussed, affecting water quality in nearby areas. [Kiefer and Felton \(2025\)](#) promote that tourism, with its golf courses, can systematically create water shortages in Hawaii. Although, given these sources, there are many golf courses, as shown in the map in the figure above, and they have a tremendous environmental footprint, they do not provide sufficient information on the extent to which course operators have been taking steps to improve sustainability. The effects of different management processes on water consumption and pollution levels are yet to be explained.

*Figure 4: How Golf Courses Destroy Hawaii* ([Notenboom, 2024](#))



### **Drought and Disparity: The Unequal Burden of Water Scarcity**

Oahu's increasingly regular droughts have significantly impacted the local population's competition for scant water supplies, as shown in Figure 4 ([Notenboom, 2024](#)). While golf courses often preserve lush fairways using recovered water systems, neighborhoods face severe rationing laws, including limits on grass watering and car washing during drought seasons ([Frazier et al., 2022](#)). This disparity arises from past water allocation policies prioritizing tourism infrastructure, a legacy of colonial-era land seizures dislocating resources from Native Hawaiian communities ([Apoliona-Brown, 2025](#)).

For many, the financial fallout is catastrophic. Restricted access raises household and agricultural water costs. On the other hand, tiered pricing strategies that promote significant

water consumption help golf courses spend almost 40% less per gallon than home consumers ([Gopalakrishnan & Cox, 2003](#)). Especially when apparent differences show up, such as browned-out residential settings following irrigated golf fields under water restrictions, these regulatory asymmetries cause community resentment.

Climate models forecast a 35% increase in drought frequency by 2025, aggravating previously existing tensions. Recent policy recommendations aim to remedy these discrepancies by demanding proportional reduction for commercial water users during shortages, yet implementation of these regulations differs ([Bremer et al., 2022](#)). This regulatory void highlights how urgently governance transforms to provide environmental justice, which is of first importance in water management decisions coupled with ecological sustainability.

### **Critique of Dominant Trends and Gaps in the Literature**

Existing literature and empirical studies have focused on the general environmental impact of tourism itself and have remained vague when characterizing the genuine difficulties that golf courses entail. Most studies emphasize the economic benefits of tourism and critical analyze the social and environmental costs, especially for the local community. Additionally, cultural sustainability and environmental justice, though focused on sustainable tourism, have little research in common.

There is another gap in specific empirical studies of community-driven solutions and Indigenous-led water sustainability initiatives. Likewise, there is also a need for longitudinal research looking into the long-term consequence of water management practice of golf courses on local ecosystems and community livelihoods.

### **A Multi-Faceted Approach**

This study used a multi-faceted approach to investigate the challenges of water sustainability issues associated with golf courses in Oahu and the possible solution to balance economic gains with environmental and social responsibility. This methodology included virtual ethnography, secondary data analysis, semi-structured interviews, and ethical considerations. Each component was geared toward obtaining complete comprehension of the problem and making a positive contribution to durable practices.



## Virtual Ethnography

In this case, virtual ethnography involved analysis of forum posts, social media site discussions, and virtual tours of golf courses in Oahu. For example, residents posted critiques to Reddit about the disparity in the water restrictions and promotional materials; for instance, the Hoakalei Golf Course showed the features of reclaimed water systems([Hawaii Tourism Statistics n.d](#)). The tensions between tourism marketing and the concerns of the community associated with tourism were revealed by this method. The study examined several opinions and practices for water use in golf tourism by searching the Web for online discussions and promotional materials.

Therefore, virtual ethnography's primary purpose was to gather diverse stakeholder perspectives. It allowed for an understanding of how groups perceive and solve problems related to water sustainability. It also made it possible to understand the marketing strategies of golf courses regarding their environmental initiatives.

## Secondary Data Analysis

The initial understanding of water use regulations, historical trends, and environmental impacts on golf tourism in Oahu resulted from secondary data analysis. Government reports from the Hawaii Department of Land and Natural Resources and environmental audits showed that golf courses use an average of 66.5 million gallons of water each year, which accounts for much of the island's freshwater use. [Frazier et al. \(2022\)](#) noted worsening water scarcity that only increased the tensions between the needs of local people and those of a growing tourism industry. Further, academic studies, such as [Gopalakrishnan and Cox \(2003\)](#), supplied comparative data regarding sustainable irrigation techniques and tourism statistics by the Hawaii Tourism Authority of 2023, highlighting the economic pressures behind more water-intensive golf course maintenance. This analysis showed gaps in enforcing water restrictions and underscored a need for revised policies to cope with already occurring climate-related problems.

The aim of looking at secondary data was to familiarize ourselves with the regulatory and environmental audits on water use in golf courses. It gave a starting point for exploring the issue within the existing policies and practices. According to [Bremer et al., 2022](#), this also aids in identifying holes and places for deeper analysis. Environmental audit records of the golf courses were drawn from regulatory agencies, environmental impact assessments, and golf course

policies in Oahu. In doing so, they did indeed help to establish policymakers' position, as well as what they did/did not do about water sustainability issues.

### **Semi-Structured Interviews**

Some indirect perspectives on water sustainability were obtained with semi-structured interviews with key stakeholders such as golf course managers, Indigenous activists, residents, and policymakers. The intended topics of the interviews included general tourism experiences, water scarcity challenges, and perceived eco-tourism-related solutions, a technique used to design interview questions to get profound glimpses and points of view on water sustainability practice. The study sought to understand the nuances of the challenges and their solutions by engaging with the stakeholders directly. The interviews also offer the opportunity to look at the current practices to see whether they are effective and what could be improved.

Examples of interview questions included:

- "What are your thoughts on how tourism impacts local water resources?"
- "Have you observed any efforts by businesses to promote sustainable water usage? If so, what do you think about their effectiveness?"
- "What measures would you like implemented to ensure water sustainability?"
- "How do you envision your company contributing to water sustainability matters here on the island?"

The qualitative data acquired through these interviews helped contribute to understanding the problems with water sustainability in Oahu's golf industry. There were subtle points of view, which statistics alone could not reveal, that became clear when I spoke directly with stakeholders. Qualitative data gathered through these interviews enriched the study findings. The study also stressed the multifaceted nature of the problem; therefore, a balanced approach that considers economic, environmental, and social factors is needed. These interviews helped inform insights to develop recommendations for sustainable water management, which focus on collaboration between golf courses and local communities. This study can provide a holistic view of water sustainability challenges in Oahu's golf tourism industry by blending differing views into the analysis to provide actionable solutions for a more sustainable future.

## **Ethical Considerations**

This research was particularly sensitive given the history of water rights in Hawaii and thus involved ethical reflection. Due to me being a non-native researcher, I also gave steps and thought to how my outside status could affect participant responses and how this data could be interpreted. To minimize bias, I used Community-Based Participatory Research (CBPR) principles. I worked with Native Hawaiian activists and local organizations to realize the study was being undertaken for the community's benefit. All interviews were conducted with informed consent, and participants were allowed to remain anonymous due to the politically charged nature of water disputes. I also continuously reflected upon my positionality to consider how it might affect the findings and my interpretation of the Indigenous framing of land and water sovereignty. The purpose of these measures was to create trust and generate research that significantly furthers advocacy for just water policies.

## **Reflection**

When selecting a focus for my Capstone project, I was particularly drawn to the question of how golf courses in Oahu manage water sustainability challenges while balancing the needs and interests of local communities. This topic resonates deeply with me for several reasons. Firstly, Hawaii has always held a special place in my heart due to memorable vacations spent on the islands with my family. These experiences sparked my interest in understanding the unique environmental challenges that Hawaii faces, especially given its delicate ecosystem. Additionally, I have several close friends from Hawaii who have shared their personal stories of growing up amidst the constant influx of tourists. Their narratives highlighted the complex dynamics between tourism and local life, particularly the strain on natural resources like water. Moreover, my personal connection to communities in South America, where my family lives in poverty and often struggles to have their voices heard, has fueled my passion for advocating for underrepresented groups. This perspective has inspired me to explore how the tourism industry in Hawaii, and specifically the golf courses, impacts the residents and their access to essential resources. By choosing this topic, I aim to bring awareness to the importance of sustainable practices in the tourism industry and highlight the need for a balanced approach that respects both the environment and the local communities in Hawaii.

The methodology used in this study was meant to provide a comprehensive and detailed

look into the various challenges of golf courses concerning water sustainability in Oahu. Through secondary data analysis, semi-structured interviews, and virtual ethnography, general ideas are captured, and varying viewpoints are given to potential solutions. Ethical considerations also encompass rules that the research process should be inclusive and respectful of local communities.

## **Epistemology**

Throughout my project on water sustainability in Hawaii's tourism sector, I have been guided by a constructivist epistemological stance. This perspective emphasizes the importance of understanding multiple viewpoints and the social construction of knowledge. By considering diverse narratives—such as those of residents, tourists, and business owners—I aim to develop a more comprehensive understanding of the issue, Disrupting Hegemonic Knowledge.

## **Positionality**

My project challenges dominant narratives by highlighting the often-overlooked environmental impact of tourism on local communities. By focusing on water usage in golf courses—an emblem of luxury tourism—I seek to question and disrupt the notion that tourism is purely beneficial to Hawaii. In doing so, I aim to raise awareness of the inequitable distribution of resources and advocate for more sustainable practices that prioritize the needs of residents.

## **Sustainable Solutions and Community Engagement Collaborative Approach**

Through integrating smart irrigation systems, native plant landscaping, and recycled water, the project emphasizes a collaborative approach. The initiative seeks to blend environmental stewardship with practical, cost-saving measures by partnering with local government and community organizations. This approach not only aims to preserve Hawaii's natural resources but also empowers local communities, giving them a voice in the sustainable development of their region. Ultimately, this project strives to balance the interests of tourism with the sustainability needs of Hawaii's residents, offering a model for other regions facing similar challenges.

## **Next Steps**

The following steps include interviews to be conducted and analyzed and broadened research specifying international models of successful ecotourism and creating a sustainable business model. Finally, research findings and interview insights should be integrated into the final report and media presentation, communicating the urgency and feasibility of implementing eco-tourism practices in Hawaii. The project seeks to ensure that Hawaii's islands' natural beauties and resources remain available for generations by building a sustainable future for Hawaii's tourism industry.

## **Key Findings: Stakeholder Perspectives and Solutions**

### **What Exists: Current Sustainable Practices**

The study found significant water distribution inequities between Oahu's golf courses and residential communities. Analysis of secondary data suggested that golf courses on the island consume approximately 66.5 million gallons of freshwater annually, 15 percent of the island's freshwater supply, as highlighted by [Gopalakrishnan and Cox's study of 2003](#). However, this disparity is especially noticeable during droughts when courses like Hoakalei keep a verdant display using reclaimed water systems. At the same time, residents get hit with tight water restrictions. Indigenous activists condemn these systems as new expressions of historical abuses, and a golf course manager in Completed Second Interview, 2023, characterizes golf courses as symbols of continued exploitation.

It turned out that stakeholder interviews showed fundamentally different views about the issue. Other technological interventions, such as smart irrigation and drought-resistant grasses, have cut water usage at some courses by 20 percent, suggesting the industry is not ignoring drought concerns. Although tourism officials acknowledged persistent problems in controlling tourist expectations of perfect greens, the real work of enhancing the image of golf and golfers did catch on. Native Hawaiian activists explained how current water conflicts fit within centuries of colonial resource extraction and placed current disparities within the Dole family's 19th-century land acquisitions. The tensions were reinforced through public sentiment analysis through virtual ethnography, which brought to light community-wide disquiet that water was being given to the tourism industry at the expense of basic living needs.

These disputes were parsed by conflicting intermediaries calling on lawyers, policymakers, and other intermediaries to intervene. They did admit to needing sustainable water management despite the lax enforcement of existing regulations from the pressure to keep tourism revenue streams. However, the ambivalence of regulating the golf courses has permitted an environment where water conservation measures have been primarily voluntary on golf courses, drawing a disproportionate share of the resource. This research suggests that the policy gap will continue with the urgent priority need for more balanced governance approaches, environmental strain, and social inequities.

### **Sustainable Tourism and Eco-Friendly Practices**

Concern about the environmental impact of all the water used by golf courses has long been criticized. Nevertheless, there is a way to integrate eco-friendly practices in creating sustainable tourism while satisfying the local community's water needs. [Meza et al. \(2025\)](#) propose that water consumption can be significantly reduced if water recycling and the application of drought-resistant grasses. Further to optimizing water usage, precision irrigation systems will apply water only where and when needed. Sustainability certificates are essential to direct them in the right direction towards better environmental stewardship.

[Cox \(2019\)](#) mentions that the Hawaii Ecotourism Association provides certifications that encourage courses on ecological preservation ethics. In addition, these certifications are a sign of the tourist's commitment to sustainability and help attract environmentally conscious tourists. [Agrusa et al. \(2010\)](#) maintain that tourism practices should align with Hawaiian cultural values, which means tourism should not damage the environment. Practice should be carried out in such a way that respects natural resources. Adding local cultural values to playing and maintaining golf courses makes the golf courses more appealing and acceptable to the community.

However, even though it is possible to find solutions, the adoption of sustainable golf course practices is low. Finally, knowing what the barriers to implementation are, is essential. Many factors hinder progress, ranging from the initial cost of sustainable technologies not being any cheaper than conventional technologies to the inability of people to know about those technologies and resistance to change. Consequently, further research is needed on the strategy and incentives for these practices. Giving financial incentives, offering educational programs, or



showcasing successful case studies would incentivize more golf courses to follow the path of sustainability.

## **Community Perspectives and Policy Challenges**

More and more Oahu residents are starting to feel the tension between local water needs and water usage from tourism. The island only has limited freshwater resources, which are already under strain from the demands of booming tourism. As mentioned by [Gössling et al \(2012\)](#), many in Hawaii believe the tourism industry favors the visitors and leaves the resident population without, for example, sufficient supplies. As a result of that imbalance, economic gain comes at the expense of the basic needs of the local community and has ethical and sustainability concerns.

In addition, [Apolonia-Brown \(2025\)](#) argues that Indigenous Hawaiian perspectives on water rights should be incorporated. From the above, it is clear that these perspectives are traditional ecological knowledge grounded in the notion that water is a sacred resource intimately tied to the health of the community's physical and cultural well-being. By putting community sovereignty and environmental justice atop the agenda, current tourism practices must be reconsidered to include local and indigenous views. Despite this lack of integration of these perspectives into mainstream water management practices, there is a gap in the literature and a potential for integrating these perspectives into sustainable tourism development.

The lack of well-developed, detailed histories of local activism and advocacy groups' engagement with the policy process surrounding water is an issue that needs further scholarly attention. Recognizing the need for improved freshwater management, the [Hawaii Community Foundation\(n.d\)](#) gives little information regarding strategies for effectively mobilizing community-driven initiatives. [Mahi et al. \(2024\)](#) mention that local advocacy groups have served as key advocates for spreading awareness and advocating for policy changes, which are occasionally ignored or undervalued in discussions beyond resource management. The lack of understanding of how these groups impact and the strategies that can strengthen the policy-making processes toward equitable water distribution remains a gaping hole in the literature.

An essential point in the literature concerning another area of deficiency in tourism was the need to maintain the sustainability of tourism through the balanced development of economic gains with environmental and social compliances. In their work, [Shekhar \(2024\)](#) explains various

sustainable tourism approaches and stresses the need for policies that focus on the people and environment from which the resource derives. Although there are approaches to addressing some aspects of what has become a challenge within the Hawaii tourism industry, there is a paucity of holistic frameworks that incorporate these approaches with the existing tourism operations in Oahu. This gap emphasizes the necessity for further research of holistic strategies that relate tourism growth to the sustainability of resource management.

### Critique of Dominant Trends

The second important area highlighted in the literature is the necessity of sustainable tourism, which aims to balance economic and social responsibility and environmental relinquishment. In this, [Shekhar \(2024\)](#) provides various approaches for sustainable tourism with policies that consider the well-being of local communities and ecosystems. Nevertheless, no frameworks are present to effectively integrate all these approaches with existing Oahu tourism operations. This gap underscores the need for additional studies to bring about a combination of tourism development that aligns with sustainable resource management.

### Diverse Stakeholder Perspectives

*Table 2: Stakeholder Perspectives on Water Sustainability in Oahu’s Golf Tourism*

Stakeholder Group	View on Water Use in Golf Courses	Concerns / Priorities
Golfers	Enjoy well-maintained courses, unaware of the water use	Quality golfing experience
Golf Course Owners	Acknowledge water use but prioritize aesthetics	Sustainability vs. Profit
Indigenous Activists	View golf courses as a continuation of colonial land exploitation	Water as sacred, land rights

<b>Local Residents</b>	Mixed opinions—economic benefits vs. water inequality	Resource allocation, agriculture vs. tourism
<b>Policymakers</b>	Torn between economic benefits and sustainability	Regulation, public trust doctrine
<b>Tourists</b>	Low awareness of water issues	Preference for eco-friendly destinations

## Golfers and the Golf Course Experience

Oahu's golf courses are, by and large, pristine and beautiful, with golfers attracted to the perfect balance of sport and nature. The green and fairways are well-maintained and give you an exceptional golfing experience that casual and well-seasoned players expect. Still, recently, with a native of Oahu, the study found awareness of the environmental implications of these courses to be entirely out of whack. Other than the aesthetics and quality of the courses, golfers do not know about their courses' extensive water usage and sustainability challenges.

Moreover, what makes this lack of awareness unique to Oahu is instead the norm in golf tourism worldwide. The study proved that golfers, who usually concentrate on individual occasions, have no idea about the environmental ramifications of their movements. For example, much of the water necessary for golfers to see lush greens and fairways is put into the pipes to maintain, which significantly strains local water resources. The concern about this maintenance practice is heightened by the scarcity of fresh water on the island and the challenges of confronting water scarcity, as emphasized by [Quach's study of 2021](#).

These findings point to a great need for more environmental awareness in golfers. Informative golfer's educational initiatives could help reduce golfers' behaviors regarding water sustainability issues and the need to practice conservation practices. In the 2021 study, [Quach](#) also highlighted that when golf courses raise awareness among golfers in support of sustainable practices like growing drought-resistant grasses and using recycled water for irrigation, it can encourage golfers to support sustainable practices. The awareness of this shift could also bring

more sustainable management practices into practice, improving the sustainability of golf tourism in Oahu.

In addition, the study indicates that golf courses can assist in educating their customers. Golf courses can create a sense of responsibility towards the environment by giving information through their environmental initiatives. Signages, educational materials, and interactive sessions could be provided based on which water conservation and other sustainable practices are highlighted as necessary. So, golf courses can engage golfers in a conversation aimed at sustainability and help build an environmentally conscious community of players.

Overall, there is a high appreciation for the quality and appearance of Oahu's golf courses. Still, there is a big gap where golfers lack an understanding of the environmental impact of service delivery through these facilities. Golf courses should promote greater environmental awareness that will encourage more sustainable behavior on the part of golfers and aid in the general sustainability of the industry.

### **Golf Course Owners and Economic Priorities**

Like my interview with the Superintendent of Hoakalei Golf Course, Oahu golf course owners and managers know that high water usage courses are required to stay healthy. However, they value aesthetics and revenues more than sustainability. It found that managers realize the environmental impact, but economic pressures to keep high-quality, visually appealing courses for tourists take center stage. The emphasis on aesthetics comes about so that golfers will play here and want to return, and golf tourism's economic viability hinges on this.

The economic benefits of golf tourism are substantial and help to contribute to the economy of Oahu. Visitors worldwide are attracted by golf courses and the revenues that come with green fees, associated tourism activities, and patronage of local businesses. However, this economic success is at the expense of the environment, as [Gössling et al \(2012\)](#) shows. [Bremer et al., 2022](#) also showed that keeping those high-quality playing grounds requires much water, especially with water becoming more scarce and drier. Most often, managers are forced to focus on these economic benefits at the expense of more sustainable ways of handling the water, as the quality and attractiveness of their courses may be perceived to be jeopardized.

However, the study noted the possibility of achieving profit with sustainability through innovative practices, as shown in chart 1. Managers realized the importance of sustainability and

were interested in implementing water use practices that would not impact the golf-playing experience. It includes advances such as using smart irrigation systems, which range from smart irrigation systems that precisely apply water based on real-time weather and soil data. Reducing water consumption from these systems can decrease water consumption, which is still enough to maintain the desired course conditions.

**Chart 1: Sustainable Practices in Golf Courses and Water Usage (Greenup, 2022)**



Other promising approaches include using drought-resistant grasses and native vegetation on the field, which require less water but are still aesthetically pleasing and functional playing surfaces. Irrigation can be minimized by selecting grass and plants that are hardy to the local climate and have natural water needs, as stated by [Meza et al. in 2025](#). Furthermore, golf course maintenance would create fewer environmental impacts by implementing water recycling programs, such as ways where treated wastewater can be used on the golf courses instead of water to irrigate them.

In addition, the study assumed that undertaking these sustainable practices could bring about long-term economic returns. With the growing awareness of environmental issues among consumers, demand for sustainable tourism options is surplus. Suppose golf courses can prove sustainable commitments, which makes sense when consumers demand more enlightened behavior from businesses. In that case, they can grow a segment of customers demanding golf courses that aspire to this ecologically more mindful behavior, making them a more viable competitor in terms of market appeal and long-term profitability. As stated by [Quach \(2021\)](#), when golf course owners invest in sustainable practices, they can put themselves in a position to meet evolving market requirements and the landscape of the golf business and contribute to its overall sustainability.

Overall, bosses and managers of golf courses alike strive to maximize aesthetics and benefits, while the market is starting to pick up on the need to find the balance between these and sustainability. Golf courses can minimize their influence on the environment by not reducing the quality of the golfing experience but by introducing innovative techniques such as smart irrigation systems, drought-resistant grasses, and water recycling programs. Without this balance, the golf tourism industry in Oahu will not be able to thrive in the long term while taking care of the island's precious water resources.

## **Indigenous Activists and Environmental Concerns**

The real-life story goes more profoundly to Oahu's lush landscaping, which is dotted with golf courses and draws tourists worldwide. From the completed second interview, Hawaiian indigenous activists do not see patrons of golf courses as merely a recreational trend but instead as a continuation of colonial exploitation. The historical context of land and water rights in which the issue is grounded is this kind of perspective about Indigenous communities historically marginalized and denied equitably resources.

The study found that Indigenous activists on Oahu see golf courses as emblematic of a larger pattern in a place where the rights and needs of Indigenous peoples are set aside for commercial interests, adding to [Apoliona-Brown's study of 2025](#). These courses can require much water for development and maintenance, potentially tying up water supplies that affect clean water access in Indigenous communities. All the more poignant in this instance is that water is a sacred substance in Hawaiian culture, which views water as a life-giving resource



necessary for physical and spiritual survival.

The findings drive home the point that reconciliation will occur if Indigenous nations are recognized and their rights, obligations, and interests in water are recognized and respected. Indigenous activists contend that, too often, the management of water resources puts the modern, historical, and cultural use of water in their communities in the background. Augmenting [Apoliona-Brown's research from 2025](#), such an approach to water management is more inclusive because it supports a more inclusive approach to water management and Indigenous peoples' traditional ecological knowledge and stewardship practices. This includes that water was and continues to be a rightful possession and a sacred resource of which Indigenous people have the right to make use of other than for commercial gain at the expense of Indigenous rights and environmental sustainability.

The study also emphasized the necessity of communication and joint working between Indigenous communities and the stakeholders in the golf tourism industry. Participating in Indigenous voices in decision-making might make equitable and sustainable water management possible. It might involve weaving Indigenous knowledge into new modern water conservation approaches, guaranteeing a space for Indigenous communities to have a seat in how water resources are regarded, or promoting practices that align with cultural views and natural health care.

These findings have consequences that are not limited to the golf courses themselves. However, they argue that such management of natural resources in Hawaii requires broader reconciliation and justice. The recognition of Indigenous water rights does not have merely environmental sustainability as a justification. Still, it is also a step towards correcting the historical injustices and promoting a more inclusive and equitable society. The efforts toward moving Oahu to a more sustainable, culturally respectful future can be facilitated by integrating Indigenous viewpoints and practices into water management on Oahu.

### **Local Residents and Water Scarcity**

On the island of Oahu, the various golf courses cause a complicated conversation among residents, who are either happy or unhappy depending on the economic benefits and the water inequality it brings about. Indeed, golf tourism is a significant economic generator and job creator. However, many residents acknowledge the financial benefits of the golf courses to the

island, which help support many businesses, complementing [Mahi et al.](#) research from the year 2024.

However, the stark reality is that most local communities face water scarcity. Residents in the valley are susceptible to the disproportional allocation of water, especially during drought, and golf courses are highly prioritized for access to water. The preferential treatment only makes the residents struggle further, being subjected to strict water restrictions and higher water bills. Locals feel the frustration of the green fairways of golf courses being maintained while they fight to get water for their everyday needs while locals fight to get water for their everyday needs. The findings showed an urgent need for fair water distribution and more participation of the people in decisions concerning water management. The residents feel their needs are being neglected, and the tourism industry is becoming more critical. This is a testament to the need to set policies and practices to ensure all stakeholders enjoy water equally ([Apoliona-Brown, 2025](#)). This would mean addressing water inequality mainly to foster a sense of justice and allow people to enjoy inclusiveness.

One potential solution is to get every one of the residents more directly involved in the decision-making process regarding water management. Adding to [Apoliona-Brown's](#) research from the year 2025, community engagement can be public consultations, participatory planning, and collaborative governance models. Providing residents with a voice and a platform to voice their concerns and suggestions to policymakers helps policymakers develop more appropriate and balanced water management strategies for the areas. This is towards tackling the immediate water scarcity issue and building trust and cooperation between the community and the authorities.

The study also found that golf courses can reduce some local water resource pressure by implementing sustainable water practices. Several techniques can be used within the context of golf course management, such as using recycled water for irrigation, drought-tolerant grasses, and intelligent irrigation systems to reduce its water footprint substantially, as emphasized by [Mahi et al., \(2024\)](#). By fulfilling the aspiration to be a sustainable industry, it is possible to prove to the local community and the environment that the golf tourism industry cares for the well-being of the local community and the environment.

Residents have mixed feelings regarding the economic benefits of golf courses in Oahu, with water inequality compared to the need for fair economic redistribution and community

participation. Involving residents in water management decisions and making people adopt sustainable practices allow for a more balanced and inclusive approach that benefits the local community and the tourism industry.

## **Policymakers and the Challenge of Regulation**

Policymakers face a challenge in managing water resources for golf tourism in Oahu. The study showed that policymakers have to balance golf tourism's economic benefits and having the necessary means of sustainable water management practices, as shown by [Mahi et al., 2024](#). On the other hand, golf courses bring a great deal to the local area, creating wealth and providing many jobs. There is a clear economic impact to this and its role in the overall development and stability of Oahu.

However, there are environmental costs to maintaining such golf courses that are equally as great. The high water usage and potential for degradation of the local water resources and ecosystems are serious threats to the island. Therefore, for policymakers, this entails an intersection of the current economic benefits against the future of the island's water supply ([Golf Course Superintendents Association of America. n.d.](#)).

While adequate in terms of government policies, those policies, which underline the central role of water conservation, fail to thoroughly tackle the environmental implications of tourism on golf. As a result, policymakers must develop and implement regulations that will avoid the adverse effects of golf courses on water resources without hampering their economic returns.

One possible approach is to set clear and enforceable water usage limits for golf courses. Specifically, in the 2024 analysis by [Mahi et al.](#), policymakers can set the targets for the water consumption of these facilities and then make sure these facilities are held accountable for their water use. Incentives for those who adopt sustainable practices, such as tax breaks or grants to develop water-saving technologies, can make golf course owners proactive regarding sustainability.

The second important area for policy intervention is the enforcement of existing regulations. The lack of sustainable Water Management Policies enforcement means that even if policies are in place, they are not being enforced. The crucial point for the success of any regulating framework is to improve enforcement mechanisms that will arrest the lapses in

complying with the measures; otherwise, the framework will fail from the onset. Regular monitoring and reporting with penalties if a company is not compliant.

Policymakers also play a role in fostering collaboration between these other stakeholders. Bringing together golf course owners, local communities, environmental organizations, and other interested parties will help policymakers foster dialogue and cooperation. This may lead to an integrated strategy under optimized controls by the principle of sustainability, the adoption involves other stakeholders.

Finally, balancing golf tourism and environmental sustainability in Oahu is a thin line and would be challenging for the administration. It creates the need for stronger regulations, effective enforcement, and co-action of stakeholders on the part of policymakers. However, these three steps will give us more excellent, sustainable Oahu water resources to help Oahu keep its golf tourism and environment.

## **Tourists and Environmental Awareness**

Although tourists do not know enough about water issues, the study shows they are more interested in eco-friendly destinations. In such concerns, however, the golf tourism industry is confronted with a dichotomy that is a challenge and one of opportunity. In [Gössling's 2012](#) study, tourists came to Oahu island, which naturally and recreationally offers them that experience time and again, so they generally anticipate enjoying the island's natural beauty. However, the study showed that many do not know the environmental impact of their bodies of activity and the water used in courses. The lack of awareness continues to affect local water resources and the general sustainability implications of their travel choices.

However, there is good news to cling onto. According to the findings, tourists are increasingly keen to visit eco-friendly destinations and practice sustainable tourism. If the golf tourism industry wants to promote and adopt these sustainable practices, they have a high opportunity in the shift of consumer behavior. Golf courses can target an ever-growing number of environmentally conscious travelers by emphasizing environmental initiatives and sustainable measures.

These findings have implications of the most profound kind. Eco-tourism is very feasible for motivating people to practice, which is very good. According to [Meza et al. \(2025\)](#), golf courses encouraging and adopting sustainable water management practices, including the reuse

of water to irrigate and the use of drought-resistant grasses, can benefit from marketing their resort as eco-friendly tourism. These practices diminish the environmental footprint and create a focus on a green tourism destination.

In addition, the study puts forward the idea that educational initiatives enhancing tourists' awareness about the need for sustainable practices could help encourage this principle. The golf courses can educate the tourists about the water challenges of the island and the steps taken to solve them, thus inducing environmental responsibility among the tourists. In this way, information materials, guided tours, and interactive sessions related to the importance of water conservation and other environmentally responsible behaviors can be addressed.

Moreover, the industry's marketing strategies can focus on the importance of sustainability. The golf course provides a niche market of travelers who prioritize environmental stewardship by showing commitment. It also assists in lessening the dependence on the water bodies and positively impacts the overall portfolio of the green travel destination.

Consequently, the golf tourism industry in Oahu is underserved because of the limited awareness that golf tourists have of water issues and the high desire from tourists to stay at eco-friendly destinations. Promoting and adopting sustainable practices can help golf courses attract environmentally conscious travelers to the broader scope of sustainable tourism. As a result of this shift towards sustainability, not only will it better help the environment, but the preferences of modern travelers are also changing, which will instill a sustainable and responsible future for golf tourism in Oahu.

## **Sustainable Solutions**

For Oahu golf courses to address water sustainability challenges, they must focus on several fronts, including advanced technology, ecological practices, and educational initiatives. Having identified several promising solutions so that golf tourism can significantly reduce its environmental impact while continuing to yield the economic benefit it provides to the island, the study makes recommendations to interested stakeholders for consideration.

Likewise, one of the best and most effective solutions is the trend of establishing smart irrigation systems. Real-time data from weather stations and sensors in the soil is dipped into these advanced technologies to maximize water use. According to [Shekhar \(2024\)](#), irrigation systems can significantly reduce water use without sacrificing the quality of the golf courses by

applying water at the time and place it is needed as shown in the figure below. Water conservation reduces water use and improves efficiency, sustainability, and maintenance.

Other than technological advancements, native plant landscaping is the most essential thing to adopt. Native plants are by nature from the local climate; they are adapted to the area and do not need as much water as the traditional turf grasses ([European Golf Association n.d.](#)). Course managers, incorporating native vegetation in the golf course landscaping can reduce water needs without affecting their function and appearance as an aesthetically pleasing playing surface. This means that, other than preserving water, it helps conserve local biodiversity and cuts the need for chemical fertilizers and pesticides.

An alternative is the use of recycled water for irrigation. [Meza et al. \(2025\)](#) argued that local water treatment facilities can partner with golf courses to apply treated wastewater in irrigation. It aims to reduce the propensity to depend on freshwater sources and ensure an available, secure water supply, especially during drought. Recycled water and natural resources are also conserved, and national responsibilities are provided.

Education and training also leverage the use of sustainable practices. The golf course maintenance staff are given training programs and workshops to learn new water conservation techniques, sustainable landscaping, and advanced irrigation technologies. Educators of courses providing staff with the relevant skills to implement and sustain sustainability practices will achieve this. The educational component of such is the golf tourism industry, which is being developed with a culture of sustainability.

Another thing that was brought up in the study as to why it worked is community involvement and cooperation. On the one hand, the participation of residents, Indigenous communities, and environmental organizations in the decision-making opens up new possibilities for developing more inclusive, efficient sustainability strategies for golf courses. As a collaborative approach, everyone's need and their view are taken in the solution, and we have solutions that do not become anything out of harmony.



Table 4: Sustainable Solutions

Sustainability Measure	Description	Implementation Challenges
Drought-resistant turf	Use of grass varieties that require less water	High initial costs
Recycled water for irrigation	Utilizing treated wastewater instead of fresh water	Limited infrastructure
Smart irrigation systems	Sensors to optimize water usage	Expensive technology
Eco-friendly fertilizers	Reduces water pollution from runoff	Availability & costs
Native vegetation Landscaping	Using native plants to reduce water needs	Aesthetic compromise

Overall, the sustainable management of water resources in Oahu golf courses is possible by applying advanced technologies, implementing ecological techniques, and educational campaigns. Native plant landscaping, recycled water for irrigation, and staff training programs represent innovative irrigation systems that can insurmountably decrease golf tourism's environmental footprint. If golf courses adopt these practices, they can help the island's sustainability without destroying its economic benefits.

## Conclusion

This article has investigated the complex interaction of water sustainability within Oahu's golf tourism sector, highlighting the importance of practices to avoid tourism's economic gains at the expense of the environmental and social interests of the local community. The study provides a comprehensive analysis of stakeholder perspectives, including golfers, golf course owners, Indigenous activists, residents, policymakers, and tourists, the environmental impact of golf courses, especially their excessive water use and their disproportionate impact on an Oahu's

limited freshwater resources. For their research, the authors highlighted the competition between the economic priorities of golf tourism and the responsibility to protect it since water is increasingly scarce on the island because of climate change and overuse.

Key findings highlighted the ignorance of tourists and golfers about the environmental aspect of touristic and golfing activities and the difficulties golf owners face in reconciling the environment against counterfeit ability and profitability. There are concerns among indigenous activists and residents over the unfair allocation of water resources that golf courses have priority in droughts. At the same time, the communities can compete with parched means. Meanwhile, policymakers try to balance the need to set rules for the industry to ensure sustainable water use without damaging economic growth.

It identified some sustainable solutions based on innovative ways of irrigation, like native plant landscaping and the use of recycled water for irrigation. Together with educational activities and involvement in the community, they represent a way to cut the environmental face of golf tourism without compromising its economic potential. The problem also included high upfront costs, resistance to change, and a lack of understanding of sustainable practice. What remains to be researched is the long-term effects of such water management practices and how these community solutions can be integrated.

Future studies should also investigate how Indigenous knowledge and cultural values influence sustainable tourism policies and how eco-tourism and foreign models can play a part in local practices. Combining these gaps' perspectives will establish a larger water sustainability framework for Oahu that considers the well-being of its residents and natural environment, singling out what other regions are faced with doing similarly.

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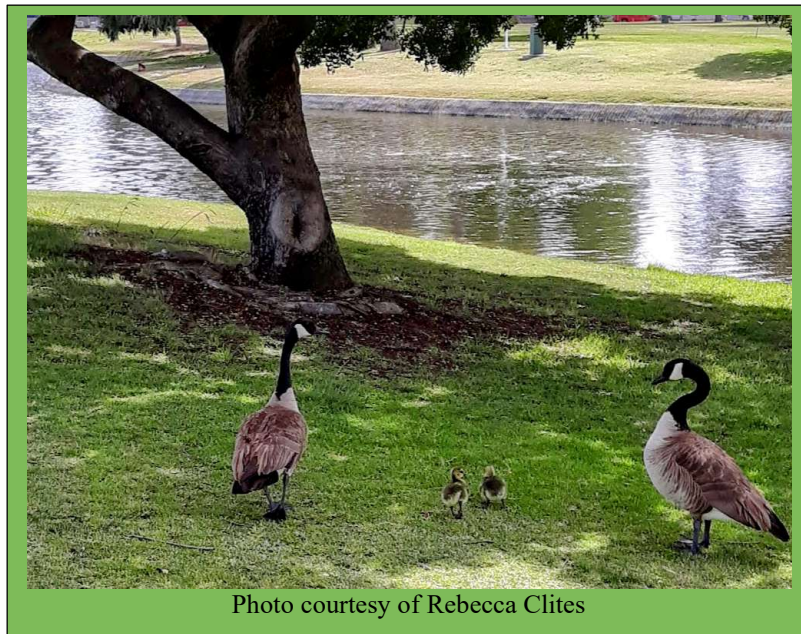
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# STAKEHOLDERS OF GOLF PLAY A VITAL ROLE IN DRIVING ITS SUSTAINABILITY

*Players, workers, engineers, the government, the industry and society have a lot to say about golf and its impact on the environmental and social future of the sport.*

BY REBECCA CLITES



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## Abstract

This is a multi-methodical study about humans, plants and animals, also known as stakeholders, who never, rarely or quite often engage in the world of golf. One can argue that golf is a waste of land, harmful to the planet and only meant for the elite. Others will argue that golf is the most beneficial and beautiful activity in existence. I believe golf is worth keeping, particularly now when socializing in a peaceful environment is rare. Over the past eight months I have asked the question: How are the stakeholders of golf driving its sustainability? Through reviewing several scientific as well as holistic publications and conducting many in-person and over the phone interviews, I have determined these stakeholders, hailed as my Wisdom Council, have quite a bit to say about golf and its impact on the environment and society. I found numerous voices in favor of ensuring golf is around for a long time. Even those concerned with common perceptions of inequalities within the sport are willing to listen to ideas for making it more beneficial for all. These perceptions or points of view by my Wisdom Council are presented in this article in the form of a kaleidoscope that no doubt influence golf and its sustainability.



# Looking Beyond the Eyes of the Beholder

It is 5:45 a.m. I am abruptly awakened by the sound of my alarm. It doesn't take long to remember it is Thursday and soon I will be outdoors in the chill of the morning playing golf with my friends. There is something magical about golf. It is the only activity I know where exercise, socializing, wildlife, beautiful flora and downright fun coexist. I can't wait.

Amongst all of this magic, I have often wondered: How are golf courses kept so green and natural looking? What causes the green and blue stains on my golf gloves or the itchiness in my eyes? Can anyone walk the course and enjoy the scenery just for the heck of it? Why aren't the maintenance workers wearing protective gear? Are the coyotes dangerous? How enormous are the amounts of water and waste on golf courses? Why are there so few women and people of color sharing the course with me and my diverse group of friends? How can the vast unplayable areas be put to better use? Can bees, geese and shrubs thrive on a golf course? Does anyone make golf equipment that lasts longer than a couple of days or weeks? Is golf worth the price?

To encapsulate my curiosities in a broad yet focused way I came up with one overarching question: "How are the Stakeholders of Golf Driving its Sustainability?" I identified six stakeholders who I affectionately call my Wisdom Council: Engineers, the government, the industry, the players, the workers and society, which includes non-golfers as well as the flora and fauna of Mother Nature. To understand just how my Wisdom Council is driving the sustainability of golf, I utilized several research methods: Archival online articles, ethnography, romantic and transformational interviewing, content mapping, participatory photo journaling and object analysis. Because of the vast array of perspectives looking through a kaleidoscope's lens, I intend for this article to provoke many more conversations around golf and its sustainability.

As an avid player, I behold golf as a necessity. The social aspect alone holds importance akin to prescribed mental health remedies. It is an individual sport yet it lives in a social platform. The sport is physically beneficial as well. Played outdoors, it is possible to walk over 15,000 steps through one round of golf. These healthy steps may cover beautiful landscapes filled with thriving plants and wildlife. In this regard, golf is truly a benefit.

Like other necessities such as traveling by car, train or plane, or using a smart phone, computer or washing machine, harm may occur as a result of playing golf. From the cases that I have researched, I get a sense members of my Wisdom Council are working hard not only to minimize the harm, but to increase the benefit. With that said, I define the sustainability of golf as systems and processes created to ensure all communities have the ability to enjoy golf while causing minimal to no harm to the environment.

Golf is perceived as a sport played in nature, on lush green landscapes. Golf is indeed played outdoors. Unlike its 15<sup>th</sup> century origins, some of golf's current landscapes include chemical enhancements to get that lush green appearance. The lack of government oversight of chemical
















## **Sustainability and Wisdom Council Defined**

I define the **Sustainability** of golf as systems and processes created to ensure all communities have the ability to enjoy golf while causing minimal to no harm to the environment.

By **Wisdom Council** I mean stakeholders, which are the engineers, the government, the industry, the players, the workers and society (non-players as well as the flora and fauna of Mother Earth).

Definitions courtesy of  
Rebecca Clites

## Glossary of Golf Terms

-  19<sup>th</sup> Hole
  - Normal course rounds consist of 18 holes. The 19<sup>th</sup> hole represents a meeting place to have food, drinks and mingle with friends
-  Ball Marker
  - A small flat coin-sized object that marks where your ball rests on the putting green
-  Bunker
  - Another name for a sand trap, a large area full of sand, where you want to avoid
-  Divot
  - A chunk of dirt and grass scraped up by the golfer's club upon hitting the ball
-  Drive
  - What the first shot taken at each hole is called
-  Driving Range
  - A place with mats lined up facing a large area for golfers to practice
-  Fairway
  - The area of the golf course where you want your ball to land. The turf is usually cut down low in these areas
-  Fore
  - What you scream to warn others that your ball is heading in their direction
-  Hazard
  - Specific unplayable area identified by the course, such as a lake or protected environment
-  Hole in One
  - Also known as an Ace. When the player's ball ends up in the hole on their first shot
-  Par
  - The score you want to measure against per hole
-  Putting Green
  - The area at the end of each hole, where the hole actually resides. The surface is cut the lowest so the ball slides on it
-  Rough
  - The area of the course that surrounds the fairway, containing longer, less managed turf
-  Sand Wedge
  - A golf club that has a big loft, usually hit from the sand. The bigger the loft, the higher the ball will travel
-  Tee Box
  - At the beginning of each hole, where the golfer hits their first ball by setting it on top of a tee

Golf Terms courtesy of Rebecca Clites

usage on golf courses allows organizations to use toxic pesticides and dyes to make their courses appear green. This in turn impacts the workers as well as the players.

I address these concerns by describing solutions that include integrating truly natural flora and fauna, making it unnecessary to use toxic chemicals. We learn that Mother Nature intervenes by shaking up the landscape when maddened with disrespectful builds. It is very important to keep her happy.

Golf is also perceived as an occasion for elitists (rich, white men) to flaunt their privileges. I cannot disagree with this argument. However, I found alternatives where those who are less stereotypically privileged may partake in the joys of golf. For example, there are curious beginners of golf who would love to be with their friends and family in an outdoor social setting. I relay an inspirational brainstorming conversation as to how this may occur.

I tell the story of a pioneer who showed the world a Black man could win a golf tournament even though the Rules of Golf contained a Caucasian-only clause (at the time).

Many people think everything about golf is expensive. And you can only use the equipment for a short time. Again, I cannot disagree with the entirety of this argument. However, I can personally attest to finding affordable golf opportunities. I am one to share and experiment with new innovations such as biodegradable as well as previously used golf balls. I found an organization that designs, builds and sells 100% recycled golf bags meant to last 100 years.

For some, golf is a life-saver. This article relays a story about a spit-fire cancer survivor who relies on the sanctity and peacefulness of golf to keep her "in the moment".

The article concludes with a collection of scenic photos my friends, family and I have taken over the past several years, presented in the form of a video. These images, poignant captions and

accompanying audio depict a few of the harms of golf and particularly highlight its beauty. The stakeholders of golf, my Wisdom Council members, the players, the non-players, flora, fauna, the workers, the industry and the government all play a vital role in golf's drive for sustainability.

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## The Grass Wasn't Always Greener: A Brief History of Golf

Bunkers and hazards are elements of the golf course all players strive to avoid. Sandy pits and soggy ponds are most difficult from which to hit a golf ball. Originally, these "hazards" were made by nature. [Robbie Mitchell](#) recounts the historic beginnings of golf off the coasts of Scotland, about 600 years ago, as shepherds entertained themselves by hitting rocks with sticks into the various rabbit holes that invaded their pastures. The challenge of this new sport of golf, along with its undulating landscape and beautiful view of the ocean, made for a spectacular venue for socializing.<sup>1</sup>

However, not everyone was allowed to enjoy golf as did the white men who played the sport. When [slavery arrived](#) in Scotland in the 18th century, Black men were forced to carry golf equipment. The white male players felt so compelled to keep the sport to themselves, by the time golf found its way to the US, a Caucasian-only clause was written into its Rules.

[Lex Pryor](#) describes golf's arrival and subsequent injustices in the US. The Masters, golf's most prestigious tournament, broadcasting on national television as I write this article, is held at Augusta National Golf Club. That's Augusta, as in Georgia, the south. The course was designed and played in the 1930s by white men who [made great efforts](#) to "...ensure the course's culture reflected the social mores of Jim Crow."

It wasn't until 1961, more than ten years after baseball and football in the US integrated, that the Professional Golfers' Association (PGA) deleted their [Caucasian-only clause](#). Even with the likes of the most famous golfer of all-time, Tiger Woods, who is Black, Thai, white and Native American, [minority participation](#) in playing golf remains low. The photo below, of me and my friends depicts an anomaly as well as hope. It is only recently, perhaps since COVID, that we are seeing more groups that look like ours on the course. During a recent visit to the driving range, I interviewed a lone Black woman and her little brother learning the sport. Both were full of excitement as they exclaimed that golf is "...so much fun".

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<sup>1</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-531 titled *M7 Final Case Study*, p. 3.



Many think the lack of minority participation is due to the infrastructure created hundreds of years ago. It is assumed to play golf well, even the recreational golfer needs [access to equipment](#), time and places to practice, and resources from which to learn. In addition, there is a misconception of elitist expectations regarding how you look, what you wear, and how you act.<sup>2</sup>

To perhaps counter these perceptions, Table 1 explains some actual golf etiquette. I think the word etiquette dissuades folks from trying golf. Requirements for attire are enacted by private golf clubs, most of which are not afforded by the public (myself included). In some areas, such as where I live in So Cal, there are plenty of non-private golf courses available to enjoy. I have never heard of a public course turning down a player because they weren't wearing a collared shirt. In the photo above, we are all wearing collared shirts because that is how we prefer to dress when playing golf. One would call us traditionalists. We also say please and thank you. The rest of the etiquette listed are all common sense ways of being a human.

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<sup>2</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-531 titled *M7 Final Case Study*, p. 4.

Table 1  
Golf Etiquette Explained

What they say	What it means
Dress appropriately	These days, golfers at public courses wear whatever feels comfortable. However, some traditionalists continue with collared shirts. Country Club courses still expect the traditional collared shirts. Some go to the extreme and disallow shorts of any kind.
Wait your turn	It is important to always consider the golfers around you when hitting your ball. Usually, it is the player furthest from the hole who hits next. If it is safe to hit your ball although it is not your turn, for pace of play, it is ok to go ahead.
Give advice, or not	Sometimes you will see a player or experience it yourself in a bit of trouble or stuck on a swing. It is customary to make it clear from the onset if you are a giver or recipient of advice. However, when practicing on the driving range, it is known that advice may come unexpectedly. Be prepared.
Respect the players	Whilst other players are taking their shots, it is customary to pause conversations and movement.
Respect the course	In addition to being aware of the people, even more importantly, pay attention and respect the environment. This means fixing divots, not driving your cart in places full of puddles or low hanging tree limbs and not feeding or handling the wildlife.

Table created by Rebecca Clites

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## The Lay of the Land: Mother Nature Speaks

So, how did golf courses take their shape in the US? [James Beard](#), via his paper on turf grass describes golf courses in the UK as naturally green or brown and void of most pests because the rainy cool weather in that region allows for such settings. Americans, being as competitive as they are, required the same or better aesthetics on their courses. The dryer hotter weather in the US made that uniform structure difficult to manage without chemical intervention. The [science of turf grass](#) has evolved since 1960 to include more biodegradable options. However, there is still much debate as to how the toxicity of a compound is determined and therefore rationalized.<sup>3</sup>

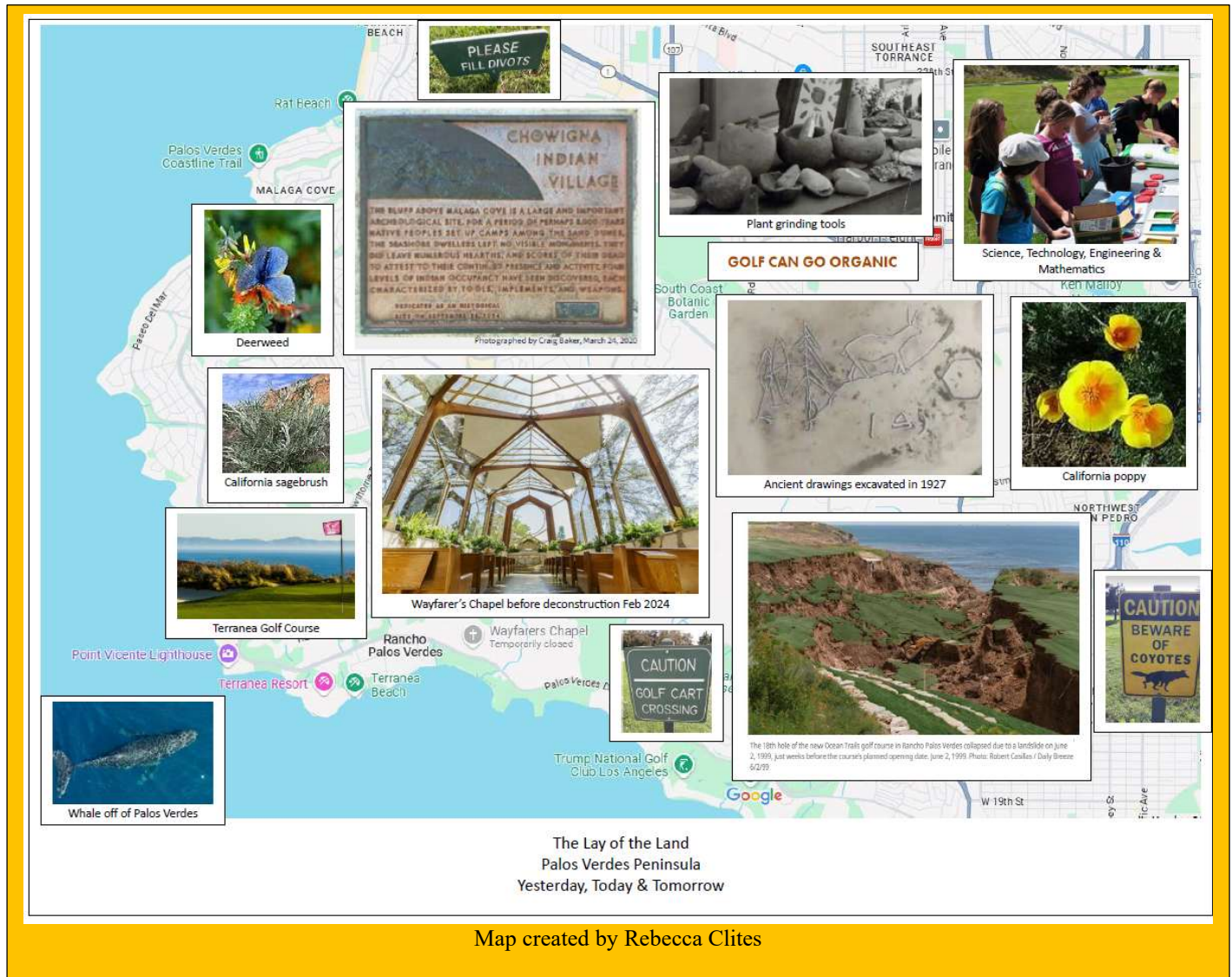
To showcase how golf landscapes have evolved and how they can drive sustainability, I created a Lay of the Land map, below. I felt the need to relay a connection with the planet earth, Mother Nature, spirituality and golf.

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<sup>3</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-531 titled *M7 Final Case Study*, p. 4.



I focused on the Palos Verdes peninsula in California because of its proximity to my home, its history with a landslide on a golf course, its vast beauty and its tremendous spirituality.



The [Indigenous Chowigna](#) people thrived on the Palos Verdes peninsula and surrounding towns for thousands of years before anyone ever thought of building a golf course on the precious land. The land has gone through many cycles and Mother Nature is definitely letting us know she is unhappy with the current state (by way of landslides).

At one point it seemed the Spaniards and the Chowigna were working and trading together. The land was fertile for planting vegetables and the sea was filled with fish. Then missions were built all over California to colonize the Native Americans. A local Palos Verdes [magazine article](#) suggests the Portuguese Azore people introduced whaling to the area in the late 1800s.



[PBS](#) published an article back in 2015 suggesting the elitist beginnings of the Trump National golf course. Once the capitalists got wind of the beautiful landscape of Palos Verdes in the 1920s, the peninsula was on its way to becoming a [luxury golf resort destination](#).

One thing few people have realized in totality about the Palos Verdes peninsula is that a vast section of it is vulnerable to landslides. There are many websites from the [city itself](#) who are [tracking the movement](#) of the land. In 1999 the 18<sup>th</sup> hole of (what is now) the Trump course collapsed. With a lot of money the hole was put back together. However, there are to this day areas that continue to move. You have to ask: What are we doing to this land? I am a firm believer Mother Nature is in charge. She sends messages when we build things where they shouldn't be built.

The [Wayfarer's Chapel](#) website describes what I think is one of the most spiritual buildings on the planet. Built in the 1950s by the Wright family, it is a place of Christian worship. It is located on a bluff on Palos Verdes overlooking the Pacific Ocean and the land under it is moving. Hence its demise, signifying the importance of understanding the land when building things, and not just chapels and golf courses.

I added a few of the (native to Palos Verdes) plants I am somewhat familiar with to my map. As explained by the [Palos Verdes Peninsula Land Conservancy](#): Deerwood is the beautiful blue plant that coincidentally hosts the Palos Verdes blue butterflies. The California poppy is the state flower. I added the California sagebrush because of its stockiness and the fact that it attracts the gnatcatcher (cute little bird with a cute little song). Another plant that has adapted well to So Cal, that I see often on golf courses is the purple Pride of Madeira. An image is portrayed in the next section of this article describing bees and their role in golf sustainability. There we see Wisdom Council members flora and fauna working together to not only beautify the golf course, but to also propagate the pollinators.

One fairly recently built resort that includes golf, called [Terranea](#) has been making great strides with their attempts at sustainability. I included them on the map because I have played the course and it appears to be lined with natural brush and wildlife and walks the talk of sustainability.

Finally, I captured the future on this map. The kids from STEM (Science, Technology, Engineering and Mathematics) showcase the collaboration with golf and education. I researched the organization Golf Course Superintendents Association of America (GCSAA) Foundation who run a program called [First Green](#), a "...environmental outreach program that uses the golf course as a living laboratory." It is great to find these programs locally and throughout the world proving society such as the soon-to-be-golfer, flora and fauna are fully involved in driving the sustainability of golf.

**Fossils & Reflections:** You can still find whale and fish fossils if you look close enough throughout the peninsula. I have personally come across a fossilized boulder at one of the golf courses. It was like coming across a ghost from the past. I wish there were more remnants visible to remind me of where I am.

I recently spoke of those fossils with someone who frequently plays the course. I was surprised to hear he had no idea these treasures existed. Once I explained the history, his demeanor changed to that of interest and concern. And he promised to pay more attention to his surroundings as he plays. It is awareness like this that will drive golf's sustainability.

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## Greener Golf – Totally “Bee”lievable

In our interview, Sam Goulden from MNML pointed me to [Greener Golf](#), founded by Parker Anderson. This industry Wisdom Council member appears to check a lot of boxes regarding golf sustainability.



Bees on a Pride of Madeira shrub on a golf course.  
Photo courtesy of Rebecca Clites

Parker is a beekeeper and advocates strongly for building areas on golf courses where bees thrive. Bees are all over golf courses. Sometimes there are signs warning golfers of an active hive. The presence of bees on golf courses actually makes me happy. Following a classmate’s project on the importance of pollinators has instilled an immense appreciation for these very busy very important creatures.

There is a very good podcast to listen to via the [Fried Egg](#) website, about what Parker/ Greener Golf is doing with the bees and golf courses. As my classmate has mentioned as well, pollinators are the backbone of agriculture. Without bees, we would be without most of our food. Sadly, there is a crisis occurring with too many bees dying. Some would argue golf courses are taking up land where bees could be working. Greener Golf

remedies this concern by taking unplayable space on a golf course and turning it into something productive for the planet.

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## Speaking of Society

### A Taxing View (Interview with a Concerned Member of Society)

Elisabeth teaches fashion design and merchandising at a major university here in Los Angeles. In the early 70s she drove herself from Washington to New York, eventually graduating from NYU. She loves ballet and jazz and good wine. She is extremely well-versed in politics and social welfare. She moved to Florida with her young son in the late 80s and landed next to a golf course. She has lived in Redondo Beach, CA since 2000. She does not play golf. I consider her an integral part of our cultural society. And I wanted to hear her perspective of golf. How is a socially educated non-golfer driving golf’s sustainability?

Elisabeth said the following about golf courses:

“Well, I have a couple concerns and questions when it comes to golf courses. For example, in Florida, golf courses were taxed as undeveloped land so their taxation rate was minimal. Which means regular taxpayers are subsidizing the elitist sport where they can’t even go on to the greens and enjoy them after they’re closed for golfers. In California my understanding, and I could be wrong, is that golf courses are taxed at a very low rate and it has something to do with Bob Hope. But that would be my concern as well. Because it’s a lot of land. It should be opened to the public when it’s not being used for golf. And it seems just elitist and exclusionary and not a good use of land, especially in urban areas where there is not that much of it. [...] Of course, there is also the water usage which is another big problem. So, I would like to see how golf courses could become both more ecologically determined. And I know there is a lot of work being done in that way.”



Setting for an interview with Elisabeth.  
Calming ambience sets the tone for an  
invigorating conversation.  
Photo courtesy of Rebecca Clites

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*“I don’t see any reason why golf courses have to be bright green all of the time. But I also think that those beautiful expanses of nature should be accessible by the general public.”*

– Elisabeth, Concerned Member of Society

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Afterward, I did some digging about the California golf club taxation / Bob Hope statement and found this interesting 2023 article in [The New Republic](#):

“In 1960, Hope, an avid golfer, campaigned enthusiastically for California’s Proposition 6, which wrote into the state’s constitution that a golf course could no longer be assessed based on its highest and best use. Instead, assessors were permitted to consider only the land’s use as a golf course. Prop 6 radically lowered taxes for L.A. Country Club and other golf courses across the state. It was later bolstered in 1978 by Prop 13, the property-tax-limiting measure that created a national tax revolt that pretty much never ended.”

Elisabeth is a resource I can rely on to brainstorm many ideas, including how golf can become more sustainable. Her knowledge of politics and society can help drive golf's wellness by exchanges such as the one above. Conversation leads to questioning that leads to research and ultimately leads to further communication and action.

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## The Interested (Interview with Beginners Learning Golf)

My sister Robbyn and my nephew's girlfriend Stephanie are two non-golfers who are in relationships with avid golfers. I wanted to understand their positions in golf. How are they as non-golfers, who are interested in the sport, driving its sustainability?

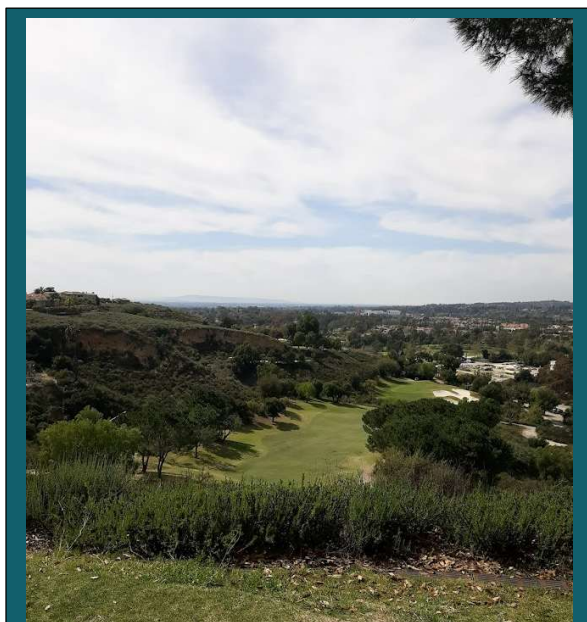
Stephanie, a grad student taking a break from her studies to pursue a new career, started the conversation by stating, "My hope is that as I have my own family, that golf will be part of our family dynamic. And not only could it be myself and my husband but grandparents are something that could be involved in golf as well." Robbyn, who works in the special needs department at a local elementary school, interjected with:

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*"But price. Golf is expensive."*

– Robbyn, Interested, Learning Golf

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Coyote Hills in Fullerton, CA  
Dark green areas are unplayable.  
Photo courtesy of Rebecca Clites

We spent the next several minutes brainstorming ideas on how to get the price of golf down. We came up with more, smaller practice areas in urban areas. We agreed these areas would have to be monitored, which in turn opens up opportunities for jobs.

"It would be an opportunity for a job." My sister said. "Someone could do it, some high-schooler or whatever could do it. Give 'em a job! Introduce them to the golf course. Maybe they are going to be a caddie someday...That will get them interested. Again, it would be a good responsibility as the golfer too to clean up their own area. That would be good."

Wanting to hear their thoughts on the landscape of golf, I shifted the topic to the unplayable areas of the course and what they thought this space could be used for. For example, to the left is a picture recently taken of a course called Coyote Hills in



Fullerton, CA, a very hard course because of its narrow fairways (light green) and massive amounts of unplayable area (dark green).

My sister was flabbergasted with the thought of all that unplayable space. She exclaimed, “I don’t like that!” After my attempt at clarifying my point that that is exactly where plants and animals can thrive, Robbyn was still not convinced. She continued with, “Well in the first place, you guys, you golfers took their homes away. Let’s get down to reality.” A pause ensued to collect our thoughts.

Stephanie chimed in with, “Build a course with what’s already there...to not disrupt the ecosystem. Would it make it interesting to make, like, terrain golf courses? Find a way to leave the terrain and make holes around it?” Bingo!

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## At Risk – Workers on the Course

I am sensitive to the recent scares regarding unwarranted immigration tactics in the US and was therefore unable to connect with workers to discuss their positions in the drive for sustainable golf. What I have are a few archival research papers reflecting the at risk position we find these Wisdom Council members.

[A 2022 The Guardian](#) article describes how a golf pro sued Monsanto claiming the chemical



This is as close as I came to interviewing a golf course worker. Their empty truck symbolizes the feeling I get when I think of the neglect they are facing.

Photo courtesy of Rebecca Clites

company did not properly warn of the dangers from spraying the weed killer Roundup. Because it was a pro golfer who sued, this made headlines (along with other similar suits). It turns out, chemicals in pesticides such as Roundup, are indeed [linked to forms of cancer](#). There is a movement to ban the use of toxic chemicals on golf courses by way of the Protect America’s Children from Toxic Pesticides Act (PACTPA). However, many golf associations and agricultural groups are refuting such [claims of toxicity](#) and have written letters to Congress opposing the bill. As of this date, the bill has not passed. With all of that said, one can deduce that the workers on golf courses have a high likelihood of toxic exposure.<sup>4</sup>

[The Guardian](#) article continues with more bad news: On a pound per acre basis, pesticide usage on golf courses is up to seven times more than pesticides used in agriculture. Golf and agriculture are industries that are widely known for their use of pesticides to maintain the aesthetics of their landscapes. This pressure to appear natural

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<sup>4</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-531 titled *M7 Final Case Study*, p. 4.

seduces superintendents and farmers to spray the land with chemicals. Thus, we are working and playing in “synthetic nature”.<sup>5</sup>

The need for organizations such as Greener Golf, mentioned earlier, is urgent to advise superintendents of the harms of synthetics as well as to provide alternatives.

The [Arcury-Quandt et al.](#) 2011 paper via the American Journal of Industrial Medicine highlights the lack of knowledge amongst not only the non-English speaking workers, but also their supervisors. Workers indicated they wanted more information on the hazards but [were denied](#) – superintendents either simply didn’t want to give it to them, couldn’t speak the language or thought there were no hazards.<sup>6</sup>

[Kari Norgaard’s](#) perspective on socially organized denial can be applied here, to help us understand why a golf course superintendent, or any passerby, ignores the Latino worker exposed to pesticides. We don’t necessarily want to promote our failures or our ugliness or present ourselves in any sort of negative light. For those who are accustomed to being comfortable, it is not very desirable to be uncomfortable. Some people would rather deny the fact that anyone could be suffering.<sup>7</sup>

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## Government O Government – Where Are You?

Per the research I have done through various paths, I found it “should be” up to the Environmental Protection Agency ([EPA](#)) to protect the planet and its citizens from harm:

“In 2017, EPA finalized stronger standards for people who use restricted use pesticides (RUPs). The revisions to the Certification of Pesticide Applicators (CPA) rule help ensure RUPs are used safely and reduce the likelihood of misapplication of RUPs.”

The timing of this increase of standards for pesticide spraying certification coincides with a decline in Latino workers on the golf course. Echoing what was said earlier, Latino workers are in the dark and at risk. With today’s political climate, it is doubtful the EPA is in a position to increase their environmental staff and work to ensure all workers are given the information they need to safely perform their jobs.

Whilst the government remains missing in action, I am presenting research conducted on other non-governmental organizations who run specific certification programs on golf sustainability. The [GEO Foundation](#) for Sustainable Golf was formed just over ten years ago as a nonprofit, stakeholder-funded organization dedicated to facilitating the global golf community as environmentally and socially responsible entities. “GEO” stands for Golf Environment Organization. GEO partners with [ISEAL](#) (International Social and Environmental Accreditation and Labelling Alliance) to certify their certifications.

I found the [Audubon Society](#) of New York State which was founded over 100 years ago and has since quieted down (in the 30s) and woke back up (in the 80s) when environmental education and

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<sup>5</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-531 titled *M7 Final Case Study*, p. 5.

<sup>6</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-531 titled *M7 Final Case Study*, p. 6.

<sup>7</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-531 titled *M7 Final Case Study*, p. 14.



sustainable resource management were gaining importance. The more recently named Audubon International issues the Standard Environmental Management Practices that golf courses all over the world view as the basis for the Audubon Cooperative Sanctuary Program (ACSP) for Golf certification. Designation as a Certified Audubon Cooperative Sanctuary is [awarded to golf course organizations](#) who demonstrate leadership, commitment, and high standards of environmental management.<sup>8</sup>

I thought it relevant to present data from my prior research addressing the argument that golf basically regulates itself, under its own terms. How the environment is defined, who determines how and what is impacted, how the assessments are conducted, whether or not the public was involved, what voices and impacts are missing and who uses these tools are reflected below via Table 2. This analysis is important to the question “How are the Stakeholders of Golf Driving its Sustainability?” because it shows the government is nearly absent in this quest. Being a member of my Wisdom Council, it is my belief the government should indeed help regulate things. The other organizations such as the Audubon Society and GEO Foundation are issuing certifications with what could be construed as greenwashing-type assessments. However, they are here because the government isn’t.

Table 2  
Tools & Certifications  
Created by Rebecca Clites during ESH-530

Survey/Tool	Audubon Certification	EPA Pesticide Applicator Certification	GEO Certification
<b>How is the Environment Defined?</b>	<ul style="list-style-type: none"> <li>Air, Water and land</li> <li>Plus vast diversity of life</li> </ul>	<ul style="list-style-type: none"> <li>Agriculture</li> <li>Non agriculture land users such as golf courses</li> </ul>	<ul style="list-style-type: none"> <li>Turf and wildflower meadows</li> <li>Biology</li> <li>Ancient woodlands</li> <li>Wetlands</li> <li>Streams</li> </ul>
<b>How is it Determined Who is Impacted? Who Determines this?</b>	<ul style="list-style-type: none"> <li>The Society itself through a rigorous standards assessment, written and onsite</li> <li>Recertified every three years</li> </ul>	<ul style="list-style-type: none"> <li>Certification is governed by EPA regulations and state, territorial and tribal laws</li> <li>It is assumed only those spraying the chemicals are impacted</li> </ul>	<ul style="list-style-type: none"> <li>ISEAL Alliance Codes of Best Practice for credible standards</li> <li>Diverse body of consultees oversees these standards</li> </ul>
<b>How was it Developed? How did the Public Participate?</b>	<ul style="list-style-type: none"> <li>Through partnerships with small and large corporations,</li> <li>Educational institutions,</li> <li>Fellow nonprofits,</li> <li>Community associations,</li> <li>Local governments and</li> <li>State and federal agencies</li> </ul>	<ul style="list-style-type: none"> <li>Developed by the EPA</li> <li>The public did not participate in establishing the criteria for certification</li> </ul>	<ul style="list-style-type: none"> <li>As a global, popular sport that is set on a living landscape, can act as a leader for sustainability and climate action</li> <li>Broad stakeholder involvement</li> </ul>
<b>What Voices are Missing?</b>	<ul style="list-style-type: none"> <li>The non-golfing community</li> <li>Family of golf course workers</li> <li>Indigenous people</li> </ul>	<ul style="list-style-type: none"> <li>The non-golfing community</li> <li>Family of golf course workers</li> <li>Indigenous people</li> </ul>	<ul style="list-style-type: none"> <li>The non-golfing community</li> <li>Family of golf course workers</li> <li>Indigenous people</li> </ul>
<b>Which Impacts are Not Measured?</b>	<ul style="list-style-type: none"> <li>Everything seems to be covered: planning, wildlife and habitat management, chemical use reduction and</li> </ul>	<ul style="list-style-type: none"> <li>Currently, only the most restricted use pesticides (RUPs) are measured therefore:</li> </ul>	<ul style="list-style-type: none"> <li>Everything seems to be covered: air, water and soil, nature, resources, community, conflict</li> </ul>

<sup>8</sup> This paragraph was copied and edited from the Rebecca Clites paper: ESH-530 titled *Journal 4.1: Critical Reflective survey on Certifications, Measurements, and Assessments*, p. 3.

	safety, water conservation, water quality and outreach and education programs <ul style="list-style-type: none"> <li>• Except: air and soil quality and conflict</li> </ul>	<ul style="list-style-type: none"> <li>• Everything else is NOT measured: air, water, soil etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Except: chemical use and reduction, outreach and education programs</li> </ul>
<b>Who Uses this Tool?</b>	<ul style="list-style-type: none"> <li>• Mostly businesses, including other golf courses</li> </ul>	<ul style="list-style-type: none"> <li>• The government</li> <li>• Those expected to spray golf courses with pesticides</li> </ul>	<ul style="list-style-type: none"> <li>• Tournament sponsors</li> <li>• Golf fans</li> <li>• Communities</li> <li>• Golf course workers</li> </ul>

## Material Changes

### Unpacking Bill Wright's Golf Bag

To demonstrate resiliency in the face of adversity, a characteristic necessary to confront unsustainability in golf, I analyzed Bill Wright's golf bag. Bill was a friend who told endless stories of how he fought racism in golf. I borrowed the bag during a transitional time when his beloved practice golf course was in the midst of being torn down. I never got the chance to return it to Bill. He passed away in February 2021. The symbolism remains.

The first major article I ever read about Bill was written in 2009. He was featured as one of the extraordinary stories of golf of the past 50 years in the 50<sup>th</sup> Anniversary issue of Golf Magazine.<sup>9</sup> Bill was the first African American to win a United States Golf Association (USGA) championship event. This happened in 1959 in Denver, CO, when golfers used thick and heavy golf bags as the one pictured to the right.

The story by Phillips tells of the struggles of a Black golfer in the United States. Bill would tell us the same stories: How he played golf with Jack Nicklaus when no other white golfer would play with him. How he gave up trying to play regularly in the elite Professional Golfers Association (PGA) because no one would sponsor him. And how he met the young Tiger Woods and never understood why he was such an anomaly.

A quick history on the golf bag from the website [Bloodline](#) explains it took many years to invent the golf bag (late 1800s). At first, there were just a few golf clubs used so the bags were made quite small. Around the 1930s fancier bags were [made of leather](#), a very heavy material, especially when wet. Thanks to WWII and advanced technology i.e. [synthetic materials](#), lighter golf bags were made to accommodate the increase in the number of golf clubs.



A golf bag once owned by Bill Wright. This bag now sits in the study of my home.  
Photo courtesy of Rebecca Clites

<sup>9</sup> Phillips, C. (2009, September). Wright & Wronged. Golf Magazine, 51(9), 118–124.

As golf became more of a leisure sport, the players also became more leisurely (otherwise known as lazy). Motorized golf carts took the place of walking and carrying golf clubs. For professional golfers, who have caddies carry their bags, the golf bags could then be made bigger, fancier and with much heavier vinyl material. Bill Wright's bag, the object I analyzed, was made of this hefty synthetic material.

Not all golfers can afford or want to [drive a golf cart](#) (myself included). Starting in the 70s manufacturers made lighter bags for those who chose to walk and carry their clubs. In the 80s, a built-in stand was invented that held the bag up at an angle, which made it easier to pull out and replace the clubs. And then in the 90s a two-shoulder back strap was added to the golf bag that balanced the weight of the bag, much like a backpack, and made it more efficient to walk the course.



Custom golf bag made at MNML. Made of 100% recycled materials.  
Photo taken by Rebecca Clites with permission by owner.

### Minimal Golf – Maximum Impact

I interviewed Sam Goulden, the owner of [MNML](#) (pronounced minimal), a shop in Redondo Beach, CA that in addition to providing golf lessons, makes and sells golf bags made of 100% recycled materials. Sam is very passionate about his love for the planet. An avid surfer (in addition to golfer), he appreciates the sea. As a result, he found a way to turn the discarded, nylon fishing nets into golf bags. He pulls from the tons of sea waste that would normally be sent to landfills and repurposes it.

Sam's recycled bags are made with magnetic closures rather than zippers. Bags today have many compartments for keys, wallets, cell phones, snacks, drinks and golf equipment, each enclosed with a zipper. These zippers break, quickly wear out and are easy pickings for an aggressive squirrel. Replacing or fixing a zipper for \$75 on a \$100 golf bag (low end) may not be worth it. Therefore, the bag is tossed and ends up in

a landfill. A golfer may go through one of these zippered bags every couple of years if they are lucky.

Not only has Sam, representing Industry and Engineer members of my Wisdom Council, solved the zipper issue, he has switched out permanent rivets that hold the stands in place, with screws. That way, if the leg breaks, it is easily replaceable. I want to reference the [Butterfly Diagram](#) at this point. The butterfly wings represent a circular (as opposed to linear) materials economy. Where on one wing, we study renewables, materials we turn into other things. And on the other we study how to make things that can be used over and over. Sam understands the circularity of a product, "...to keep it in use", he says. His bags will set you back \$300 without customization. He claims they will be of "utility" for 100 years. Doing the math, that is \$3 per year for a sustainable golf

bag. To maintain our current linear production mindset, the consumer cost is \$50 per year (\$100 bag lasting two years).

Sam and his General Manager Rob had just returned from giving away golf bags to kids in the burned areas of Pasadena, CA. These are junior golfers who either lost everything in the LA fires or because of the fires, decided to learn golf as a relief from some of the pain. This program called [Trade it Forward](#) is where MNML provides buyers of their recycled golf bags the devices needed to donate their used bags, which are in turn given to those who may not have the resources to purchase golf bags themselves. The golf industry is making great strides in their quest for sustainable golf by way of rethinking how to make and distribute golf equipment.

*Golf bags are therefore symbolic of renewal and growth.*

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## Being Smart (Interview with an Engineer)

My ex-step-father Ed, with a degree from USC, was a City Engineer back when he was step-fathering my sister and me in the 70s. I respect(ed) him immensely. I thought he was the smartest person ever.

Ed is now in his 80s and suffers from dementia. He doesn't remember much from today, last week, last month or last year. However, his memory from long ago is vivid. The two of us recently engaged in an intimate conversation about his work as a city engineer.

I asked Ed if he ever did any engineering work around golf courses. To my surprise he said he had. In fact, he said he built a small 9-hole course in So Cal, just around the corner from my childhood home. The name of the course escaped him for the moment. I asked if he remembered how he went about building the course. Although the conversation was through a phone, I could sense his energy pick up as he described his past accomplishments. He said with excitement, "It's a matter of land planning."

I asked about any obstacles he faced building the golf course. Ed quickly responded with "... the amount of land that is available. Seldom is there enough land." He was expected to deliver a "...big package out of little property." He said, "You have to make the course attractive...every hole has an interest. Some physical feature that separates it from flat land." He went on as if talking with his team on the job.

"What do you want to get out of a golf course?" Ed said is the question every engineer should ask first. "And then deal with what you got...in the natural geography." He exclaimed, "You have to think about it!" He went on to describe what he meant, "...people want variety. So, you need to use imagination and creativity. Then pair down based on what is given to you."

I expressed that I had not thought of him nor engineering as an art form. He suggested that:

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*“Yes. Engineers do more than build things that don’t fall down.”*

– Ed, City Engineer and Builder of a 9-Hole Golf Course

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Ed hasn’t lost his sarcasm. He says engineers have imaginations which are not learned in school. And if you don’t possess one of the skills, technical or imaginative, you need to collaborate with those who do. He stressed imagination was more important than the technical engineering part of the building process. This engineer Wisdom Council member drives sustainability of golf by learning and working with the natural environment.

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## **The Beauty and the Promise of Golf**

### **The Warrior (Interview with a Survivor)**

Ruthie is one of the strongest, most beautiful women I know. She is a multi-time breast cancer survivor, her latest conquest just two years ago. Her various golf excursions take her all over the US from New York to Washington. For the most part she travels alone. Her daughters and grandchildren will entertain her on the driving range but rarely set foot on the course. She is seventy-one years young.

On the day Ruthie and I met, it was the first sunny day since a week-long rain hit So Cal. I could tell she would rather have been playing golf than doing anything else on such a nice day.

I asked Ruthie what is the most she would pay for a round of golf. Since her last conquest with breast cancer, being able to walk a golf course was most important to her. She spends her vacation money on golf. She prefers playing her “dream courses” alone, where she can enjoy the conquest in peace, I thought, much like her battles with cancer.

We digested several insightful gems and reflected how life and golf are intertwined. Sometimes golf is really good. Sometimes it is really shitty. Same with life, we both agreed.

Ruthie’s face lit up when she reminisced about recently walking a course she planned and saved for months to play. “I got my body back,” she said. As our intimate chat came to a close and I sensed I was at the end of her attention span, I asked Ruthie how much playing golf means to her. She replied:

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*“If I can’t play golf, it’s time to go.”*

– Ruthie, Golfer, Cancer Survivor

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Ruthie followed up our interview with a text that simply said: “I never knew what being in the moment was until golf.” I asked her what she meant. “Standing still” she explained.

This conversation displays how the desire of a player to use golf as a survival mechanism can indeed drive golf sustainability. Isn't that worth keeping golf around?

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## Creativity

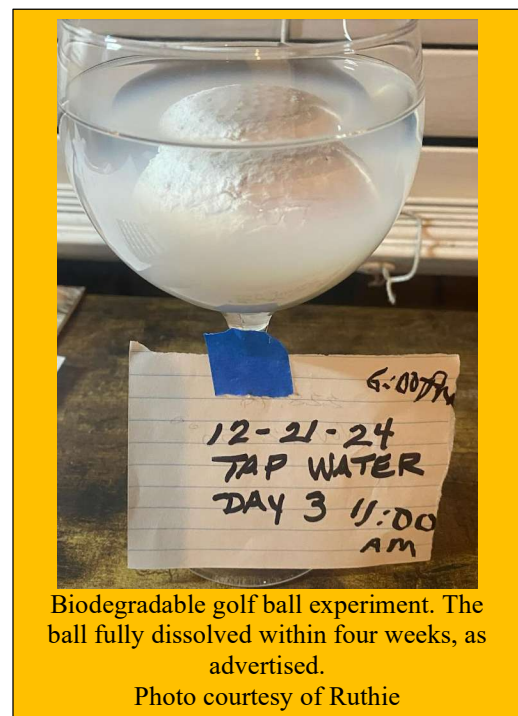
There are promising ways to build golf equipment more sustainably, such as what MNML is doing with golf bags as mentioned earlier.

*Now is when a collaborative effort amongst the Wisdom Council is needed: Integrating creativity with engineers, society, players and the industry.*

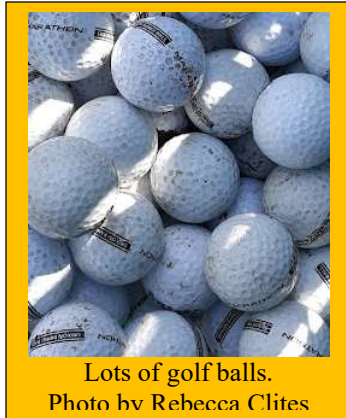
Golf carts are now electric. Which means there are batteries ending up in landfills emitting toxins into the air and sea. I was introduced to an article by [Proctor and Dennis](#) describing an advocacy program, The Right to Repair and PIRG (Public Interest Research Group) for the need to increase research and technology to ensure batteries are recycled, parts are reused and most importantly, they don't end up in landfills.

How about turning golf equipment into something else? Websites such as [Venture Well](#) show and tell how they conduct sustainability workshops where items like golf clubs or clothing can be turned into something else entirely. Again, maintaining that circular materials economy we talked about earlier.

Today's golf balls are [made of synthetics](#) like polybutadiene (core) and urethane elastomer (encasing). I found a 2024 [CNN article](#) that suggests golf balls can indeed be made biodegradable. For Christmas this past year, I gave biodegradable golf balls to my player friends, to test out the viability of this innovation. If you enjoy hitting heavy rocks as perhaps the shepherds did 600 years ago, these balls will work for you. The technology has a long way for the public to accept these balls. They do make for a fun science experiment, as captured by one of our players.







Lots of golf balls.  
Photo by Rebecca Clites

Here is another creative idea: There are many golf balls abandoned by golfers whose golf shots end up in the rough, hazard or unplayable areas. Many millions of these “lost” balls are recovered. There are people whose formal job it is to retrieve golf balls. Those folks work for big brand companies and sell back the abandoned balls so the big companies can then resell them back out to the public at reduced prices. That makes golf more affordable since lost balls have likely been used for only one or two shots. Workers are informally collecting the abandoned balls and informally selling them to the public at even lower prices. Why not formalize this process so the workers receive a better profit?

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## The Many Views of Golf – A Video

Below is a link to a video I made comprised of photos my friends, family and I took over the past several years. This multi-media method of research depicts the many views of golf, from its beauty to its harm and a little of its artistry.

The stakeholders involved in this video are the players as well as those just learning. You will see depictions of flora and fauna throughout the video. No solutions. Just images for now. I hope the video stirs up a little emotion, some questions and perhaps a smile.

Please enjoy! [Click here to view the video.](#)

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## Conclusion: Golf is Worth the Drive!

How are the stakeholders of golf driving its sustainability? My Wisdom Council consisting of engineers, players, workers, the industry, the government and society all have perspectives that are driving the future of golf. Is it wasteful, harmful and only meant for the elite? Is golf sustainable, beneficial and accessible? Is golf worth the drive to its sustainability? Yes, yes and yes!

I deduce that we as a society find it hard to let go of the past. Historical clauses that ruled out minorities from playing golf seem to understandably still be on the minds of those who would like to play. Thus, preventing them from trying. Although not yet affordable “by all”, I found evidence that golf is accessible. There are public courses all over that offer areas to practice and to play at reasonable prices. Players who know this need to connect with those who don’t. In addition, we need to seek people and organizations offering free lessons, rounds and equipment.

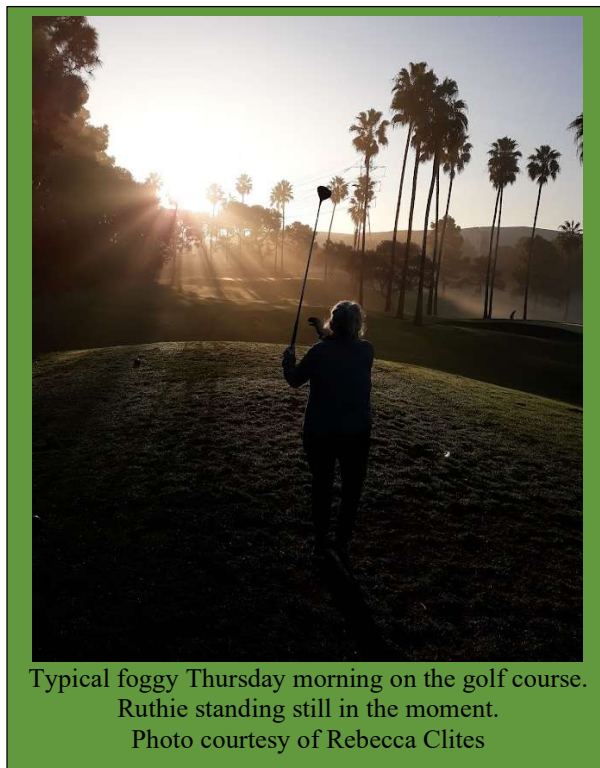
Mother Nature is in charge. We can learn from this Wisdom Council member that doing research, talking with folks like Greener Golf, planning the landscape organically, including natural flora and fauna are the only ways that will drive sustainability.

Workers need to be consulted as to their rights (exposure to chemicals as well as collecting balls for resale). Perhaps educating their supervisors can help with that regard. We must stop ignoring the workers.

I would like to say the government is here to help drive the sustainability of golf. There was enough research in place before the current administration to conclude agencies such as the EPA are MIA. Therefore, we will rely on private organizations such as the GEO Foundation and hope the greenwashing is addressed.

I found that the industry and the engineers are leading this caravan of innovation and creativity. There is a ton more research to uncover with regard to the material circular economy. What I present in this article barely scratches the surface.

Players and soon-to-be players are probably most likely to make the biggest impact driving golf's sustainability. We are in the driver's seat. Awareness of our surroundings is key. Speaking up and out will drive responses from the industry and the engineers, as we see throughout this article. It is my hope that more articles like this are published, discussed and therefore acted upon.



Typical foggy Thursday morning on the golf course.  
Ruthie standing still in the moment.  
Photo courtesy of Rebecca Clites

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**Deciphering (Mis)Communications and Amplifying Voices:  
Analyzing Mining Communications in the Peruvian Andes**  
*An Analysis of Qualitative Data and Intervention Proposal*

Kayleigh Plessinger  
May 2025

**Abstract**

This study explores the nature of communications between mining companies, governments and communities regarding mining activities and impacts through an analysis of qualitative data from interviews conducted in Peru in 2013 as discussed in [Socially Just Mining: Rhetoric or Reality? Lessons from Peru](#). A lack of focus on the perceptions of rural and Indigenous individuals in existing literature creates a dominant narrative of [beneficial development](#) and [impoverished undereducated and helpless communities](#). This qualitative analysis contributes important insights on how corruption, power-asymmetries, inadequate policy and legislative implementation, absence of representation of local communities, and structural bias play into the conflicts which arise and how all these themes center on a profound lack of communication. Strategic processes by which companies and governments utilize misleading communications to consolidate power and control dialogue about mining activities will be explored. As will the persistence of members of communities to insist that they be adequately communicated with and consulted to ensure their rights are upheld. This analysis culminates in the proposal of a community-led communication intervention strategy utilizing radio broadcasting as a culturally and technologically appropriate media for the context. Limitations and benefits of this strategy show that though current feasibility is unlikely due to procedural obstacles like governmental control of media, the agency which this strategy theoretically could promote make it worthy of further exploration.

**Preparing to Consider Differing Perspectives**

Peru is one of the [most biodiverse countries in the world](#) hosting 40 distinct ecosystems consisting of inland water, forest, mountain, cavern, marine and costal habitats. Peru is also home to a [diverse people](#); there are approximately 51 Indigenous groups in Peru, the most populous of which are the highland Quechua. These diverse landscapes and peoples come together to represent a culturally and biologically rich country that is instrumental in planetary health and global commerce. Given mining's numerous environmental impacts and its profitability, it is a significant influencing factor on both Peru's environmental and economic roles on the global stage.

This study focuses on the Andean region of Peru surrounding the [Yanacocha mine and its Conga expansion project](#) in the region of Cajamarca, as well as the [Tintaya mine](#) in the Cusco region. The communities of these regions are peasant farmers (Campesinos) and rural Indigenous peoples. Mining in the Peruvian Andes is a serious threat to both the biodiversity and the socially marginalized rural peoples of Peru, [especially because of their cultural reliance on subsistence farming](#). Impacts on these communities are environmental, social and political in nature and are heavily influenced by historically informed social constructs, such as land dispossession, class power dynamics, and Indigenous othering. These constructs date back to the [Spanish Colonial Era](#) of the early 16<sup>th</sup> century through the early 19<sup>th</sup> century BCE and inform communication relationships between communities, companies, governments and other authorities. This study intends to explore these communications, guided by the question:



*What problems exist in the communications between mining companies, rural and Indigenous communities, and governments in the case of the Peruvian Andes, and what possibility might women-led community radio broadcasting hold as an intervention strategy to improve environmental and social outcomes?*

To understand the current issues, we must first ground the present social dynamics in the past. Beginning in the 1990s, then President Alberto Fujimori [opened the Peruvian landscape to the global market](#). By selling resource extraction sites to international companies, the federal government has secured land and resource markets. Profits from royalties paid by the company to the government throughout the production of a mine also have created economic opportunity for Peru to increase their national wealth and has ensured mining's importance as a [key economic industry in Peru](#). With respect to socioeconomic outcomes, however, the risks of mining may outweigh the benefits. Modernization and globalization have [normalized the risk involved in extractive processes](#), especially when the greatest threats they pose are to marginalized groups. [Displacement and relocation](#) of peasant and Indigenous groups throughout Peru have occurred at multiple points in the country's history, each time land that was not believed to be as valuable for economic development was allocated to dispossessed groups. When gold or other valuable materials were discovered on the lands allocated to these groups, land rights were revoked, or manipulative incentivization tactics were [used to acquire land rights](#) from rural communities.

(Mis)communication between mining companies and local communities is central to how we understand these impacts. Information on environmental and social impacts of mining activities have been provided to communities as long, "jargon-full" documents known as Environmental Impact Assessments (EIAs). These documents are often provided to the relevant communities by means that assume accessibility to internet, and do not consider literacy and fluency level in the language the document is presented in. Furthermore, EIAs are often intentionally skewed to [diminish potential negative impacts and overstate remediation and restoration plans](#). Public media exposure of unethical behavior has proven to successfully lead to social action and has resulted in mining profit losses which have triggered implementation of [Corporate Social Responsibility](#) (CSR) activities.

This study aims to assess the feasibility of an informative broadcast as an intervention to the lack of accessible and contextually appropriate information. I hypothesize that accessibility to this information could mitigate conflicts by allowing informed social organization to protect the ecosystems to which the rural communities are so deeply connected, protective of, and reliant on. Additionally, amplifying marginalized community voices could disrupt legacies of oppression by creating visibility of nuanced experiences, thoughts, and feelings within the communities, and dispelling stereotypes through connection to stories.

### **Existing Dialogue and Silences: A Review**

Throughout its centuries long history in Peru, mining has been an important fixture in culture and economy but has also acted as a catalyst for conflict. This report will review the existing dialogue in literature around mining conflicts in Andean Peru, current communication about mining and the consequences of this dialogue, community radio broadcasting and its importance and prevalence in the case of the Peruvian Andes, and the power of women-led activism. Finally, I will critically analyze the silences in, and voices missing from the literature reviewed and elaborate on the unique contributions to the literature that this project on the feasibility of a women-led community radio broadcasting aims to make.

## Historical Context and Structural Violence

Under Spanish rule Indigenous peoples of Peru were held as slaves by the appropriated Inca labor system “Mita”. Peru became independent from the Spanish in 1824, but the [tribute system](#) (goods and services forcibly paid to the government) continued Indigenous oppression and servitude. The later decades of the 1800s through the 1900s perpetuated land dispossession, and violence, culminating in genocide: the slaughtering of Indigenous peoples by the militaristic regime The Shining Path in the 1980s and 1990s and the [forced sterilization of over 272,000 people between 1996 and 2001 by the government under former president, Alberto Fujimori](#). During the same period a shift occurred in Peru’s focus from nationalism to globalization and neoliberalism which [emphasized mining as a major source of exports and direct foreign investments](#). By 2010 this refocus meant that more than [half of all the rural peasant class](#) (Campesinos) lived in mining affected areas. Economists [Diego Andrucci and Giorgos Kallis](#) analyze the interplay of racial and spatial aspects of extractivism stating:

“Racism-as-othering takes on a geographical dimension: spaces of extraction come to shape, or become intertwined with, the very limits of the life-promoting duties of the state, defining affected communities as populations which can be ‘left to die’ (or even ‘made to die’) in the name of development”.

They further explain that this political discourse describes Indigenous communities as not only an acceptable sacrifice for the development of the country, but also an impediment to such development if not repressed.

## Mining Conflicts and Misleading Communications

The intentional and structural repression of rural and Indigenous communities often begets protest. While protests are typically peaceful, government has been repeatedly documented as using unreasonable force and intimidation in attempt to quickly [“delegitim\(ize\) and politically isolat\(e\) socio-environmental movements”](#). This forceful show of dominance often results in [injuries and even deaths of protestors](#). International scrutiny of these methods of conflict intervention led the central government of Peru to develop government offices like [The Office of National Dialogue and Sustainability](#) (ONDS) which claimed to use roundtable discussions and social involvement to prevent conflicts. However, [distrust of the government](#) and authority figures has made Campesinos reluctant to participate. Accessibility of meetings and failure to actively engage community members has also been regarded as major obstacles to effectiveness, and these dialogue sessions have [failed to bring tangible results](#).

Furthermore, these attempts at community engagement appear entirely tokenistic. According to a [2012 review of environmental impact assessments](#) (EIAs) 86% of mines reviewed lacked proper documentation on operation approval by the Ministry of Mines. Tactics to repress community participation at public hearings [have also been documented](#) including egregious start time delays, large turnout of representatives of the mine and mining company who control dialogue, delayed response to questions in a time-sensitive dossier released at a later date, and intimidation by armed guards at the entrance to the hearing space. EIAs are the [only documentation of estimated mining impacts that are legally required in Peru](#) to be provided to the communities. Accuracy and accountability of EIAs are highly contested. Even in the United States where environmental protections and regulations are much stricter than Peru, it was found that while all mines sampled predicted total compliance with water quality standards in their EIAs, [76% of mines exceeded water pollution limits while in operation](#).

This is in part due to the nature of EIAs, they are [highly unstandardized](#) and rely on biased opinions of for-profit entities who are [selected, hired, and paid by the mining company](#) who wishes to begin operations. Further, they are [highly technical, long and require advanced literacy to interpret](#), a fact which companies and interested parties exploit. The misleading nature of these communications is [ensured by the central government's motivation to further extractive development](#), and the [World Bank's conflicting roles of regulator of social impacts of mining, and investor in mine profitability](#). EIAs are predicated on the presumption of their approval. This is to say that the process by which they are completed facilitates their inevitable approval because regardless of their findings the supposed mitigation plan can be [stretched to meet any predicted impact, which is both intentional and by design](#). Roundtable discussions about EIA findings and mine impacts have been found to [“make compromises, sign acts, and make promises in a ‘ritual’ way, but without binding character”](#).

The [failure of authority to appropriately engage the public](#) in discourse about mining impacts, the disregard of community concern and input, the lack of follow through on promises and the violence with which protestation is met have all contributed to the Campesinos [visceral distrust of government agencies and mining companies](#). Additionally, actual impacts represent far greater impairment on life and livelihood than anything represented in EIAs or other non-standardized communications. Effects of operations are described as [transformative to the cultural means, livelihoods, forms of governance, natural environment, social fabric, and even the complete disappearance of communities in some areas](#). These social impacts are largely omitted from impact assessments and requisite communications about mining and proliferate anticipated social stressors.

### **Community Utilization of Radio**

As evidenced, there are many drawbacks to the current modes of information disbursement. Given this, more culturally appropriate and participatory means should be considered. Despite the common misconception that radio is becoming irrelevant, radio to date has the [largest global reach of all media platforms](#) at approximately half of the global population. The use of radio is even higher in developing countries with around [75% of households regularly tuning in](#). This is because radio bridges the digital divide. As radio does not rely on expensive technologies or services, it can be an [accessible source](#) of information, education, community connection and entertainment. It [does not discriminate](#) based on literacy and education level, which is an important factor for information dissemination in Peru given that [many Campesinos cannot read or write](#). This is [especially true of women](#). Community radio also reaches people in their native tongue, which may not be widely available by any other media source. Indigenous elders especially are [likely to speak only one language](#). According to the [Peruvian National Institute of Statistics and Informatics' Third Census of Native Communities and First Census of Peasant Communities](#), 50.3% of connected communities use radio as their primary communication service while only 6.7% have internet and 1.2% have cell phones. Community radio plays a large role in reaching these communities, but it also allows communities to amplify their experiences, and knowledge. As [Cotji and Portalweska \(2019\)](#), note:

“Indigenous community radio stations play a crucial role in defending the right to freedom of expression of Indigenous peoples. Providing the most effective way of disseminating information on issues affecting the communities, they also reveal news of the violence that hits them. They are the first to broadcast information about the incidents, and to interview and air the views of community leaders on these acts of violence.”.

Radio has proven a valuable resource in Peruvian Indigenous and Campesino communities before; it was used to combat disinformation about COVID-19. However, strict control over radio licensing by the National Institute of Radio and Television of Peru (IRTP) and the 78% monopoly of the Comercio group over national press renders little diversity of information and opinion across all sources of media. Permits are usually given to broadcasters who suppress critical stories, further government agendas, and speak favorably about the current administration. Journalists and broadcasters who speak critically of the government or government sanctioned activities have reported being suddenly fired from their positions. Due to these precedents, communities are forced to utilize “pirate” radio (illegally obtained unused broadcast frequencies) which are often confiscated. Mining companies are also utilizing radio in regions with high mining conflict to broadcast mining propaganda, perpetuate stereotypes about communities and speak in favor of mining companies. Because of the high level of control over radio it has been argued that the better option for reaching communities is online radio despite the low rate of accessibility to internet in Campesino and Indigenous communities. Other organizations argue that overwhelming international support and the persistence of Indigenous community radio despite repression and delegitimization justifies mobilization to change laws and secure more rights for community broadcasting rather than change media source. Whatever the technological means, community radio is a powerful tool for social and political mobilization, cultural preservation, agency promotion, corporate and government accountability, and information dissemination.

## **Women-led Activism**

As voices are amplified it is of the utmost importance to ensure that a variety of perspectives are heard. However, some voices tend to be silenced more than others. Indigenous and Campesina women’s voices are often ignored by state agencies and mining companies. Even the anti-mining movement has minimized women’s involvement as mere volunteering or excluded their work writing them off as passive victims of environmental and social impacts of mining. Yet, women have placed themselves at the forefront of activism both implicitly by “staying put and carrying on”, and explicitly by demonstrating, speaking out and pushing for environmental justice locally and globally. Amongst other reasons this is because women’s roles in society are more reliant on natural resources and commons than men who become increasingly reliant on wages as development increases. This reliance may also place women at higher exposure rates to soil pollution than men due to their roles in food security, and water and particulate matter pollution due to their household management work. Children’s exposure to environmental pollution through outdoor play, and the lower tolerance for contaminants that is inherent of their smaller, less developed bodies also places further burden on women when children become sick due to their roles as caregivers and the social stigma on mothers with unhealthy children. Meanwhile, corporate social responsibility (CSR) programs are primarily directed toward benefitting men, as are job opportunities and other economic benefits. Glevys Rondon of the Latin American Mining Monitor Programme (LAAMP) illustrates how government and corporate interests intentionally use gender discrimination and violence to “politically resist the advance of women activists representing local movements”. It can be argued that this resistance is particularly targeted at women because of the fear that they will be effective activists. Not only can women bring to light some of the worst mining impacts, which companies would rather keep under wraps- and usually deny responsibility for, but globally it has been documented that campaigns and movements with high levels of women’s participation are more likely to succeed. Consequentially, women activists are significantly more likely to be subjected to violence than their male counterparts, telling the single story of this subjectivity threatens to socially reproduce the ‘women-as-victims’ archetype which disempowers and



‘others’ them. Instead, while still recognizing that disproportional distribution of burdens does exist, the primary [dialogue must shift to empowerment](#) and equity through women’s *agency* to affect change and shape social relations.

### **Silences and Missing Voices**

With few exceptions, the dominant discourse in literature seems to decouple individual destructive mining operations and government bad actors from their multinational corporate origins, global market ties, and colonial or neoliberal roots. While it is widely accepted that greedy companies make decisions which negatively affect communities, and certain corrupt governments or agencies allow, and even profit off, bad behavior from companies, few studies highlight that corporations in the global North and markets are cutting the checks which propagate this. Even deeper involvement lies in cases like [“Operation Condor”](#), during which the United States government covertly financed a series of military coups resulting in rape, kidnap, torture, and murder of tens of thousands of leftists, social activists, trade-union organizers and student activists from the Southern Cone of Latin America (Argentina, Uruguay, Chile, Paraguay, Bolivia, Brazil, and intermittently Peru) until 1983. This operation in many ways helped to solidify the neoliberal movement and the ensured global exploit of Latin American resources. These silences in the literature are significant because the omission of details about why and how things became as they are today allows for the perpetuation of paradigms which replicate violence. The case of Operation Condor is symbolic of how power can be derived from silencing or excluding certain voices.

While conducting this review I found that Indigenous and Campesino communities largely were underrepresented. While outliers exist such as [Baillie et al](#), which is comprised of interviews and direct accounts from community members, or [Jenkins](#) who emphasizes everyday resistance of rural women through interviews providing conceptualizations of what it means to be an activist, most available literature features the voices and opinions of academics and professionals exclusively. This allows outside forces, even if well intentioned, to use underrepresented communities to gain power for themselves, and keep power in traditional institutions like academia, government, and organizations. The agency, then, belongs to the institutions which have control over the information rather than the communities which the information is about. This perpetuates existing power dynamics and allows the further subjugation of communities who are not in control of their own narratives or the resulting actions and social representation that comes from the dissemination of these potentially misrepresented narratives.

Finally, there is a notable silence from the Peruvian Government about issues of mining, human rights, and social conflict. When conducting a simple search for destructive mining in Peru one will find that they are inundated with information about the impacts and [destruction of artisanal, or local small-scale mining operations](#) rather than the large corporate mines like Yanacocha. Other than a few mentions in articles about community radio, information was lacking on the government agency over broadcasting permits, or the prevalence of mining companies to secure local frequencies to broadcast pro-mining propaganda. A single example of sanctioned community radio through the Minga Peru organization features a story of an [Indigenous woman being educated by Minga Peru](#) so she could educate her community on domestic violence, Minga then paid for her to go to college, and now she organizes social justice in her community. This article portrays a backwards community of “poverty, disease, and domestic abuse”, in a way that is reminiscent of how [Kallis relays President Alan Garcia’s dialogue around Indigenous peoples](#) being ‘incapable of development and condemning themselves to backwardness’. It is clear from these silences that there is a serious issue of repression and state-control over communications and media, and as

a result Indigenous and rural communities are depicted with negative stereotypes.

### **Contributions to the Literature**

This capstone seeks to contribute to the existing literature on mining conflict and environmental degradation intervention strategies in the Peruvian Andes by suggesting women led community broadcasting as a theoretical non-violent intervention. The intention of this suggestion is to promote the agency of women and rural communities whilst amplifying lived experiences within communities to combat governmental and corporate disinformation and propaganda regarding mining. Specifically, the cultivation of inter-community discourse about actualized impacts of mining in nearby communities to counter misleading claims about impacts and benefits as represented in EIAs and public hearings. This model takes into consideration the importance of culturally appropriate methodology and acknowledges the need to close information gaps that exist because of positivist views of knowledge which may not echo traditional views of the communities. My intention is to convey the necessity of providing communities with accessible, comprehensive and qualitative interpretations of the technical information about mining impacts in the spoken language of the communities. The intent is not to assimilate knowledge, but to level the playing field of technical information dissemination thus empowering communities to maintain agency through fully-informed consent and negotiation discourse.

### **Taking a Qualitative Methodological Approach**

#### **Research Question**

This feasibility study aims to answer the central research question: What problems exist in the communications between mining companies, government, and rural and Indigenous communities in the case of the Peruvian Andes and what possibility might women-led community radio broadcasting as an intervention strategy hold to improve outcomes? The objective focus of asking this question is to determine the underlying social factors of mining conflict, especially pertaining to intentionally misleading information, and omission of information about costs and benefits as it is communicated by mining companies, and the consent that communities are giving under the precedent of deception.

#### **Epistemological Framework**

This project attempts to address the failure of communications between mining companies, authorities and communities. Current communication practices, like EIAs, are based on positivism which positions companies as experts who determine economic opportunity and development can ‘fix’ community issues of poverty, undereducation, lack of modern medicine, and lack of infrastructure. This focus perpetuates an industrialist cultural ideation that undeveloped spaces are ‘empty’ or ‘open’ rather than ecologically and spiritually significant, and that local economies, traditional knowledge, and traditional medicine are deficient. With this approach communities’ needs are assessed from an empirical standpoint which ignores unobservable factors like values, emotions, cultural and historical contexts, and the significance of ongoing reciprocity between humans and nature. From these identified shortcomings it becomes apparent that the epistemological approach of this project must be holistic- addressing tangible and intangible factors, as well as human and ecological well-being, which are especially inextricable in the context of the rural Peruvian Andes. Furthermore, it must be adaptive, acknowledging that reality is not concrete but rather evolving and being constantly influenced by the collective contribution of every living and non-living thing within its context, as well as



perceived and filtered through the lens of experience and positionality of each individual. Therefore, the project must remain open-ended, fluid and responsive, as well as focused on the acknowledgement of perception and experienced reality. To this point the perceptions of the researcher play into the interpretation of the data and the conveyance of the findings from it. This [“conscious partiality”](#) is essential to the processing of stories from a place of deep empathy, connection, and vulnerability to them which allows the researcher to analyze the information with humanity rather than sterility. This humanity allows the researcher to amalgamate the perspectives contained in qualitative research in a way that bears witness and raises consciousness without being disassociated and voyeuristic. As I was able to experience this is an intense and extremely impactful position to take as a researcher as well. Allowing the data to move you and experience the full range of emotion that comes with connecting with the participants in this study led to a much deeper and visceral experience for me than I have ever felt with research before. This intentional movement against the dissociation of feeling from research led to genuine connection with the humanity of the individuals on the other side of the transcripts. How else could I be able to explore the concept of platforming perspectives of individuals to raise consciousness and bear witness than to feel empathetic to their very real, lived experiences that their stories convey? This perspective is vital because it begins the kind of reception of the research that is the imperative of it with me, the researcher.

These stances are well represented by [eco-feminist epistemology](#) which is the guiding theory for this research. This selection is reflected both in the utilization of qualitative over quantitative data with the centration of narratives and perceptions contained in the interviews that are analyzed. Eco-feminism is also extremely applicable to the proposed women-led community radio broadcast intervention which would aim to amplify the lived experiences of women in active mining communities to inform potential mining communities of experienced impacts and benefits within the context of the region and from the community members who have [likely been most impacted](#) (women). By design this is adaptable and open-ended so that it can evolve with changing circumstances and be responsive to community needs. To contextualize this proposed intervention, I am analyzing a series of interviews conducted in Peru by researchers other than myself, as well as a primary interview with a researcher who was present during these interviews. Epistemologically, this reflects the centration of experience which describes intangible and tangible constructs like observed impacts, emotions, and the context of values and lived realities rather than empirically collected data which speaks only to observations from researchers.

### **Agency-Based Capabilities Theory**

Promotion of community agency, especially of women as the bearers of the greatest portion of the burden of mining, is vital to the essence of both the research conducted for this capstone as well as the proposed solution that it informs. As such, one theoretical framework stood out as the best fit for this study, Claassen’s [Agency-Based Capabilities Theory](#). This adaptation of Capabilities Theory expressly attempts to address criticisms of perfectionism in [Martha C. Nussbaum’s work](#), and lack of structure in [Amartya Sen’s approach](#) to Capabilities Theory. These original capabilities’ approaches create a valuable foundation to build from in the direction of agency. For example, Amartya Sen’s work sets the framework that development of society is measured by ability of individuals to enjoy freedoms rather than the achievement of economic thresholds such as GDP. This ability to enjoy freedoms is central to agency, as agency in and of itself is a freedom. Sen describes the attainment of these freedoms as the ability to [expand capabilities and rejects the notion that capabilities are fixed due to the ever shifting and individualized social, cultural, spatial and perceptual factors of what it means to ‘do valuable acts and reach valuable states of](#)

being'. Claassen honors this nuance describing agency as consisting of individual agency-actions allowing 'autonomous' and 'free' moves, participatory agency participation in social action and cooperation, and the highest level of agency, navigational agency- which is the ability to not only participate in actions, but to freely navigate between them. This is intentionally left as a broad definition to make space for the non-fixed state of capabilities as Sen describes them and the highly individual contexts that defines what capabilities are. Claassen argues that for justice to truly be achieved that every citizen must have capabilities to reach the highest level of agency: navigational agency. Essentially, individuals have freedoms of choice and directionality in their daily lives and can make decisions based on their determination of 'valuable acts and states of being' in relation to their own values and lived experiences. Utilizing a combination of the original framework and the agency-based expansion of it, I will be able to analyze current expressions of and limitations on individuals within communities' abilities to determine their own outcomes in life through navigational mobility of everyday choices. I will then apply these findings to the suggestion of a broadcast as an agency enabler by creating space for expression and platform for consciousness raising of obstacles to agency.

## **Methods**

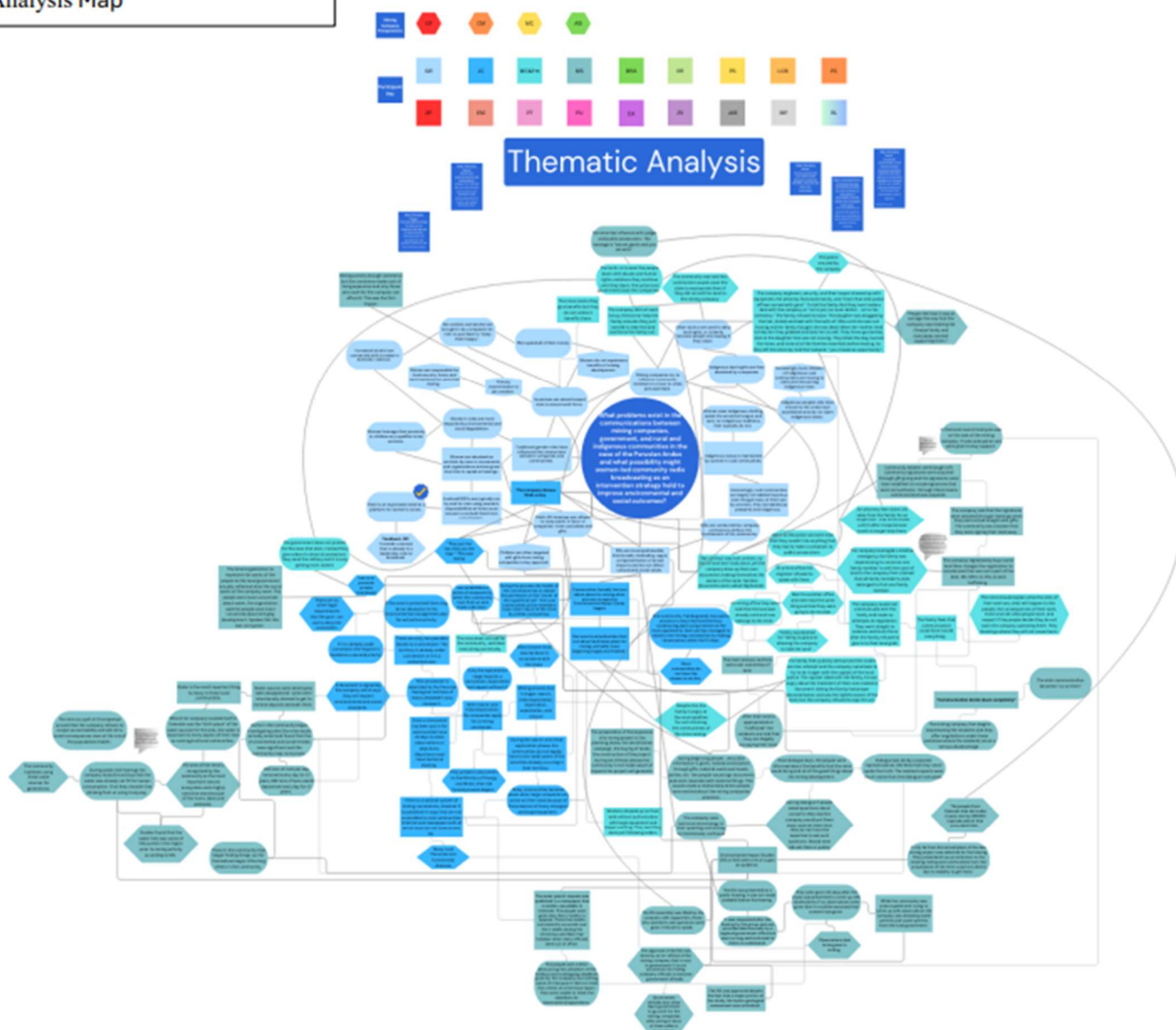
This feasibility study will analyze qualitative data from a primary interview with the director of Latin American Mining Monitor Programme (LAMMP), Glevys Rondon. Glevys has history and rapport with the communities of focus, and has provided invaluable insight into the issues, social dynamics, and ongoing attempts at resolution to mining conflict in the region. I will also analyze 21 interview transcripts from Peru which were conducted between 2013-2023 by Glevys Rondon, Rita Armstrong, and Caroline Baillie. The subjects of these interviews consist of mining industry professionals, non-governmental organization (NGO) representatives, and individuals and families from two mining communities in the Andes of Peru. The interviews were originally conducted in Spanish, which is the common language between different communities in Peru and the researchers and have been translated into English for analysis. Lastly, a review of literature around the topics of mining conflicts in Peru and their contexts, community radio broadcasting, and women led activism provide substantiation and reflect consistency or lack thereof, for the qualitative data provided in the interviews. This method is intended to be reflective of the intangible emotional and experiential data which cannot be accurately depicted empirically or quantitatively.

## **Thematic Analysis**

The data which will be analyzed in this project is qualitative and narrative, the presence of emotion and even the assessment of bias are essential to constructing a well-rounded, real-world depiction of the events and greater social constructs which this project hopes to contribute to addressing. The analysis method therefore is intentionally poststructuralist and utilizes subjectivity as a tool, rather than viewing it as an impediment to reliable conclusions. Reflexive Thematic Analysis is a method described by its creators Braun & Clarke as being about "Articulations (which) might look quite disparate on the surface but... (have) underlying social meaning that draws them together...TA- capture(s) divergences in articulation, and themes...capture competing understandings. Meaning is contextually located, so a...complex analysis would... capture divergences, and different ways of understanding." (Lainson, Braun & Clarke, 2019).

Utilizing this analysis style is appropriate for data that is polyvocal, and socially, politically and historically contextualized. This method provides the flexibility to understand how things that may, on a surface or purely observational level to be unrelated, are in fact connected. It also allows the space to understand the researcher's role in shaping the data and helps to ground the analysis in implicit details which would otherwise be confounded with being irrelevant or unascertainable. Finally, this method of analysis speaks to the broader epistemological objective of being responsive, open ended and adaptable to allow the participants' voices to remain central and apparent throughout, in other words utilizing this method of analysis is intended to allow the research to fit the voices rather than to fit the voices to the research.

Figure 1: Sample of Thematic Analysis Map



## Emergent Themes and Perceptions

For the privacy and anonymity of the interview participants in the original interviews conducted in Peru, the individuals and groups that participated will be referred to using coded identifiers\*.

### A Troubling Lack of Dialogue

Through analyzing the interviews one perception became abundantly clear, and with exception to the perspectives given by the mining company representatives, unanimous: though there are policies and projects apparently aimed specifically at creating dialogue between companies and communities, dialogue is not what is happening. Instead, impacted community members report being unaware of mining concessions given for their properties until the company and their machines are physically present. IA reported that prospecting and initial exploratory phases of mining which identify presence, location and quantity of exploitable ore are “free” and do not require permissions from governments or communities to be carried out. IA expresses that from her experience, often municipal authorities are not even aware of the land lease plans of companies until beginning stages of mining activity have concluded. These beginning stages are not entirely harmless either; processes include surface and below ground exploration that creates impacts like “destruction of vegetation, noise and vibration, groundwater contamination through drilling, and fluid disposal” (read more from a study of exploration and exploitation impacts [here](#).) Yet systems in place require no communications to occur until a mining company puts in for a concession for mining the land. The interview data indicates that participants were led to believe that several stages prior to mineral exploitation existed during which communities were supposed to be able to give input, voice objections, and give consent and specific permissions to the mining companies. One of these stages includes fifteen days after companies have put in for a concession, during which time community members can send written observations; these observations are required to be technical in nature and necessitate pathways by which information on concessions are accessible to communities. However, IA and IC indicate that the ways by which mining concessions are reported are in most cases inaccessible to rural communities. IN, a lawyer, claims that the steps to confer with communities are being disregarded all together, she states:

“The Peruvian state has not complied with having the towns participate in the decision making to see if they want the infrastructure project, or a determined mining project... moreover they are not given the opportunity to give consent for extractive activities that are going to have a significant impact in the life of the communities”.

Other stages like the review of the Environmental Impact Assessment (EIA) are required to include a public hearing. Interviewees reported that these hearings were filled by the companies with company representatives, and supporters which are demonstrative of their approval throughout the event.

\*IA- CEO of an NGO which is involved with Yanacocha, GB- a family from Cajamarca, IC- a movement leader from Celendin, ID- family member of a deceased movement leader in Celendin, IE- Ronda leader from Celendin, IF- director of an NGO in Cajamarca, IG- coordinator of a women’s association and Ronda member in Cajamarca, IH- a community member from Cuzco, II- a community member from Cuzco, IJ- a community leader in Espinar, IK- a longtime community member of Espinar, IL- a former community president of Espinar, IM- a community member in Espinar, IN- a lawyer working with an NGO based in Lima, IO- the ex-CEO of an NGO in Lima and

former Peruvian Ministry of the Environment employee, IP- a lawyer, and IQ- director of an NGO working with the highlands communities. I will also refer to the individuals and groups that represented select mining companies as: MG1- a vice president, sustainable development manager, and community relations manager from a company operating in Cajamarca; MI2- CEO of a mid-tier mining company operating in Cajamarca; MI3- a mining operations consultant, and MI4- the CEO of an explorations company.

IC indicated that EIA hearings and other events like “Dialogue Days” have been held in intentionally inaccessible locations, include the presence of DINOES (contracted police officers who act as private security to the companies) who provoke anyone who opposes the mine, and do not allow for adequate community input during them. Furthermore, that these events were largely uninformative and used to ridicule any member of the audience who showed opposition. The only differing perception of these dialogue sessions was given by MI2, the CEO of a mining company, who claims that his dialogue with the people is truthful and thorough, stating that he personally spends hundreds of hours with the communities and that none of his mine sites have ever had a conflict.

### *Failures of the Legal System*

*“As we say here in Peru, “They put the law, they put the trap.” as the companies always find a way.” - IA NGO founding member*

In her interview, IP, a lawyer who has represented community members fighting the mining companies describes a system that feigns consultation with Indigenous peoples to check legal boxes which are largely tokenistic. She explains that companies have the best legal teams, strategic advisers, media support, technical staff and economic means far beyond that of the communities so for the communities to sit down with the companies without any consultation or intervention to inform them before the meetings amplify power imbalances. Furthermore, she describes that meetings with communities are structured in a way that perpetuates subordination as communities are not treated as experts and are not allowed to sit by representatives from NGOs who are present. [The Consultation Law](#) was passed in 2011 and has the expressed intention of preventing social conflicts which have increased in response to the promotion of extractive industry projects by the Peruvian government. However, within this law it is stated that “An agreement reached as a result of the consultation process... is binding and enforceable at the administrative and judicial levels.”, the issue here, which was expressed by Glevys Rondon, is that once a company obtains a signature from the community the one time given consent is treated as an unretractable and undeniable right to the land and all resources on it.

IN, another lawyer describes ways in which collectively owned and communally worked lands are divided into individual land titles so that companies could negotiate with individuals on land sales. This practice is noted as culturally inappropriate and exploitative because the lands are divided at the bequest of the companies and not the communities, IN insists that the governing bodies that do this know that these communities make important decisions collectively and rely on this collective style of operating making this division disrespectful and disruptive of cultural norms. Furthermore, there have been instances of land being individually negotiated by the companies, then land of other individuals that did not take part in negotiations being appropriated into the land sales of the individuals who do agree to sell. IC referred to this as the “trafficking of land”. This is exact method is what GB describes as what happened to them. They claim that a plot of land adjacent was sold to the company by a different community member by means of coercion, the company then appropriated the land of GB into the sale that



did not include GB. GB, IC and other interviewees describe the company having their own set of documents which have forged signatures and inaccurate information, which they claim are the legal and correct documents and that the documents held by the residents are illegitimate.

### *Absence of Representation*

Every interviewee, including mining representatives, that mentioned government disclosed that local offices are not involved enough, do not have the necessary capacity to represent and uphold law, and need to be more present in the communities, negotiations, informative processes, and must do better at instating laws and protections. Though the motives behind the desire for more government involvement are likely differing, the conclusion that government is not doing enough is unanimous. IP states that to ensure that the power asymmetries are more balanced, government representatives need to join as a third party in public hearings, dialogues, and negotiations to ensure that the meetings are fair, true, and that companies are upholding their entire obligation to community consultation. Furthermore, GB and IC state that local governments need to take on the responsibility of ensuring that the company is providing all available information to communities and take it upon themselves to ensure that communities have access through some means to information put forth. Instead, local governments are noted as siding with the companies, being bought off with vehicles, campaign support and other gifts. Local offices are also mentioned as aiding companies in discrediting community members who disapprove of the mine and interviewees describe feeling as though they had nowhere to turn and no one to help them.

### *Distractions and Diversions*

Throughout the stories told in the interviews, the theme of the companies entering a relationship with the community through gift giving, grandiose promises of the benefits that the mining company will bring to the community and the buying of approval and fondness of the community are multiple. The relation of this practice to communication is direct, if a community's approval can be superficially bought then the company can quickly get the signatures that they need to continue with their processes without having to communicate anything. The idea is that communicating is more difficult because once environmental and social impacts are brought up, the mine is a harder sell. By diverting attention away from the actual issues companies hope to begin exploitation sooner.

### *Corporate Time Frames and Social Licenses*

The data indicated that relationships between companies and communities change drastically between exploration and exploitation phases and one reason given for this is corporate time frames. IO, an ex-CEO of an NGO and former government employee, states that business agendas always preside over social agendas and as such that social licenses, a necessary step in the securing of the right to mine the land, follow the business time frame. MI2 agrees with this stance stating that most companies are unwilling to be inconvenienced by the fact that social relationships take longer to build than technical business steps take to complete, both agree that when companies attempt to simply buy, rather than earn approval it is a fast track to social conflict because communities are unable to prepare for the inevitable unpleasant side of mining. MI2 elaborates that it is important also to communicate how mining impacts will be remediated after mining operations are finished, which is a conversation that cannot happen if the impacts are never communicated in the first place.



## **Power-Asymmetries and Affirmations**

### *Division within Communities*

One strategy of the mining companies described by interview participants was the intentional dividing of communities against one another by investing in creating support for the company and activities with community members in proximity to vocal objectors to the company. By creating this division several things are accomplished- communities are unable to organize against the company because they are fighting amongst themselves, companies have individuals to reference when illustrating how well liked they are in the towns where they operate, and community members act to suppress and discredit those who object without the company having to involve themselves. IK describes the mining company hiring a group from the community to monitor other community members to collect information on who is speaking out against the mine. They meet twice a week to discuss with the company what they have heard, and they are compensated. IN describes a situation in which the mining company is arming rural workers to be able to confront any community members who oppose the mines, which is likely to incite violence amongst community members. Violence within the community also perpetuates stereotypes of the communities being uncivilized and “backwards”, a picture which paints the company as the hero who brings development and order. This community degradation is also mentioned by Glevys Rondon who states that often companies will encourage men in the community to drink copious amounts of alcohol and will bring in sex workers, which destroys familial relationships and creates a culture where those who are receiving the benefits stand with the company, whom they rely on to feed their newfound vices. IJ says in her interview “the division starts, and if a community is so divided then our traditions are no longer there, our culture, everything is breaking apart, and the mining companies should not do that.”

### *Private Contracts with Public Forces*

DINOES are private security hired by the mining company, however as IP describes since 2011 police officers are allowed to privately contract their services during regular work hours, so what is happening is that policemen which are paid by the taxpayers are also accepting compensation from the companies to act on their private interests. This is a major issue because the police are using excessive force and have even killed people in the name of the company. The people are in turn developing a deep distrust of the police and a public entity which is supposed to protect them are acting on private interests and becoming a major threat to them instead. The excessive force and intimidation then take place of dialogue and communication as the main mechanism by which negotiations occur. This also negatively affects the community’s relationship with the government because policemen in state uniforms are the only form of government official that they see regularly. Without the ability to use other pathways to negotiate and have their concerns addressed, communities exercise their ability to publicly protest, however with the enlistment of the police and in some cases even the military, interviewees describe the complete suppression of protest by police and paramilitary using excessive force.

## **Communication Politics and Dominant Discourse**

### *Company Control of Media*

IJ is the host of a radio show for women, she describes how the company came to her and wanted to give her funding for her show, but that she had to publicly thank them and say good

things. She refused to do so and her refusal of support for the company led to her being criminally tried for slander of the company. IK describes the company buying out all radio programs and newspapers in the areas surrounding mining, he states that every single radio program in the area is owned by the company, and they control what is said on them. Through these mediums they portray towns that are thrilled with their presence where life is so much better because of the company. They show festivities and broadcast interviews with members of the community who support them. This propaganda not only creates a favorable climate for their eventual expansion but also delegitimizes outspoken objectors to the mine and the impacts. This is important to feed the public perspective that those who are against the mine are just looking to gain something and are lying.

### *Public Perceptions of Communities and the Ideation of 'Greater Good'*

MI2 talks about the greater good that the exploitation of minerals in certain areas fuels for the entire country. He repeats a narrative that is all too common in Peru, that those who oppose the mining projects oppose the betterment of the country and the development of their own towns. He credits the corrupting want for socialism for why they do this, stating that they put their political agendas over the social needs of the whole of the country by hoarding land that does not belong to them. This idea was discussed in the literature review of this capstone, referring to Georgios Kallis's (2017) account of Alan Garcia's description of rural communities as the selfish backwards people who stop the progress of the whole nation.

## **Discussion: Women-led Community Broadcasting**

### **Disrupting Generalizations about Women**

#### *Looking Beyond Victimization*

Through the stories told by the women participants in this research, we can see that while they have in fact been victims in many cases of exploitative mining activity and gender-based violence, victim is not their identity and portraying them as such undermines agency. Through the review of the transcripts, it is apparent that women in mining communities in Peru are exhibiting everyday acts of resistance such as continuing work and live on land that they have wrongfully been told no longer belongs to them, refusing to be bullied into selling their land, or refusing gifts that they understand are intended to buy their compliance. More explicit acts of resistance like partaking in social protests or even the story of the woman who refused to thank the mining company for giving her a radio show and then used the show to speak out against the company's disrespect of the community and environment show that this reduction of women to merely victims diminishes the strength and persistence shown by so many of them in small and large ways. Creating a space where women can obtain the mobility of expression of their perspectives and stories not only would increase their agency, but it would also encourage the reevaluation of stereotypes of women in these contexts by challenging oppressive narratives and promoting agency for women adjacent to those who are made visible.

#### *Participation Equity and Gender-roles*

Beyond this, creating a space for women in activism and dialogue about mining would show that they are more than their gender-roles which show them only as maternal caregivers and homemakers in the context of Peru. While these roles are powerful and valuable in their own right, they are yet again reductive and lead to women, who are typically the most burdened by the impacts of mining because of these very gender-roles, being left out of the dialogue about

consent, and negotiations that lead to decisions which profoundly impact them. The promotion of space for women to participate unmasks and addresses the patriarchal exclusion of women from these spaces by both men within and out of the communities and would provide a seat for women at the table of discourse about mining and development of the communities in which they live and work. It would also expose issues around mental and physical health, and daily hardship that are not typically experienced by men in the communities to the same extent because of the normativity of the male experience, catering of community benefits to men, and the greater proximity of women to the natural environments which are being impacted than men due to gender-roles. This is in line with both Agency-based Capabilities and Eco-Feminist frameworks.

## **Culturally Appropriate and Accepted Information**

### *Opening Communication Pathways*

Rightfully so, community members who were interviewed expressed a distrust of the information that they are given about mining by both government and company sources after the initial honeymoon phase of company-community relations. The creation of a space for communication between communities of prior experiences with mining activities and companies and actualized impacts would better inform communities about what to expect from mining in their communities and help create transparency of information that mining companies and government sources are likely unwilling to divulge because of their vested interest in the execution of mining projects. The kind of information given this way could also be more contextually appropriate as it would likely include more qualitative aspects rather than technical facts and figures. This kind of information sharing is much more valuable to and relevant to communities than technical data. However, the technical information still needs to be made available to communities in ways that are adapted to their understanding, this could only occur by having allies partake in information sharing who poses the technical knowledge and ability to relay this information to communities.

### *Information Through Representation*

With this, community partnerships need to be created and would ideally consist of community representatives who are committed to the community and not the mining companies' best interests. These individuals would greatly benefit the communities not only as information relays but also as informed representatives who can assist in negotiations, contracts, and ongoing consent attainment throughout the lifespan of the mining projects, as well as an agent of accountability enforcement for corporations. By including technically informed individuals in community communications the playing field may be more level for actual informed consent to occur.

## **Needs Beyond Broadcasting**

### *Talk Can be Cheap*

Though this solution aspires to drive structural change through consciousness raising, like any singularly focused solution, community radio broadcasting could fail if not supported by structural changes. Governmental agencies in Peru, and beyond, must shift from measurements of national success through economic measures alone, and begin measuring the opportunities and navigational agency created for their citizens and the ecological health which supports them. Furthermore, companies must be held accountable for their activities by both the

governments in the countries where they are operating and the countries from which the corporation originates. With these combined factors communities could experience agency within the context of mining to determine the outcomes of development or to refuse development within their communities all together. The desire for the ability to refuse mining activity was after all, the single most expressed sentiment amongst the community member interview data when asked how things should change.

### **In Summation**

Dialogue with communities around mining activity is heavily influenced by the desire for it to proceed and profit by those in who hold power in Peru, namely governments and companies. Addressing discrepancies in the communications about environmental impacts, social outcomes, economic issues, and land rights would be a large step in the direction of agency for communities. This is especially women who are often the most affected by mining activities due to gender-roles and are most consistently left out of the discussions around mining and activism by mining professional, government and community actors. Community radio broadcasting featuring women's narratives of lived experiences could be a platform for enabling women's activism and expressions of agency through the raising of consciousness about the experiences of violence, health impacts, environmental impacts and more that they face. However, the power of this truly comes from the ability of women and others in the communities that are impacted to portray themselves with more than the single story of victimhood, and express their acts of resistance, strength, perseverance, and more. Afterall it is their story to tell, and I can personally express that listening has been a powerful experience.

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## Indigenous Autonomy, Water, and Mining in Bolivia: An Archival Study

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Leah Cottrell (She/Her)

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### Abstract

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Indigeneity is explored in this paper in the context of water, mining, and autonomy within the Bolivian region. Special consideration is taken with the Indigenous political figure Evo Morales while I incorporate archival research of various Indigenous voices. The literature review encompasses research conducted throughout the general Latin American region for a more informative foundation, as much of the research within the mining context omits Indigenous perspectives. This research paper investigates how Indigenous autonomy is situated throughout Bolivia in relation to mining and water and contributes to existing literature through amplifying Indigenous voices on autonomy. The results of this study find themes such as Indigenous spatiality to self, signifying a deep connection between identity and environment, social violence and resistance, and disparities in consultation with Indigenous leaders. Indigenous autonomy is confirmed to often be undermined in practice, even when it is acknowledged in legal writing. The discussion expands towards de-colonizing westernized systems, such as with Bolivian politics, and suggestions to further improve the sustainability of these systems as informed through Indigenous knowledge and insights.

### Introduction

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**“The rivers for us are the artery, the most important thing that mother nature has”...“we could compare it to the jugular vein” - [Alex Villca Limaco](#)**

Water is a central component to Indigenous identity and well-being. Water supports human life, plants to sustain the environment and the biodiversity that coexist alongside Indigenous peoples and serves as an indicator of overall planetary health and well-being. Access to clean water is a human and environmental right. This right has been impeded by mining, which results in runoff contamination into water that has no boundaries, and through monopolization of water for profit.

Bolivia serves as a key setting to analyze Indigenous autonomy in relation to mining and water due to its unique socio-cultural history and status as the first nation in Latin America to elect an Indigenous president, Evo Morales. The country is home to the largest Indigenous proportion in Latin America, with about 56%-70% of citizens of full Indigenous origin ([U.S. Department of State n.d.](#)). The history of mining in Bolivia predates colonial times, where silver was extracted in large amounts from the Potosí mines at the hands of indentured Indigenous labor ([Morales, 2010](#)). Today, Bolivia is reported to have over 1,400 mines and is a world producer for natural resources such as gold, silver, and lithium ([The Diggings, n.d.](#)). As mining has become a major domestic commodity for Bolivia, the water strain on communities and the environment has increased to support extraction endeavors. Some mining projects are backed by Indigenous locals; however, many community members have caused social upheaval due to Indigenous human rights, environment, and autonomy extractivist exploitation. To the public's

surprise, much of these human rights violations have occurred under the jurisdiction of Evo Morales, who is Indigenous himself, and who initially advocated for the well-being of Indigenous communities throughout the nation.

Throughout this paper, I dive into the current literature available to understand Indigenous autonomy throughout Bolivia within the water and mining framework. I aim to make connections between existing literature to formulate an informative overview of the autonomy situation amongst various Indigenous peoples in Bolivia. My literature review utilizes research conducted within the broader Latin American region, while specifically utilizing secondary sources. I utilize primary sources more dominantly within the results and discussion section, so as to uplift Indigenous voices as an informative tool for discussion. This is a fully archival research study, which hopes to amplify Indigenous voices that have already been documented and spread out among varying resources. Limitations of this research alongside contributions are incorporated throughout. There are various implications for further research suggested, such as the need to invest in mental health research regarding identity and extractivism, and the aftermath of various social conflicts that have resulted in trauma, violence, and even fatalities. I ask the following research question to help guide my research with a focus on autonomy, Indigeneity, water, and mining: **Through the lens of Indigenous within Latin America, specifically Bolivia, what is the current situation of *Indigenous autonomy* in relation to the mining industry, and how may these perspectives inform further sustainable interventions?**

## Literature Review: History, Indigeneity, and Discourse

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### I. Brief History

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Mining has a historical legacy throughout Indigenous Latin America. Bolivia in particular holds historical significance with silver mining stemming from 1514 in the Potosi mine in modern-day Bolivia ([Guajardo, 2013](#)). Forced labor and disruption of Indigenous ways of life occurred during this colonial era, sparking the beginning of an ongoing exploitation of sacred lands and people. Though colonial occupation from the Spanish in Bolivia ended in 1824, war continued through land grabs from the new nations of Peru and Chile ([CHIMU, 2024](#)). Bolivia's geographical space dwindled after La Guerra del Pacifico, or The War of the Pacific, losing its oceanic boundaries to now a land-locked country ([Memoria Chilena, 2024](#)). Interests from Chile of the Atacama Desert were due to the naturally occurring saltpeter, which was a popular component of explosives used for warfare during this time. Today, the Chuquicamata Mine in the Atacama Desert is the largest open pit copper mine, and lithium is particularly rich in the area as well ([EROS, n.d.-b](#) and [EROS, 2021](#)). According to [The Diggings \(2025\)](#) website, Bolivia has a recorded 1,408 mines, with some that may not be accounted for. Tin, lead, zinc, copper, silver, and lithium are the main natural resources prevalent throughout the nation. These sources are significant for the increased production of modern-day technologies such as smartphones, electric vehicles, and home appliances predominantly consumed by the Global North.

La Guerra del Agua in Bolivia (2009), translated as *The Water War*, is a key historical event that occurred in Cochabamba, Bolivia due to increases in water prices from monopolization of the source, which further resulted in protests. La Guerra del Agua set the precedent for community organizing, particularly among Indigenous communities, as the traditional Indigenous practices of water autonomy, like harvesting rainwater amongst other practices, were systematically criminalized as backed by the Bolivian government ([Clements, 2009](#)). Water autonomy among Indigenous throughout Bolivia was infrastructurally stripped

through the weak governmental systems that aim to serve international for-profit corporations through mining and water extraction, in effect altering the sovereignty of Indigenous communities that persists today.

## II. Terminology Clarification

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Commentary on key terminology used throughout this paper is necessary for a true understanding of the archival literature sources that are the foundation to this research. The word “Indigenous” can often serve as a conflicting term; to identify as “Indigenous” or to identify another as Indigenous holds varying socio-cultural and political implications. According to the [Bolivian Constitution](#), “Indigenous” is explained as “the human community descended from populations that were settled prior to the conquest or colonization and are located within the current boundaries of the state; they have a history, an organizational structure, a language or dialect, and other cultural characteristics that identify their members as belonging to a given sociocultural unit; they maintain territorial ties by managing their habitat and their social, economic, political, and cultural institutions.” Spatiality of self to land (i.e. ‘maintain territorial ties by managing their habit...’) is a common detail utilized to define “Indigenous.” It is also common to not mention land at all, such as through the [UCLA Equity, Diversity, and Inclusion](#) department: “Indigenous refers to those peoples with pre-existing sovereignty who were living together as a community prior to contact with settler populations.” Though “Indigenous” can have various contextual meanings, I will abide by the definition as staged by the Bolivian Constitution as it relates directly to the purposes of this research study, as well as the lack of resources on how Indigenous Bolivians themselves would define “Indigenous.”

[Article 5](#) in the UN Declaration on the Rights of Indigenous Peoples states ‘autonomy’ is the right to self-determination, and further “the right to maintain and strengthen their distinct political, legal, economic, social and cultural institutions, while retaining their right to participate fully, if they so choose, in the political, economic, social and cultural life of the State.” This “right” that is explicitly defined by the United Nations implies that Indigenous peoples have the access to institutional participation. However, as I explore through this paper, this is far from the truth.

## III. Situation of Autonomy

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The Bolivian Constitution defines “autonomy” in relation to Bolivian Indigenous in [Article 289](#) as follows: “Rural indigenous autonomy consists of self-government and the exercise of self-determination for rural indigenous nations and native peoples who share territory, culture, history, language, and unique forms of juridical, political, social, and economic organization.” Additionally, the UN Declaration of Human Rights on Indigenous Peoples states in [Article 10](#) the following: “Indigenous peoples shall not be forcibly removed from their lands or territories.” These sources depict an institutional inclusion of autonomous rights for Indigenous peoples throughout Bolivia. The infrastructure for Indigenous autonomy is embedded in the written law. Yet, [Tockman and Cameron \(2014\)](#) claim, “Bolivian government officials and policy serve principally to constrain the exercise of indigenous autonomy, allowing it to function only on a restricted scale and with limited jurisdiction for largely symbolic purposes.” They state that Indigenous autonomy and rights in Bolivia are widely recognized, but institutions actively “undermine them in practice” ([2014](#)).



Even when Indigenous members are given an opportunity to be included in decision-making processes and consultation, it is also possible for Indigenous People to consciously choose not to be a part of this process. [The Leveraging Transparency to Reduce Corruption project \(LTRC\)](#) states, “governments and companies have often used these processes as box-ticking exercises rather than as opportunities to subject projects to scrutiny and solicit meaningful input on their design. In this context, Indigenous communities often fear being co-opted or used to legitimate projects that they do not support.” Accountability from governments, companies, and necessary infrastructural change for Indigenous collaboration must occur to move toward sustainability. This requires public health officials with high cultural sensitivity, those able to communicate cross-culturally in an empathetic way, engineers from various fields to offer different solutions and perspectives for project designs that are independent from political mongering, and cooperation from the government and companies that have historically disregarded this meaningful input in affected communities.

#### IV. Perceptions of Mining

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This study aims to focus on the Indigenous perspectives in Bolivia. It is insightful to also grasp the perceptions of mining throughout the Latin American context as a whole. Salvadorians report a 70% opposition to mining due to environmental and health concerns for younger generations ([Zakrison et al., 2015](#)). Consultations with various communities throughout Latin America from 2002-2012 highlight 700,000 people reporting a “massive rejection” to mining activities throughout the nations of Peru, Guatemala, Argentina, Colombia, and Ecuador ([Walter and Urkidi, 2017](#)). Reasons for this rejection include environmental contamination, negative health implications from said contamination, “livelihoods, and identity and social structure...” ([2017](#)).

Yet, the Brujula Minera survey showcases an 83% positive perception of mining in Chile ([Cruz, 2024](#)). Indigenous perceptions were not stratified for this survey. Nonetheless, Indigenous perceptions are variant in themselves, as seen with a peer-reviewed article by [The Extractive Industries and Society](#) ([2022](#)) discussing the Salar de Atacama (The Atacama Desert), “... besides outright opposition, such negotiations have also encompassed diverse forms of participation, such as environmental monitoring, or benefit sharing in the form of jobs or compensatory payments.” This suggests ways in which collaborative efforts can inform a more sustainable approach to mining. Due to Bolivia’s lack of opportunity for local economic development (ranking 100th out of the 122 countries documented in the [Global Innovation Index \(2024\)](#)), it is reasonable to understand the positive perceptions of mining work available to Indigenous peoples despite the threats to the environment and communities. As negative health conditions of the environment and humans often develop after a period of time, the opportunity to earn a more immediate income from mining may override potential health concerns. This holds concern for the systemic barriers in place, however, such as equitable employment opportunities for Indigenous peoples in non-extractivist fields of work.

#### V. Mining Under Indigenous Leadership

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Bolivia has [38 recognized Indigenous groups](#) and the largest proportion of Indigenous people compared to any other country in Latin America, with an estimated 56%-70% citizens of full Indigenous origin, and about 30%-42% of *mestizo* (mixed) ethnic origin ([U.S. Department of State, n.d.](#)). The inauguration of the first Indigenous leader of the Bolivian republic, Evo

Morales, showed promise and hope to the majority Indigenous nation, as seen with his majority 54% vote during his 2006 election ([Britannica, 2025](#)). Evo Morales is the first Indigenous leader to gain power on the political level not only in Bolivia, but throughout all of Latin America. Morales transitioned the perspectives of mining for the general public from an act of historically exploitative practices to an opportunity of entering the competitive global market. Morales initially offered to the public an idealistic ‘future-oriented’ approach to lithium mining in the Uyuni Salt Flat, which would improve the socio-economic standing of many in the competitive mining market ([Carpanese et. al., 2024](#)). [Sérandour \(2017\)](#) examines Morales’ success via propaganda techniques that convinced many Indigenous Bolivians to accept and even advocate for increasing mining projects.

However, Morales’ popularity decline can be attributed to his advocacy for mining on Indigenous lands that did not necessarily result in the ‘future-oriented’ aims that were promised. His decline of support was further exacerbated when he convinced the Constitutional court to allow his re-election after the majority public vote wanted him out. From the literature found on Evo Morales, the high hopes from many Indigenous peoples who have historically been underserved by the government were falsely met with deception and power gains. The authors depict a similar tone of unjust manipulation for political gain from Morales, posing the need to investigate the consequences following his political rule. The role of Neo-Marxism as an analysis framework positions Morales’ rule to be just one of the many supporting roles towards globalization efforts, resulting in unjust exploitation of Indigenous throughout Bolivia for the consumption of domestic elite communities, alongside western nations that consume products at a cheaper price.

## VI. Water: Mining and Health

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Mining extraction poses serious harm to air, soil, and water that causes health issues amongst plant and animal species, human well-being, and sustainability of the impacted environment and biosystems within. Throughout this paper, I will explore the significance of water as a culturally and environmentally vital resource which has been impacted by mining. This will be evidenced with Indigenous perspectives as represented in the literature. Water is complex; it spans boundaries fluidly and holds its own biodiversity that depends on its health, efficiency, and abundance. Though mining is believed by some to be advantageous economically, it requires extensive water use. For example, about 500,000 gallons of water is utilized per tonne of lithium ([Katwala, 2018](#)). Gold requires 250,000,000 liters of water per tonne ([MOERK Water, 2024](#)). In general, almost 100,000 cubic metres of water is used for mining in Bolivia every day, which amounts to the total amount of water used by the capital of Bolivia for two days ([Katwala, 2018](#)). The excessive water use for mining further exacerbates the already limited water supply due to drought. 178 municipalities have declared drought to be a state of disaster in Bolivia, impacting millions of families, livestock, and crops ([DREF Operational Update, 2024](#)). However, Bolivia’s government continues to allow the extraction of water for use in mining instead of distribution to communities lacking access. This instigates a moral questioning of how ethical mining activity is for those directly impacted, specifically Indigenous and other surrounding communities. Furthermore, it necessitates an increase in Indigenous autonomy relating to water and policy which reflects the lived experiences of the relevant communities.

Water contamination is another significant concern in regard to Indigenous health and mining. For example, water from neighboring rivers to Indigenous communities in Bolivia, the

Aymara Pakajaqi, were “being diverted for mining, reducing the flow to about 600 people downriver” and the “water that does come to the community has become contaminated and harming crops and livestock” ([Indian Law Resource Center. \(n.d.\)](#)). This is a public health crisis; access to clean drinking water is necessary for the very livelihood of human health, as well as the environment and surrounding ecosystems. Poor water conditions can be attributed to the “discharge of untreated mine water,” which eventually makes its way into surface water ([Lewis et. al., 2017](#)). This then contaminates the water sources that neighboring communities utilize for cooking, drinking, bathing, and supply for their crops and livestock. As many, if not all, Indigenous riverside communities rely on fish as a main source of their diet, many Indigenous are particularly vulnerable to water-induced health issues. A peer-reviewed article finds that mining and milling ores of the Cerro Rico are the main source of lead contamination in the Bolivian Pilcomayo River ([Stassen et. al., 2012](#)). The Weenhayek are an Indigenous community that resides along the Pilcomayo River, and were found in this study to have higher concentrations of congenital anomalies, reproductive issues, and developmental disorders associated with water intake ([Stassen et. al., 2012](#)).

Collaboration with environmentalists, engineers, and ecologists is necessary for a full understanding of how water changes impact the ecosystem that Indigenous people live in and rely on. This has implications for food supply and water access changes for Indigenous. Water use and contamination in the context of mining holds insight towards Indigenous autonomy; reclamation of self-determination of water resources holds promise in improvements of water quality, access, and health. Indigenous water sovereignty would thrive through these collaborations, as well as with organizations or political figures that have the means to fund material needed to maintain a clean water source.

## VII. Discrepancies in Mining Benefits

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Mining benefits to the Global North showcase a disparity in accessibility, allocation, and use for those in the Global South. The growth in neoliberal globalization has coined the interchangeable terms “the resource curse” and “the paradox of plenty” to describe the lack of countries who benefit from their own natural resource supply, instead depending on outsourced investments for export ([Natural Resource Charter, 2015](#)). These terms relate directly to Latin American nations, where many aim to enter global markets through export of natural resources, such as various precious metals (lithium, gold, etc.), instead of investments into domestic affairs.

In mainstream media, unless the discussion is explicitly about the positions of Indigenous Peoples, euphemism is common in support for mining activities for the benefits of those residing and profiting from these practices. However, there is a clear “lack of local benefits from mining projects” ([Bernal et al., 2023](#)). Cooperative miners within Bolivia experience inequitable outcomes, who represent “90% of the mining workforce, although they generate only 30% of total mining exports” ([Achtenberg and Currents, 2016](#)). Most of the mining work is carried out by a temporary, low-wage labor force under extremely precarious conditions, without benefits. Approximately 55% of Indigenous Bolivians reside in rural areas where the majority of mining activity occurs ([Kirkpatrick, 2021](#)). Data from Peru and Ecuador show that rural communities have significantly less access to the internet than their urban counterparts ([Luisetto, 2023](#)). Because of a lack of literature specific to Indigenous internet access in Bolivia, this data serves as a reference point given the contextual similarity. It is through this analysis that it becomes evident that those who are most affected are also those who benefit least from resulting advancements to technology that mining enables.

According to the [United Nations \(2014\)](#), “more than 200 conflicts in Indigenous territories are linked to extractive energy and mining activities.” This may be due to increased “militarized” areas. These conflicts often result in injuries, health conditions from contaminated environments from mining waste, and fatalities.

Not only on the domestic level, but international discrepancies in mining benefits and exploitation are prevalent. While Latin American regions are used for extraction, consumption is predominantly visible in the Global North. For example, Chile is one of the major producers for lithium and copper, yet “Chile’s production is not increasing fast enough to meet the expected demand. Some producers are struggling to expand operations due to falling productivity, declining ore grade, and long cycle times to open new mines, among other reasons” ([Leiss and Yeluri, 2021](#)). This “expected demand” stems from the consumer needs of the Global North: electric vehicles, and technologies like laptops and cell phones. A study conducted in the Atacama Salt Flat in Chile suggests that lithium mining has created a “rapid change to traditional culture and social practice” and has led to “social conflicts between mining firms and local communities;” causing migration as “many locals abandoned their agriculture land due to the lack of water” which has been contaminated from tailings, the by-product of mined ore, from lithium mines ([Liu et. al., 2019](#)). Questions are rarely asked as to *why* there is “falling productivity,” *what* has all the ore grade been utilized for, and *why* is it taking longer to open new mines. While the Global North’s consumption needs remain unsatiated and constantly sought after, the continuous commodification and destruction of Latin America’s environment and local populations remains business-as-casual.

## Contribution to Literature

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This project aims to engage readers with the situation of mining and water throughout the Global South, specifically Bolivia, with an emphasis on Indigenous autonomy and voices. My goal is to build on existing literature and to highlight the current documentation of both the strengths and limitations of available research. This study explores the major gap in mainstream literature: Indigenous perceptions of mining and water impacts, and the potential for improving Indigenous outcomes relating to mining, water accessibility, and health. Even though Bolivia holds the highest proportion of Indigenous communities throughout Latin America, most of the literature focuses on other nations, such as Peru, Chile, and Brazil. A majority of peer-reviewed literature often omits the direct voices of Indigenous communities as well, pushing the need for an emphasis on Indigenous-guiding material to further inform the mining framework in the Bolivian region. This paper draws on the shared experiences of Indigenous across the Latin American continent to provide suggestions about sustainable interventions that can be made to empower the impacted voices from mining in Bolivia that are often overlooked. This project’s focus on Indigeneity, autonomy, public health, water, and mining in Bolivia unites the complexities of mining outcomes by bringing segregated pieces of literature into a coherent whole, drawing connections between various documented experiences rather than focusing on one set participatory group. Indigenous autonomy as a central focus to this paper serves to enlighten readers on the historical, systemic, and prevalent barriers to self-determination of Indigenous rights and well-being. Indigeneity in relation to mining and water often depicts Indigenous communities as victims to ill consequences. Though these impacts may indeed disproportionately impact Indigenous communities negatively, such as water contamination or accessibility, autonomy as a focus portrays the infrastructural issues that prevent many

Indigenous from obtaining equitable outcomes, while also highlighting the resistance and empowerment actions that continue towards Indigenous self-determination.

Perceptions of mining by impacted Indigenous communities holds value for trans-collaborative efforts. Acceptance, resistance, and community efforts stem from a community's perception of an issue, which would affect the outcomes of mining projects. It is also important to acknowledge the perceptions of mining from power systems at play, which may inform the ways in which discussions across borders, cultures, and languages can improve to be productive and collaborative on all fronts. Laying the foundation for the understanding of Indigeneity, autonomy, and mining continues to propel discussion towards sustainable interventions and highlighting Indigenous perspectives that continue to be silenced and dismissed in the academic world of research.

## Methodology

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I pose the following question as a guide towards discoveries within the mining, water, health, and Indigenous autonomy framework: **Through the lens of Indigenous communities within Latin America, specifically Bolivia, what is the current situation of Indigenous autonomy in relation to the mining industry, and how may these perspectives inform further sustainable intervention?** From this, I ask: *What is Indigenous? What defines indigeneity and autonomy? Regarding water and mining, what interventions are being implemented to increase autonomy and why are these necessary? What are and why are there barriers to achieving sustainable outcomes? Who pays and who benefits? What are the shared experiences with different Indigenous groups throughout Latin America? How well are Indigenous groups represented in existing literature and what leads to this representation or lack thereof?*

This study will analyze a collective archival of literature that is informative of the current state of mining, health, and Indigenous communities in the Bolivian context. A particular focus will be on what research has been conducted on Indigenous mining perspectives and experiences with Indigenous autonomy, health, and mining, as well as to take this opportunity to observe the gaps in literature. Mining is at the heart of Bolivian history, culture, and socio-economy. Therefore, how mining has developed, and consequently the impacts it has had on local Indigenous communities and environments will be important to understand.

Interpretivism is relevant to this research study as a majority of the literature gathered is from qualitative research methods. The information gathered is then subject to the understanding and biases of the researchers, and further to my own understanding of their findings. The data used for this research topic go through many sources before I receive them, oftentimes in a quoted article. Mining interviews provided by Dr. Baillie, for example, depict an interpretivist approach. Many of the news articles utilized throughout the literature review also quote Indigenous opinions and statements. Interpretivism states that reality is subjective, which validates the unique experiences and opinions of Indigenous that are found throughout the literature. Interpretivism also draws from the interviews I gather from my data, where responses from these interviews depend on the questions asked, the context of where and who were asking these questions, as well as how I then interpret the responses for discussion.

Colonialism theory is a framework that serves useful for this research topic. Colonialism theory acknowledges the history of colonization in the context of mining and Indigenous, and accounts for the current marginalization of many Indigenous communities due to this history.



This is an important aspect due to the colonial Spanish and Portuguese powers throughout Bolivia, and Latin America as a whole, which sparked the extraction of natural resources. Neo-Marxism is another theoretical framework that will be utilized throughout this research process, which analyzes Indigenous communities in the global context. As mining for resources like lithium and copper is often advertised to the Global North to be a “sustainable transition,” Indigenous communities continue to be exploited. Neo-Marxism views the mining context through the various systemic complexities that factor into the impacts on Indigenous communities in the Global South and Global North. For example, products such as electric vehicles and solar panels are marketed as solutions to the global climate crisis for westerners, however the extraction and production of these items are often omitted from the public. Not only are products like these often unattainable to those in the Global South, like Bolivia, mining materials for these items exacerbate already drought-driven water shortages, contribute to water contamination and water-induced health conditions, displace thousands of Indigenous from their ancestral lands, and disrupts the overall environmental health.

This study is dependent on archival research being collected through literature reviews on reports, articles, interviews. Information has also been provided with MESH courses, such as ESH 501: Engineering and the Health of the Plant and ESH 520: Sustainable Energy, to name a couple. Interviews are provided by Professor Caroline Baillie with her research on mining and documented experiences from Indigenous voices. Dr. Baillie holds a significant role in this project because it is through her ESH 501 course that I gained interest in the topic of mining in the Global South and Indigenous impacts. Her direct experience with the focal study population is influential with knowledge sharing of Indigenous voices from Peru.

A majority of the research analyzed was from PubMed, the Lancet, and other platforms through the University of San Diego online library and Google Scholar. Government and advocacy websites have also been utilized to understand organizations and outreach with Indigenous communities. The following keywords were used for research purposes: “Indigenous” or “Native,” “experiences,” “perspective,” “autonomy,” “water,” “health,” “Latin America” or “Global South” or “South America,” “Bolivia,” “mining” and/or “natural resources.” Primary and secondary resources were mostly separated; I attributed only secondary sources within the literature review and amplified primary sources within my results and discussion section. The aim is to corroborate the results and discussion sections in conversation with the literature. Ethical considerations such as anonymity were considered for interviewees whose words inform the results and discussion sections. Anonymity of interviews from private resources will remain throughout the paper. Pseudonyms for these interviewees are used to ensure anonymity. However, as the format of this paper requires the use of hyperlinks, anonymity of those included in public works would only be possible without citing the source in which they were interviewed. Thus, interviewees’ true names are utilized throughout this paper, not only to give credibility to their words, but also to provide context and connection between the interviewees and reader.

Consultation for feedback and peer collaborative efforts have been performed weekly for the 14-week endurance of the capstone course. A mentor and two peer cohorts join in these meetings for mutually beneficial and enlightening discussion surrounding each research topic. These weekly meetings serve as a fruitful opportunity for constructive criticism and diverse inputs to improve the research process.

The findings of this study are mainly analyzed through a Neo-Marxist framework. As mining within the Indigenous context throughout Latin America requires a historical background



and understanding of the current socio-economic and systemic powers at hand, the Neo-Marxist framework requires all these factors to be considered when discovering information of mining impacts on Indigenous health and sovereignty.

## Limitations in Current Literature

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It is important to note the gaps that are prevalent throughout this literature review. As this research focuses on Indigenous perspectives and communities throughout Latin America, notably throughout Bolivia, it is significant to centralize these voices. However, this is where literature is most limiting; there is minimal, if any, previous research that incorporates and highlights Indigenous voices in this region within the mining framework. My own positionality while conducting this capstone study additionally is from an outside, non-Indigenous point of view, with limited access to literature through financial and institutional barriers. For example, much of the research cannot be accessed with the University of San Diego institution login or is only available through monetary purchases. These pay-walls have considerably been a barrier throughout the research process, where documentation of Indigenous voices in relation to mining, water, and autonomy are inaccessible to supplement the data needed for more in-depth analyses.

Patterns in much of the literature focuses on Aboriginal or Indigenous Natives from lands of the Global North such as Canada, United States, New Zealand, and Australia. Though the experiences and perspectives of Indigenous globally are insightful and potentially relevant to this case study, it is a continuous conscious effort to not generalize the experiences of those already available in the literature to the focus population of this study. Language barriers also pose a challenge as Indigenous languages are not commonly spoken outside of the community, and literature is additionally often in Spanish. As different languages do not always translate the exact meaning, this may cause barriers to truly understanding those being studied. The inability to speak directly with community members that are being studied holds basis for skewed understandings of their experiences, thus this research study continues to aim as an archival collection of literature relating to the autonomy, mining, Indigenous framework.

It must be noted that this research paper is overall an archival understanding of various research that has been conducted with Indigenous participants and of the various ways in which cross collaboration has taken place. The intention of this research is to serve as a possible reference for potential approaches to nurture a sustainable relationship between Indigenous and non-Indigenous alike, as well as to outline the shared experiences of autonomy and Indigeneity amongst Indigenous groups.

## Results and Discussion

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### I. Identity, Belonging, and Self to Nature

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Indigeneity identity and belonging is deeply intertwined with nature, which ultimately determines relation to autonomy and what factors are significant for Indigenous autonomy. [Alex Villca Limaco](#), from the Indigenous Uchupiamona Nation, claims that it is the “progress of development of agriculture, livestock, and mining that are destroying ecosystems” ... “that are vital in the balance of the planet and essential for survival of the human species.” [Limaco](#) states “for us, the territory, the river, is fundamental in our lives” ... **“without territories we cannot**

live.” [Domingo Ocampo Huasna](#), who is Indigenous to Rena of the Mosetén Pueblo similarly expresses, **“without territory, Indigenous peoples do not exist.”**

Mining projects pose a threat to these territories that Limaco and Huasna explicitly feel are connected to their identities. Through their eyes, to be Indigenous is to exist with territories. As [Limaco](#) puts it, expansion of extractive projects, such as mining, **“is like mutilating parts of our body”** .. “it is without a doubt we may still be alive, but never will we be those whole people again.” [Liita Gonzales](#), one of the famous Indigenous mountain climbers also known as the “Cholita Escaladoras” shares, “for me, [the mountains] are the landscape, but they are also beings. **The mountains have life. They are like grandfathers to me.**” Indigeneity, to many, can be categorized as a direct contrast to extractivism. [Gualberto Cusi](#), from the same Indigenous Aymara tribe to that of Evo Morales, asserts, “[Morales’] way of thinking and his actions aren’t indigenous.” The association between development and indigenous is striking; because Morales wanted to develop, he is not Indigenous in the eyes of others. I relate this back to the literature on the epistemological definition of “Indigenous.” Indigeneity values the health and well-being of the natural environment, which is inhibited through mining processes. “Indigeneity” may be defined within the Bolivian Constitution, but ultimately the socio-cultural perceptions of Indigeneity may be subjective amongst Indigenous individuals throughout the nation and beyond.

With these voices in consideration, what do current mining projects have to do with Indigenous autonomy? Autonomy, as mentioned previously, is the right to self-determination, which includes, but is not limited to, the freedom to govern one’s respective institutions, as well as to strengthen these institutions within their political, economic, and cultural framework.

The concept of spatiality of self to land as previously mentioned in the literature review is confirmed through these Indigenous words. Epistemologies often vary with defining “Indigenous,” which can now be assumed to not only include the cultural and social histories, but also the environmental relation. It is worthy to note that these Indigenous perspectives were offered without questioning a definition or description of Indigeneity, but rather organically in conversation when discussing extractivism on their territories. Thus, the mentioning of self-spatiality to land can affirm even deeper importance than previously written literature for many Indigenous people, as this concept is engrained when discussing mining and water. This causes the need to further question the potential health impacts that may be caused from mining, as these experiences showcase a direct correlation between self-identity and belonging with mining extraction projects.

The relationship of identity, belonging, and self to nature with Indigenous holds significance for further understanding the possible health implications that result from invasive mining practices. Expansion of research on not only the physical consequences of mining (i.e. developing chronic conditions via contaminated water), but also potential mental health conditions would be significant to explore in relation to mining, identity, and often displacement. Through these voices, it may be insightful to also allocate natural resources and the environment protective rights, similar to human rights. As many Indigenous peoples throughout Bolivia personify their natural environment, this may serve as a respectful and effective way of ensuring environmental preservation efforts, as informed by Indigenous voices.

## II. Violence and Social Conflicts

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The health of Indigenous communities are further threatened by provoked violence and social conflict. These conflicts and impacts on the physical health of Indigenous people stem

from the fight over natural resources, direct violation of humanity from colonial mining companies, and disruption from a militarized presence. These are all influenced and even caused directly in some cases, to mining. Forced displacements are common as well, which usually result in a violent removal of Native people from their lands. In an interview with the Apaza family, they mention how **those working for the mining companies killed their dog, destroyed their home, and beat the daughter with the “butts of their rifles”** as she peacefully protested by kneeling on her land (Baillie, C., 2018). Violence from interactions with the mining corporations that invade Indigenous property, backed by the militarized entities with deadly weapons, has shown to create traumatic experiences that have resulted in other health conditions, such as the loss of hearing with Apaza’s daughter.

Similarly, intimidation through violent forces perpetuates silencing of voices. Indigenous Bolivians held a protest in April of 2024 against the mining use and contamination of their freshwater. Dynamite was reported to be thrown into the homes of protestors, and “a group of women holding a vigil to protest the harmful impacts of mining were attacked and had their campsites burned” (Radwin, 2024). The demonstrations showcase how dangerous standing up to the government can be. [Adolfo Chavez](#), an Indigenous Tacanan and former leader of 34 lowland Indigenous tribes, says “he was a victim of political persecution for leading the Tipnis demonstrations.” Chavez currently lives in Peru, after fleeing Bolivia due to the TIPNIS demonstrations. **“Those who did protest back then are now dead.** The government made it very clear that no mobilizations were going to be allowed because there would be bullets,” says [David Inca Apaza](#), a human rights lawyer representing families from a November 2019 massacre in response to military and police brutality.

[Inca](#) further shares institutionalized violence within the healthcare system; “The doctors have a very class-based criteria. Most of them—not all, but some—are very racist, because they were part of the CONADE [National Committee for the Defense of Democracy, organizing against the Morales government]” ... “Many of the doctors have a republican notion of authoritarianism—they think they are the only people with knowledge. In other words, they are discriminatory to their core. So, they didn’t automatically attend to the wounded at first. They didn’t fulfill their Hippocratic Oath.” This is regarding doctors in El Alto and La Paz.

I have not encountered any forms of institutionalized violent literature that depicts the same scenario that Inca confides here. Social conflicts and violence is often seen in the public eye, commonly scrutinized through video documentation through social media and news platforms at a swift rate. Yet, the violence within hospitals has layers to uncover. Though Bolivia does not have a federal law concerning patient privacy rights, such as in the United States (HIPAA), there is frequent monitoring of information that can be released from medical facilities. Additionally, patients are often in a vulnerable health state and may not even be able to document first-hand their experiences while receiving, or rather a lack thereof, treatment. Institutionalized violence within Bolivian healthcare institutions as a sole research focus is suggested from this data.

### III. Lack of Consultation and Consent with Indigenous Community Members

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Another issue is the lack of consultation and consent with Indigenous community members. Oftentimes, mining corporations will go into communities and begin material extraction without communication with locals. For example, Canadian-backed mining company, Minera Meraki, “illegally entered into the territories belonging to the community of Totoral Chico” within Bolivia which has been reported by locals to “destroy their arable land, pastures,

and what little is left of water sources” ([Personius, 2024](#)). A copper mine in Bolivia was created “[without consulting the Aymara Pakajaqi Indigenous people](#)” who are in the affected area. According to the Indian Law Resource Center, not even an environmental impact assessment was conducted prior to building this mine and actually, there is no government agency in place for Indigenous consultation. A collaborative effort of Indigenous to demand rights for their lands and cultures took place in 2021, where “currently, the 34 nations of the Amazon, Oriente, and Chaco do not feel included or represented in the Legislative Body of the Plurinational State” ([Kirkpatrick, 2021](#)). Similarly, the Emberas People of Colombia were not consulted with regard to the U.S.-backed Muriel Muring Company ([Indian Law Resource Center, n.d.](#)). Muriel Muring began mining activities on Embera land, and the Embera People were not notified prior to these invasive practices.

In a mining interview based in Cooperacion, Peru, an issue with modern communication was pointed out in terms of mining activity knowledge; people receive their news through a popular newspaper, El Peruano, but “[\[rural, often Indigenous,\] communities don’t receive this newspaper, and they don’t have access to the internet.](#)” These communities are additionally “[functionally illiterate](#)” and will only be aware of mining activities when they see “workers in the field.” Local municipalities may also be an area for further research as there are discrepancies in legal intervention with police forces and impacted communities. Though this was reported in Peru, it is an insight that is relevant to the situation of many Indigenous throughout Bolivia.

#### IV. Autonomy

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The literature on autonomy amongst Indigenous throughout Bolivia depicts varying stances. To put simply, the Bolivian government states they prioritize Indigenous rights and autonomy through implementation of autonomy rights within legislature, whereas other sources cite the lack of action to put these rights into action.

The TIPNIS highway construction proposal was a direct contradiction from Morales on Indigenous autonomy. Locals were worried that this road would increase commercialization of mining and other drug trafficking and extractivist practices on Indigenous territory. Not only were there concerns with the potential consequences of the highway construction, it also was simply illegal. The Isiboro Sécure Indigenous Territory was declared a national park in 1965 and even deemed to be a part of *Tierra Comunitaria de Origen* (TCO) in 1997, which is when the Bolivian constitution applies and is supposed to respect the self-government of appointed lands in the hands of Indigenous. Morales’ decision to propose and act on the construction of the TIPNIS highway aligns with the dominant literature highlighting the disregarding of Indigenous rights.

One can also look at Charagua, the lowland Guaraní region with Indigenous inhabitants. Charagua is one of the first autonomously run Indigenous towns, as anointed in January 2017. [Ramiro Lucas](#), an Indigenous Guaraní leader, questions “Now we have land, but what good is that if we don’t have resources?” Alongside Lucas, other Guaraní leaders have also reported being unhappy with the Charagua autonomous state of affairs. [Lucas](#) reports that the “the regional budget, financed in part by La Paz, remains the roughly \$4.5 million it was before autonomy.” This has left locals in Charagua scrambling to make ends meet, such as the need to “halt school breakfasts because money was needed for health centers.”

Though autonomy has been acknowledged in legal documents, what truly is sprung into action is the systematic marginalization of autonomous communities. Autonomy rights for

Indigenous communities may even be argued as being put into practice, yet as seen with Charagua it is not the outcome that was hoped for.

[A local](#) of the autonomous Charagua even states, “we are worse than before” ... “I want a recall on this autonomy.”

The experiences in Charagua corroborate the literature stating how the Bolivian government “undermines” these rights put into the legislature. Evo Morales is an important factor to note as he initially entered the political realm with the advocacy to uplift underserved Indigenous communities. [Salles](#), a former Conamaq leader and Aymara and Quechua speaker, states, “[Evo Morales] always said he would consult the people,” “Now he doesn’t.”

## V. Confronting the Colonial Framework

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It may not be autonomy itself that is unsuccessful, but the implementation of autonomy for Indigenous within westernized structured systems. [Leonardo Tamburini](#) affirms how “the legal or judicial tools available to [Indigenous] since colonization—tools that didn’t reflect their Indigenous paradigms of justice—were insufficient to allow them to make their own decisions about the natural resources on which they’ve depended. That affected their ability to exercise their right to self-determination.” Tamburini is the executive director of ORÉ, a Bolivian non-government organization that works alongside Indigenous Bolivians to strengthen their collective rights. Tamburini’s input questions the western systems that have become the status quo internationally, and the lack of efficient autonomy legislation that is not even put into practice much of the time, and when they are put into practice, it does not appropriately represent Indigenous priorities, ways of thinking, or values.

“It seems corruption has been institutionalized,” [Edwin Prada](#), a lawyer and former advisor to Conamaq, said in an interview. The outrage with Evo Morales, Bolivia’s first Indigenous president, stems from Morales’ change in priorities from Indigenous empowerment to personal wealth and pride. The colonialist framework in the Bolivian context is necessary to reference as this institutionalized corruption that Prada references is not a new event. [Clements \(2009\)](#) states, “Bolivia’s system of governance is corrupt, ineffective, and largely distrusted by the Bolivian populace.” La Guerra del Agua that had occurred in Bolivia’s Cochabamba region was a catalyst for community demonstrations that continue today towards autonomy in solidarity against the systems that continue to privatize water systems. Indigenous systems of water authority were criminalized; “water systems were made illegal, private wells were put under the jurisdiction of the owner of the water distribution system, and collecting rainwater was prohibited” ([Clements, 2009](#)). The systematic oppression of many Indigenous practices, people, and territories exemplify the colonial framework that runs persistent in modern day. Yet, [Howitt \(2010\)](#) states, “recognising remote regional economies as hybrid economies that rely on environmental, social and cultural wealth is an important first step in reorienting policy settings.” By integrating the significance and key factors of environmental, social, and cultural well-being into current systems, there may be a chance towards transitioning towards a more sustainability structure that serves Indigenous communities equitably.

Local miners should also be considered, as many of them rely on mining for income. Though extractivism may contradict Indigenous values, the complex socio-economic reliance on mining is often resorted to due to a lack of job opportunities. Therefore, highlighting this complexity is important for improving the sustainability of the current systems in place. For example, there are over [1600 mining cooperatives](#) in Bolivia that aim to protect the workers of mines. Even within these cooperatives, exploitation occurs amongst the hierarchy of employer to



employee, compensating unskilled or new workers at unlivable wages. The potential to improve the standards of occupational mining are there, yet it still has work to do.

Ultimately, “[long-term vision of self-determination of Indigenous peoples](#) and recognizing that these peoples can’t be truly empowered unless they’re managing and conserving their own resources. But we’re not talking about political empowerment here in the sense of them holding positions in the national government; we’re talking about these peoples making serious, responsible, and conscious decisions about their lands.” [Tamburini](#) proclaims that “without strong and empowered Indigenous peoples and organizations, there can be no conservation or sustainability.” De-colonialism within westernized systems may hold potential for more effectively empowering current and future autonomous regions throughout Bolivia, and even beyond throughout Latin America to internationally. This is a new topic that sprouted from diving into various archival interviews with Bolivian Indigenous. There is little to no previous literature that specifically discusses decolonization of the systems throughout Indigenous Bolivia, sparking the need for more in-depth research with this concept within the mining framework context.

## VI. Resistance and Current Interventions

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Despite the current state of affairs on mining and Indigenous autonomy barriers, there continues to be resistance. [Domingo Ocampo Huasna](#), who is Indigenous to Rena of the Masetén Pueblo, firmly states, “we as an Indigenous people, we are not going to give in easily to what they want to do because this is our only space where we can live” ... **“If I want to, I go. If not, no.”**

[Maida Peña](#), Indigenous to Chiquitano of the Bolivian Lowlands, also says, “those behind the destruction of the forest are now applying pressure to remove me from my position as president of the management committee with lies. **But we will continue the fight.**” The resistance from Indigenous communities has been vital for ensuring exploitation of Indigenous lands and people is defied. The TIPNIS demonstrations, which resulted in injuries and fatalities, resulted in a stop of construction development of the highway that would irreversibly alter the natural landscape and well-being of the Isiboro Sécure Indigenous Territory. Steadfast opposition and action to protest unjust developments such as the TIPNIS is what ultimately allows Indigenous peoples to continue fighting for their land and autonomy rights.

Current interventions in place can be observed to understand resistance. Bolivia passed the “[Law of the Rights of Mother Earth](#)” in 2010, which demonstrates Indigenous land and autonomy rights. This serves as a motivational step towards legal recognition of rights, though how it is acted in practice is still a concern. [PROGREEN](#) is another sponsor that has assisted in funding programs and services for ensuring sustainable forest governance in alliance with Indigenous communities.

Reclamation of water autonomy among the Indigenous Masetén and Tsimané within the Bolivian Amazon depicts community-centered empowerment. Despite water scarcity, flooding, and runoff from mining projects, these Indigenous communities collaboratively reinforced an 85-meter ravine path, enhanced their 1,320-gallon (5,000 liter) water tank with a non-invasive lid from outside inhabitants such as mud, and upgraded their adduction network ([Paredes, 2024](#)). Oscar Libay Chamairo, of the Indigenous Tacanas, states, “the water that we had was from the municipality; it arrived to us in tanks. They cut it off from us two years ago” ([Paredes, 2024](#)). The experience of the Bolivian Amazon Indigenous communities serve as an example of how



water systems do not necessarily serve the well-being of those in the most need, but how community-based interventions continue to be the backbone of community well-being.

## Reflections and Recommendations

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Indigenous autonomy in the context of mining has shown to be a complex and multifaceted issue today. As autonomy can be intertwined with identity, belonging, resistance, violence, health, and bound to the western-bound infrastructure that holds the power, it is vital to explore further in-depth immersive research to truly understand Indigenous autonomy throughout Bolivia. Further interdisciplinary research on mining and Indigenous autonomy in Bolivia would supplement the limited discussions available. It would be insightful to continue amplifying Indigenous voices that more often than not are omitted from research. Potential resides in engagement through a consensual, collaborative, and mutually beneficial research process that works alongside Indigenous peoples who are directly affected through social conflicts and health conditions related to mining. As these areas may position Indigenous peoples in a vulnerable fashion, it will be crucial to maintain privacy rights, as well as avoiding capitalizing off of participants' potential trauma, which commonly serves as a resource for informing western-based research. The results of this paper depict a need for research and possible interventions to healthcare systems to ensure an equitable treatment based on need rather than biases. Questions and further discussions that stem from this paper contribute to building awareness of Indigeneity, autonomy, mining, water, and health in Bolivia, which may also support conversations for communities globally.

The communities in Mosetén and Tsimané as a case study for community-centered support contributes as an action framework for other communities who may similarly experience water insecurity due to mining, or for any other systemic issues targeting Indigenous peoples specifically. Financial and awareness support for community-based works such as this can stem from stakeholders who may hold power politically and economically. Community-based work may be platformed domestically and internationally through increases in access for communication technologies, which is inferred by the literature to be lacking in many rural Indigenous Bolivian communities. Indigenous autonomy holds potential to thrive in community-centered infrastructure, where committee organization and empowerment may reside. Education on mining and autonomy among Indigenous youth would also allow communities to foster an awareness of self to surrounding issues from a young age. This may be true with youth in the Global North as well. Mining, autonomy, water issues, and Indigeneity is often omitted within the Global North, excluding the experiences of those who are impacted from predominant Global North consumption. It would be impactful to advocate for sustainable consumption practices so as to possibly mitigate the extractivist strain on those throughout the Global South, with Bolivia included.

Overall, I conclude that there is a need and desire from Indigenous peoples to continue research, collaboration, and discussions; ultimately empowering Indigenous communities towards self-determination relating interventions on injustices and inequities in relation to Indigenous autonomy within the mining and water framework throughout Bolivia. I hope to spread the wisdom of the Aymara principle *suma qamaña*, which roughly translates to “living well together.” As [Liita Gonzales](#), an Aymara and Quechua Cholina Escaladora demands, **“even now I feel fear, but you have to find the courage to try. Nothing is lost by trying.”**

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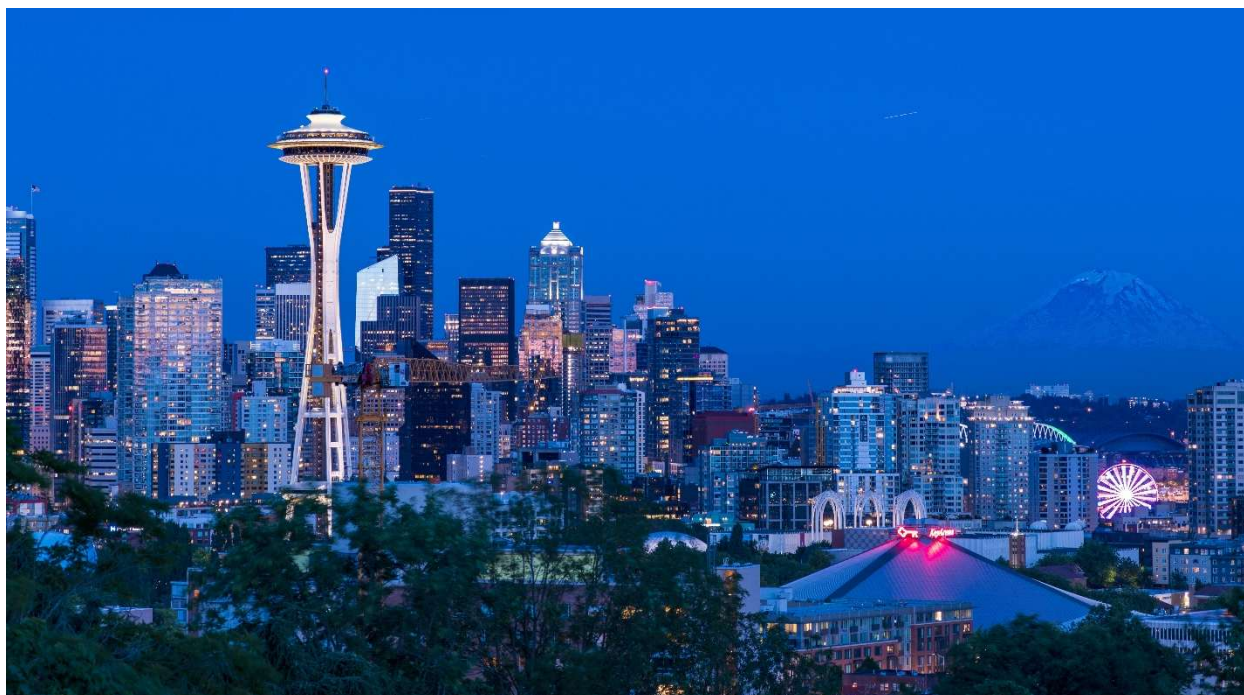
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## **What are the limitations of Seattle's zero-waste resolution and policies to drastically reduce waste in the city, landfills, and the oceans?**

By Tina Altis  
April 2025

### **Abstract**

In this article, I set out on a journey to answer the question of what limitations exist for Seattle's zero-waste resolution and policies that would hinder the city from drastically reducing waste within its boundaries, designated landfills, and surrounding waterways. The following describes my purpose for researching this topic. Waste entering our oceans leads to destruction of the oceans and ourselves and if the pollution is past the breaking point, it will be irreversible. In this article I describe my efforts for research, including a literature review and overview of my methodology. I then describe the results and provide discussion regarding what I learned. I chose Seattle as my target community for several reasons. Seattle is an environmental and sustainability leader in the United States and has done much to protect its environment both within the city and within the state. Seattle is also a coastal community and its actions affect the neighboring Puget Sound to the west and Lake Washington to the east. I found that Seattle is making strides to reduce waste as well as prevent waste as they pivot their direction toward a circular economy to truly become zero-waste.

## Introduction

Take a breath. That breath is part of the “85% of oxygen [that] comes from the ocean” which keeps us alive ([Mezcua, 2023](#)). Life on this earth cannot live without the oceans and we are killing our oceans. The oceans absorb a third of the carbon dioxide we put into our atmosphere, but it can only hold so much ([National Centers for Environmental Information, 2024](#)). The ocean is home to a diverse landscape of marine life that protects us from extreme storms and provides us with livelihoods and sustenance. Yet, we are eliminating these living societies with chemical pollution, destructive overfishing, and the continuous feeding of marine waste. Scientists estimate that by 2050, there will be more plastic in the ocean than fish ([Pavid, n.d.](#)). With 25 years to go, we are running out of time.

Marine waste is the greatest threat to the survival of our oceans and as such, the survival of us. Since marine waste is the biggest culprit to harming our oceans, one would think we need to just remove the marine waste. Simple, right? Many organizations, such as The Ocean Cleanup, are doing just that. They are endlessly removing marine waste from our oceans and the waterways that lead to the oceans. Yet, marine waste is still entering the oceans at an alarming rate. Removing waste is obviously not a viable solution to protecting the oceans from this killer. It is a perpetual band-aid solution. In order to save our oceans from this threat, we must look beyond the surface and address the heart of the problem, our waste management and production systems.

In our current political, economic, and cultural state, we do not have the systems established to completely prevent waste, although there are many communities who have come close. Seattle, Washington is one of the leading cities in becoming zero-waste. They have enacted policies and programs to reduce the waste that is sent to landfills. They promote recycling and reuse as well as educating the public about waste and their contributions to reducing it. Visiting Seattle, one can clearly see their efforts to keep waste off the streets, but are there elements or challenges that are hindering the city from achieving its zero-waste goals? I have set out on a journey to find an answer to this question.

*What are the limitations of Seattle's zero-waste resolution and policies to drastically reduce waste in the city, landfills, and the oceans?*

The guide I use to determine zero-waste is defined by Zero Waste International Alliance (ZWIA) as “the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health” ([Zero Waste International Alliance, 2018](#)). Zero-waste follows a circularity process where waste does not take place. Landfills are no longer needed under a completely zero-waste society. Though not in the definition given above, ZWIA's additional description as to the importance of zero-waste, is a valuable concept to take into consideration. The ZWIA describes zero-waste as “a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use” ([Zero Waste International Alliance, 2018](#)).

This journey has taken me in many directions, several of which I did not anticipate. This article not only describes my journey to answering my research question, but also shows what information I reviewed, the methods used and how I analyzed the information, and why I utilized

the information to obtain my answer. I also provide my results and discuss my position, thoughts, and conclusions that I reached as a result of this journey.

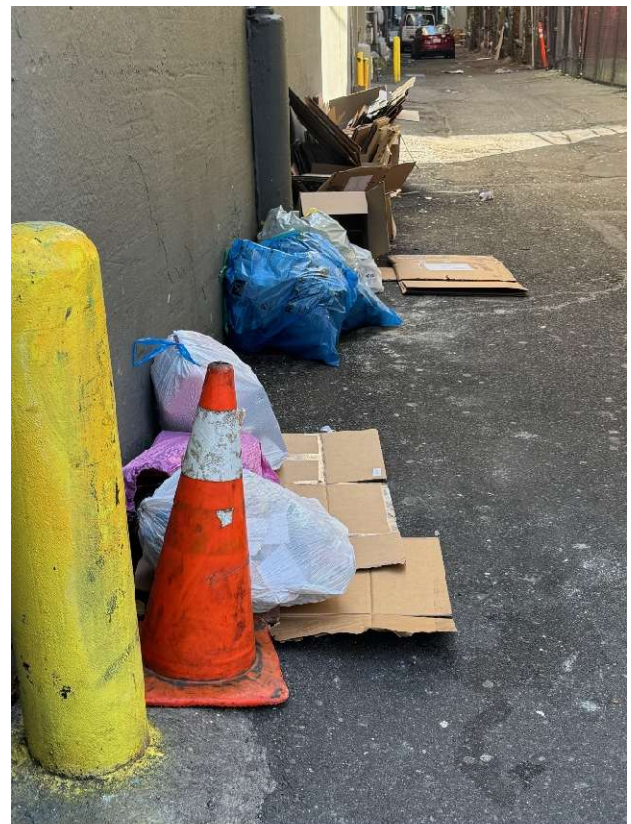
### **Finding the Facts – A Literature Review**

I reviewed an extensive array of literature during my research regarding Seattle and its efforts regarding waste, waste policies, and zero-waste. Types of literature I reviewed include state, county, and city public code, city business and waste planning, and reporting documents, peer reviewed literature, and miscellaneous websites from government entities, non-profits, and non-government organizations (NGO). The following highlights the literature I reviewed which are central to my research question.

#### **Policies – City, County, and State**

Seattle is governed by its own policies as well as the county's policies and the state of Washington's policies. Federal policy also applies to governing waste management in Seattle but for the scope of this subject I focused on the state, county, and city level. The current federal policies are unstable and volatile due to the presiding government leadership at the federal level.

Government code is informative, and it is interesting to know the codes of a community. The language of policy is typically generalized and only specific in areas that the lawmakers choose. Even then, there can be an added comment about the list not being all-inclusive of what the policy applies to. However, as I have experienced, it is also not a very entertaining read. I focused on the sections pertaining to waste in Washington State, King County, and Seattle public code for this article. However, there are many other sections that establish all aspects of operations for the city.



Seattle Alleyway

Seattle is governed by Seattle Municipal Code, Title 21 – Utilities, Subtitle III – Solid Waste. The current code is updated as of March 18, 2025. There are four chapters which consist of “Solid Waste Collection, Solid Waste Collection Rates and Charges, Infectious Waste Management, [and] Standards for Solid Waste Handling” ([Seattle, 2025](#)). Section 21.36.017 – Title, declarations, and administrative provisions names the section regarding waste as the Solid Waste Code ([Seattle, 2025](#)). The code allows for the Seattle Public Utilities (SPU) to manage the waste system and set rates. The code also addresses hazardous infectious waste. This material is managed and disposed of by the Seattle Health Officer which is the Director of Public Health. Handling of waste must also follow the Health and Safety Code under Title 10 ([Seattle, 2025](#)).

Seattle resides in King County. The solid waste code for this county is Title 10. The current county code is updated as of January 30, 2025. Section 10.04.010 Title of chapter names



the section regarding waste as the “King County Solid Waste Code” ([King County, 2025](#)). Though there are sections labeled 4-30, there are only ten chapters included in this title. Many public entities skip numbers to allow space for adding future code. The chapters in this section include “King County Solid Waste Code, Solid Waste Sites, Disposal Sites – hours and types of waste accepted, Solid Waste Site Disposal Fees, Waste Reduction – recycling and recovery, Collection of Household Recyclables and Yard Debris in Unincorporated King County, Solid Waste Management Plan, Solid Waste Management Planning, Solid Waste Advisory Committee, [and] Construction and Demolition Waste” ([King County, 2025](#)). The subsections of each chapter are very brief and generalized. However, the list of disposal fees is very specific and measured by weight, vehicle, and/or entry to facilities. A very inclusive list of waste items can be found under the Waste Acceptance Rule ([King County, 2017](#)).

Section 10.14.020 County goals references the county’s dedication “to achieve zero waste of resources by 2030” ([King County, 2025](#)). Their key methods to achieving this goal are waste prevention and recycling. To assist in meeting this goal, cities within the county can receive grants for their programs that increase recycling and prevent waste from being generated.

Washington state law is found under the Revised Code of Washington (RCW). The title presiding over waste is Title 70A RCW Environmental Health and Safety. Chapter 70A.205 RCW Solid Waste Management – Reduction and Recycling and Chapter 70A.214 RCW Waste Reduction are key chapters pertaining to waste law. Chapter 70A.205 includes topics such as landfill disposal, waste management plans for the counties and cities, solid waste handling, etc. ([Washington State Legislature, 2024](#)). This section outlines the responsibilities of the counties and cities and how they are to operate. Chapter 70A.214 RCW describes topics including waste reduction techniques, office duties, programs and awards, reduction plans, etc. ([Washington State Legislature, 2024](#)). The state code is extensive in its subjects but brief and generalized, describing each section. Mostly the legislation outlines who has authority and what they will do.

## City Plans

As a public entity, Seattle Public Utilities (SPU) is required to have several plans in place that serve as a composite of the city’s goals and provide direction on how to achieve those goals. The most common plans generated by the city with regard to waste are the Strategic Business Plan and the Solid Waste Management Plan. SPU also provides solid waste reports which provide information on “residential and commercial garbage, compost, and recycling, including summaries of activity at...transfer stations” ([Seattle Public Utilities, n.d.](#)).

The Strategic Business Plan provides the main structure of the department’s work. The plan is updated every three years. However, an updated plan that spans six years was adopted on September 3, 2024 ([SPU Media, 2024](#)). SPU is responsible for solid waste, water, and drainage and sewer management for the city. The Strategic Business Plan encompasses all of these areas but the Solid Waste Plan focuses only on the waste portion of their services. This plan is updated every six years and the most recent plan is from 2022. An update to this plan was adopted on April 11, 2023, indicating the city’s direction to focus on more upstream initiatives and solutions by generating less waste. The plans are further described later in this article.

## Peer Reviewed Literature

As waste is one of the top environmental issues we currently face, the available peer reviewed literature in the scientific community is definitely not lacking on this subject. There is literature spanning from waste management, waste creation, businesses and their waste systems, and even case studies of Seattle and the city's environmental initiatives. There are many case studies of Seattle that focus on greenhouse gas emissions and climate change, but waste still has a standing presence within this particular group of literature.

One case study titled *Beyond Climate Ready? A History of Seattle Public Utilities' Ongoing Evolution from Environmental and Climate Risk Management to Integrated Sustainability*, provided a base knowledge for Seattle and its struggles with waste. Faced with its two main landfills at full capacity in the late 1980's, Seattle was forced to redirect its waste to the county ([Grodnik-Nagle, Sukhdev, Vogel, and Herrick, 2023, p. 4977](#)). The department responsible for solid waste management is the Seattle Public Utilities (SPU). The initiatives of SPU focus on long-lasting sustainable methods, and adaptive, partnership-based learning regarding the needs of its citizens, businesses, and the environment.

Other peer reviewed literature provided information on greenwashing and fetishism of consumption, of which will be discussed later in this article. The literature regarding zero-waste was of great importance as the core subject of my research question is the effectiveness of zero-waste policies. One article in particular, [\*Minimizing the Increasing Solid Waste Through Zero Waste Strategy\*](#), provided a good foundation on the subject of zero-waste including the principles of the concept and the zero-waste management hierarchy. This article discussed the various types of waste, such as municipal solid waste (msw), e-waste, and food waste, and it addressed the impacts of waste on land, water, climate change, and biodiversity and how zero-waste interacts with these categories. Case studies of various cities and businesses that utilize zero-waste practices were provided.

This article also described the circularity of materials which is a key component of zero-waste. Zero-waste begins with product design. Products need to be designed to be reusable and repairable. Designers and engineers need to accommodate for the life cycle of the product as well as the materials used for creating the product ([Song, Li, and Zeng, 2015, pp. 199-210](#)). The technology used to create the product as well as processing the product at the end of its useful life must also be considered so that waste is not being generated from these tools. Zero-waste also entails a closed-loop system where materials that cannot be reused or recycled are made into raw materials that can be used for other products, as well as the responsibility of the producer with managing their products' life cycle.

## Websites

In addition to reading government code, city management plans, and peer reviewed literature, I also gathered information from various websites. The websites I examined included government websites, such as Washington State Department of Ecology, Seattle Public Utilities, World Economic Forum, and the Environmental Protection Agency (EPA). I reviewed non-profit websites, I examined online newspaper articles, such as The Seattle Times, business websites and blogs, and non-governmental organization (NGO) webpages, such as C40 Cities. The following highlights a few pieces that provided valuable information to my research.

The EPA website provided a case study of Seattle and its efforts toward zero-waste. This webpage is where I accessed Seattle's Zero Waste Resolution that was adopted in 2007 and the city's Zero Waste Strategy that was adopted in 2010. The resolution outlines Seattle's goal of recycling "70% of the waste produced within the city by 2025" ([Seattle, 2007](#)). When learning about a city it is best to evaluate their website. Waste is managed by the Seattle Public Utilities which is the website I researched to locate basic background information about Seattle and its waste. On their website, I located information pertaining to their leadership, plans, reports, policies, and various news releases. Within each section I drilled down further as links led me to further information ([Seattle Public Utilities, n.d.](#)).

Non-profit websites I utilized included Zero Waste Washington which focuses on advocacy for changes to waste policy. Their work covers "issues such as preventing waste, improving reuse, modernizing recycling and composting, increasing producer responsibility, and championing right to repair" ([Zero Waste Washington, n.d.](#)). C40 Cities is a member-based organization (non-governmental entity). The organization consists of mayors that have committed their cities to solutions addressing environmental issues. Their major focus is emission reduction but they also address other issues such as zero waste, food systems, and energy. Seattle has been a member of this organization since 2006. ([C40 Cities, n.d.](#)).

The Seattle Times was a great resource for information and news about the city. An example of one of the many articles I reviewed is by Sam Henkels titled *The Emerald City has lost its luster under heaps of trash* ([Henkels, 2022](#)). This article described the current trash situation in Seattle and the newly-elected Mayor Bruce Harrell's plans to resolve this issue.

## **There May Be Some Gaps**

Though the subject of waste and zero-waste is not a novelty, my journey in writing this article still can play a role in the subject. I have reviewed a number of documents, websites, and videos on the subject of waste and Seattle, especially government code. There are a few articles that I found written about Seattle but very little about the city's waste and waste policies. I found evidence of limitations to Seattle's waste policies but they were scattered among many different sources. In fact, most information I gathered was scattered with little pieces in various mediums. My article can serve as a platform to bring those scattered facts and questions into one place and bridge information found in peer reviewed articles with that of what is missing from that literature. This article provides aspects of challenges to zero-waste that many of the other literature only touches on one or two parts.

## **Methodology**

Researching a city that is over a thousand miles to the north of me provided difficulties in the methods I could use to address my research question. I was able to conduct online research which involved government code, peer reviewed articles, government and other public entity websites, subject matter focused websites, and media. However, online research was not enough for me to be able to tell the story of Seattle and waste that I felt was appropriate. This goal led me to utilize ethnography to gain a better understanding of the city itself. Ethnography includes the observation of people as they carry out their daily activities. I would immerse myself in the environment and gain knowledge through observation while also taking field notes. There is a



difference between reading about a place and experiencing a place, and I learned this by visiting Seattle in person.

Many of the websites and digital media I reviewed provided voices and positions outside my own that were informative in addressing my research question. However, a person-to-person voice was what I valued obtaining as part of my research. I was fortunate enough to interview Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department. I was able to gain a better understanding of Seattle's waste management and experience the knowledge of a person that is in the midst of the policies and programs that are being implemented in the city of Seattle.

The use of ethnography and interviewing gave depth where reading articles and webpages have less personal connection and lasting impact. The online research was valuable, as I gained a lot of knowledge about Seattle's history, policies, citizens, and businesses with regard to waste. The research also prepared me for my interview as I was able to recall the response topics from what I had researched. A well-rounded methodology that includes a variety of information-gathering methods is key to truly answering any research question. The following describes the different aspects of my journey in gathering information and conducting research.

## Observations

I had the ability to go to Seattle to observe the city's waste reduction practices in person. I could only dedicate a day to this research method but it was definitely informative about the subject of my capstone project. In addition to learning about Seattle's waste, I also learned how important ethnography is when evaluating a community and/or group of people. This method establishes a very different perspective on a subject than reading an article can provide.

I chose to use public transportation and travelled on the Lite rail to downtown Seattle. I began south of downtown exiting the train at University Avenue and 3<sup>rd</sup> Avenue. I walked toward the water to the Seattle Great Wheel and north to Pike Place Market. From there, I went eastward into the heart of downtown before I had to get back on the train to catch my flight home. I did a



Seattle Waste Bins

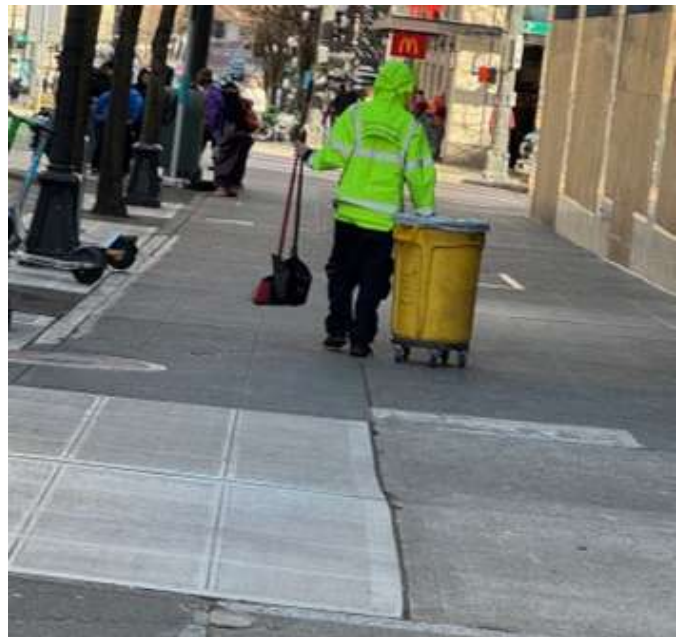
lot of walking that day and discovered there are many hills in downtown Seattle, and of course, the day I go to Washington the weather is sunny and warm. I had no need for the coat that I brought to keep me warm. Walking up those hills did that for me. I was looking forward to having clouds. Unfortunately, I didn't get the usual Washington weather.

I kept a keen eye for any waste, litter, or anything that came close to that. I also observed the homeless situation as I learned this was a contributing factor to waste within the city of Seattle. As I rode the train north from the airport to downtown, I noticed that this southern area was low-income neighborhoods. There were a lot of rundown buildings with patches of trees intermixed. The further north I went, the nicer the homes became. I did see some litter along the roadways but there was very little. There was a lot less litter on the highways than what I see in California.

I was expecting to see encampments with massive amounts of trash piled everywhere as I had seen in many of the videos I had watched. I did not see either of these. As the train arrived at the Mariners stadium, I caught a glimpse of the trash piles. They were on the edge of the woods that surrounded the backside of the homes and businesses. We pulled away from the stadium and I saw a few tents on the side of the road. I did not see any huge encampments. I was viewing all of this from inside a moving train, so I could not investigate further.

As I took my first steps into the city, I looked at all of the buildings and curbs and saw...nothing. There was absolutely no trash anywhere. I did, however, find a lot of public Lime bikes. There were also traffic control personnel at every crosswalk. Seattle values its pedestrians a lot. I learned the pedestrian *always* has the right-of-way. Much different from my experience in California where the pedestrian always takes a risk crossing the street.

I looked for litter everywhere as I headed to the waterfront. Even the alleyways were clear of litter, although toward the end of my trip I did find one alleyway that contained piles of garbage. I eventually saw the cause of the lack of litter around me. In addition to the many, many garbage and recycle bins that were at every corner, there are city employees that walk around and pick up trash. There are also city personnel that power wash the sidewalks with water and soap. I was not able to find out what brand of soap was used but it was an industrial soap bottle. I don't think using industrial chemicals is the best way to go about cleaning the sidewalks. The soap flows into the sewers and the ocean that is west of the city.



City Employee Picking Up Trash

## Interview

To add polyvocality to my research regarding the subject of waste I attempted to schedule an interview with the current General Manager and CEO of the Seattle Public Utilities (SPU) department, which is responsibility for all waste management within the city. I received an email directing me to another individual, Susan Fife-Ferris, Director of Solid Waste Planning and Program Management. This was a timely message as I was able to schedule an interview with this person just prior to her leaving for a week-long conference in Washington D.C.

The interview was conducted via Zoom since I am located in Southern California and she is based in Seattle, Washington. Our discussion began with Susan describing her background and the focus of her department within SPU. I mentioned Seattle's resolution to achieve diverting 70 percent of waste from landfills by 2025 utilizing zero-waste practices. I asked what challenges SPU has faced in meeting this goal. When she mentioned the large companies that reside in Seattle, such as Microsoft and Starbucks, I asked if SPU had any challenges with these companies in adhering to the city's waste policies. Her response was positive on the subject, which surprised me as I view large corporations as adhering to their own agenda. She also

described an additional focus the department was working on. Public event centers have become a major contributor to waste in the environment, especially in the last few years since the pandemic.



Gum Wall

Unfortunately, I was only able to speak with the Director for 45 minutes. We could easily have spent hours discussing Seattle and the city's waste policies as we are both passionate about the subject of waste. My last question focused on waste entering the ocean. I mentioned Seattle is a coastal city and asked if they had had difficulty with waste entering the ocean. She discussed issues with Puget Sound and local waterways as well as Seattle's storm drains. We also discussed food waste and the waste issues with illegal dumping and the unhoused population. Due to my observations when I visited Seattle, I was compelled to ask one more question about gum. I have been incredibly curious about the amount of gum I found on the sidewalks and even the gum wall. I don't think the subject of gum ever entered her mind with regard to waste and she stated that she would bring the subject of gum to her team. Perhaps in a small way, I contributed to Seattle's future waste initiatives.

## Legal Review

In order to understand a community's policy, one must actually read and experience it. I conducted an extensive review, reading each sentence, of Washington state, King County, and Seattle public code. I have worked in the public sector for 19 years and I am very familiar with the structure of government code. They are typically set up like an outline with links that take the reader into a rabbit hole of information. Many chapters, also known as titles, are related to each other and overlap in responsibility. A person can spend days reading all of the code which I did. Although, I focused on codes relating to waste. The other subjects, such as transportation and energy, are not within the scope of this article.

## Digital Research – Articles, Webpages, and Media

I examined websites and video media that included information regarding Seattle, waste, policy, consumer and business perspective, greenwashing, green fetishism, landfills, homelessness, and many other subtopics pertaining to this list. The text I reviewed is described above in my literature review.

I also viewed several video news reports utilizing YouTube as a source. These videos provided information such as the mayor and the city's efforts regarding construction waste, struggles faced by specific small businesses due to Seattle waste initiatives, and Seattle's Climate Pledge Arena stating it is a zero-waste facility. These videos provided valuable information and perspective from citizens of Seattle that was difficult to access in person from another state.

My purpose in gathering information was to obtain a holistic view of all aspects of the subject matter. In order to understand a topic, a foundation of knowledge is vital. Thus, a large portion of my research was through literature review and digital research. Digital research also provided an increased level of polyvocality as I was obtaining stories from sources that are outside of me and my surroundings. This research was helpful during my interview with the Director of Solid Waste Planning and Program Management of the Seattle Public Utilities (SPU) department as I was able to follow the topics and programs she discussed. I was able to conduct the interview with confidence.

## Results

In order to discover the answer to whether there are limitations to Seattle's waste policies, I must first discover Seattle. I need to know its history, how the city came to be at this point in time, what the city is currently doing, and where the city is going in the future. I conducted a holistic search of information about Seattle and its waste. The following sections describe Seattle and the journey it went through with regard to waste.

### The Starting Point

Seattle has been a leader in transitioning to a sustainable city since 1991 ([Sustainable Seattle, n.d.](#)). However, this was not the case in the late 1980's. At that time, Seattle was in a waste and water pollution crisis. Seattle was producing 880,048 tons of waste annually by 1988 ([Bagby, 1999, p. 6](#)). Only 21 percent, or 184,000 tons, of the amount generated was being recycled ([Bagby, 1999, p. 6](#)). Seattle's waste management system, which followed that of King County where the city resides, was not working. "The last two remaining landfills, closed in 1983 and 1986, had become Superfund sites that would cost more than \$90 million to make environmentally safe" ([Seattle Public Utilities, 2023, p. A.3](#)). A Superfund site is an area that is "contaminated...due to hazardous waste being dumped, left out in the open, or otherwise improperly managed" ([Environmental Protection Agency, n.d.](#)). The name, Superfund, is a nickname for the legislation that describes the sites and enables the Environmental Protection Agency to address the designated sites. The legislation was enacted in 1980 as "the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)" ([Environmental Protection Agency, n.d.](#)).

In 1987, without any operating landfill, Seattle began transporting its waste to the county landfill resulting in "customer rates...increase[ing] by 82 percent" ([Seattle Public Utilities, 2023, p. A.3](#)). With the public unhappy with the rate increases and against utilizing incineration of waste, the city of Seattle had to find another option. State legislation requires a municipality to have an active solid waste plan. In 1989, Seattle adopted its "first solid waste plan,...the 1989 *Integrated Solid Waste Management Plan, On the Road to Recovery*" ([Seattle Public Utilities, 2023, p. A.3](#)). The waste plan moved the city's designated landfill from the county to the Columbia Ridge Landfill located in Oregon. Transported by specially designated trains, Seattle's waste has now become Oregon's problem and they are the ones who are responsible for ensuring the environment is protected from waste that comes approximately 320 miles from the north ([City of Seattle, 2003, p. E-1](#)).

In 1998, Seattle adopted its second waste management plan that incorporated aspects of zero-waste, but it wasn't until 2007 that the city formally embraced the concepts in zero-waste



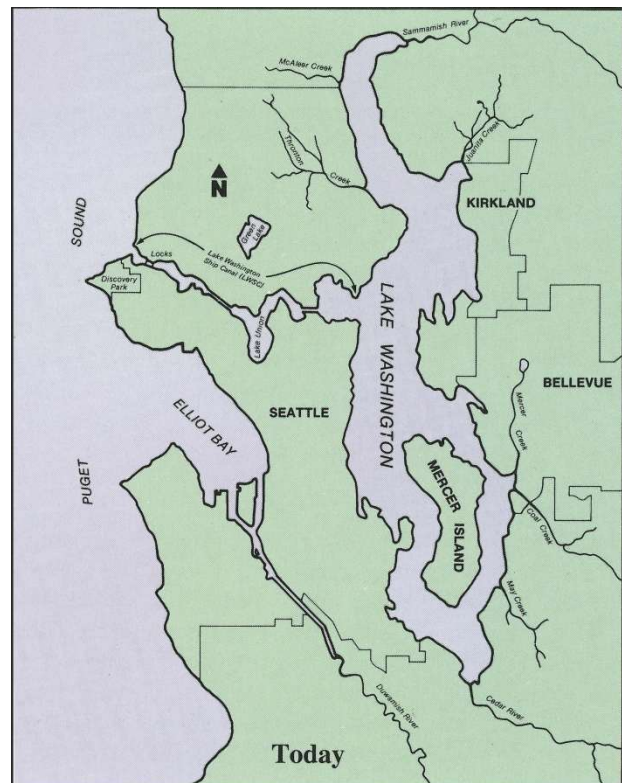
management. The city adopted the Zero Waste Resolution in 2007 that outlines Seattle's goal of recycling "70% of the waste produced within the city by 2025" utilizing zero-waste practices ([Seattle, 2007](#)). Recycling was the main focus of Seattle's waste management plan until after the Covid-19 pandemic in 2020. The city monitored its waste management over the next couple decades and is presently adjusting its efforts towards a more circular, preventative waste system, continually learning and experimenting with various programs as they move forward.

## The Other Crisis – Water Pollution

In addition to municipal waste, including recyclables, yard waste, and food waste, Seattle has also been dealing with issues of chemical waste and pollution of its surrounding waterways. In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated "Seattle...on the west side is bounded by the Puget Sound which empties into the Pacific...and then on the east side is all of Lake Washington. So, really...half of Seattle's land area is actually under water. So,...it's a big focus in trying to prevent litter and materials going into the waterways" (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).

To the south, connecting Lake Washington and the Puget Sound is the Duwamish River. "In 2001, United States Environmental Protection Agency (EPA) listed the last five miles of the Duwamish River as...[a] Superfund Site" ([Seattle Public Utilities, n.d.](#)). The Superfund designation was due to over "100 years of industrial and urban use...[and] contamination from polychlorinated biphenyls (PCBs) and other industrial chemicals including arsenic, polycyclic aromatic hydrocarbons (PAHs), and dioxins and furans" ([Seattle Public Utilities, n.d.](#)). The water and sediment became polluted from this industrialization, of which Boeing was a main polluter. Seattle, in collaboration with King County and Boeing, created the Lower Duwamish Waterway Group (LDWG) to conduct the cleaning efforts of the waterway, which is continuing to be monitored to this day.

Not far from the Duwamish River, the city of Seattle was also cleaning up Lake Washington that had also been polluted from decades of industrial activity. In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated "before my time here, back in the 70's, you couldn't swim in Lake Washington because it was so polluted. So, a significant effort was made to clean up Lake Washington. Now...you can go swimming, the salmon run. So...the waterways are a significant issue that we monitor and we still do a lot of work around" (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).



Seattle waterways – 1990s

## The Puget Sound

Another waterway that is of significant concern for Seattle regarding waste and pollution is the Puget Sound which leads to the Pacific Ocean. The Puget Sound is a major port for transporting goods as well as a major hub for cruise ships. The cruise ship industry releases approximately “a billion gallons of sewage...into the ocean annually” ([Friends of the Earth, 2022](#)). The sewage includes “human waste,...chemicals, pharmaceuticals, bacteria, viruses, heavy metals, and hazardous waste” ([Friends of the Earth, 2022](#)). Cruise ships also dump food waste into the ocean. Cruise ships are not allowed to dispose of litter, or garbage, in the ocean. Ships must store the waste until they dock and can unload the waste, and many separate recyclables from the waste. There are some ships that dump waste into the ocean even though it is illegal to do so. There are also ships that will burn waste, which is not a sustainable option ([Friends of the Earth, 2022](#)).

There are laws that govern what and where cruise ships can dump their waste. In the United States, “cruise ships...[are allowed] to dump treated waste into the ocean if they are within three and a half miles from shore. Beyond that point, there are no restrictions for dumping untreated, raw sewage in U.S. ocean waters” ([Friends of the Earth, 2022](#)). In 2018, the State of Washington designated the Puget Sound as a Vessel Sewage No Discharge Zone (NDZ). However, “certain commercial vessels” have a 5-year grace period, which means the policy did not fully go into effect until 2023 ([Department of Ecology, n.d.](#)). “The Vessel Sewage No Discharge Zone includes all Washington marine waters east of New Dungeness Lighthouse, at the east end of the Strait of Juan de Fuca, plus Lake Washington, Lake Union, and the waters that connect them to Puget Sound” ([Department of Ecology, n.d.](#)). Unfortunately, this policy does not include the release of graywater into the ocean. The vessels still follow federal rules for dumping graywater. Graywater is “wastewater that is generated from showers, baths, sinks, and washing machines” and has not been used in toilets ([Friends of the Earth, 2022](#)). Cruise ships can dump approximately “250,000 gallons of gray water...in just one day”, depending on the amount of people on the ship ([Friends of the Earth, 2022](#)). The Seattle Public Utilities monitors cruise ships within the Puget Sound to ensure there is no illegal dumping of waste.

## Stormwater Waste and Infrastructure

The city of Seattle has a 174-year history. It was founded in 1851 and became an official city in 1869. Though there have been infrastructure upgrades throughout the decades, the city is still utilizing an older, combined sewage system. Seattle does not separate its stormwater from its sewage pipes. Thus, all of the stormwater and sewage empty into the ocean which can harm the surrounding water and marine life. In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated “in Seattle they have a lot of combined systems and so they’re under a consent decree to slowly deal with...[or] eliminate those...[so] when you have a huge rainstorm the combined system doesn’t end up...out into the Puget Sound and...it does get diverted to the waste water treatment plant” operated by the county (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025). A consent decree is an order issued by the court to take specific action.



## Post Zero-Waste Resolution

Seattle established its waste requirements and a payment structure within its municipal code. The payment structure that applies to citizens and businesses is dependent on the weight of waste collected. There is also a tier-system that separates rates by single family homes, multi-family homes, commercial waste and rates for the two transfer stations. The transfer stations serve as a collection area before items are either recycled or transported to a landfill. There are also separate rates for recyclables that are picked up and food and yard waste. The system is called “pay-as-you-throw” ([Seattle Public Utilities, n.d.](#)). Citizens and businesses are required to have and pay for waste disposal services per statute. The city has sole source contracts with Waste Management Inc. and Recology to retrieve and transport waste from citizens and businesses. Statute directs that waste management be either handled by the city directly or through a third party, and Seattle has chosen to utilize a third part. This system of waste collection, transport, and service costs is still in place today.

## Food Waste, Yard Waste, and Composting

One of the main focuses of Seattle is food and yard waste. The transition to removing food and yard waste from garbage was a slow process. This transition started in the late 1980’s when, “in 1988, Seattle prohibited yard waste from the garbage” ([Seattle Public Utilities, n.d.](#)). This requirement became law in 1989. Food waste took longer as it was first addressed by the city in 2005. In this year, “Seattle...began curbside food waste collection”, however this was voluntary at the time ([Seattle Public Utilities, n.d.](#)). It wasn’t until 2015, that Seattle officially established statute that “prohibited food waste from the garbage” ([Seattle Public Utilities, n.d.](#)). The city did create an initiative in 2009 to require “food and yard waste collection or participate in backyard composting,” but this was not law at this time ([Seattle Public Utilities, n.d.](#)). It was merely city policy. Food and yard waste that is picked up by the city is transferred “to Cedar Grove Composting on Smith Island in Everett” where it is processed into compost material and then sold back to consumers ([Tice, 2007](#)).

The items included in the category of food and yard waste have also expanded over the years. Anything that can be composted is considered part of the food and yard waste category. This includes “food-soiled paper products such as paper towels, paper napkins, and cardboard” ([Seattle Public Utilities, n.d.](#)). Since both green matter (fruits, vegetables, etc.) and brown matter (dried leaves, sticks, etc.) are needed to compost, even animal hair can be used as composting material. We can see over the years how the use of composting in Seattle has grown as the popularity of composting has risen. In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated “our big focus is try to work upstream. We’re prioritizing food waste. We went through a big prioritization process in 2023 and...trying to ensure that [we]...reduce food waste as much as possible but ensure it doesn’t get into the landfill” (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).

## Plastic Bag and Styrofoam Bans

The first city to ban single-use plastic bags was San Francisco, California in 2007. Seattle followed this action shortly thereafter when it banned plastic bags in 2011. However, Seattle included bio-degradable bags in its ban. In 2021, the state of Washington formally banned single-use plastic bags from being used. The legislation also established a fee structure for the use of alternative bags such as paper, thick reusable plastic, and compostable bags ([Department of Ecology, n.d.](#)). As of 2018, approximately 82% of stores comply with the plastic bag ban ([Seattle Public Utilities, 2019](#)). There are efforts being made to eliminate plastic bags from recyclables that are included in household waste pick-up. Restaurant businesses are not included in the plastic bag ban but must still utilize compostable bags. I experienced this on my trip to Seattle. I was given a compostable bag to carry my leftover food, but saw, in fine print, the bag included a notation that it must be sent to a facility that would accept the bag for composting.

Seattle also placed a ban on Styrofoam containers that went into effect in 2009. In 2010, “plastic utensils and plastic food containers” were added to the ban ([Surfrider Foundation, 2008](#)). The state of Washington followed suit with a ban on Styrofoam in 2024. Exceptions to the state ban include “foam trays and packaging for raw meat or produce, egg cartons, foam packaging blocks (like the ones surrounding a new TV) and foam shipping containers for drugs, medical devices, agricultural goods or perishable foods and items from a wholesale or retail environment” ([Zhou, 2024](#)). The ban on Styrofoam affects the restaurant industry the most as it applies to food containers, including cups ([Zhou, 2024](#)).

## Post Pandemic and A New Direction

The Covid-19 pandemic that struck the world in 2020 affected all areas of business and municipalities. The pandemic provided insight to Seattle’s leaders that the community is at the core of change. They learned that they “must apply this sense of partnership, resilience, and resourcefulness to address the challenges that lie ahead” ([Hara, 2022, p. 6](#)). Seattle began its pivot into a new direction of managing waste by lessons learned during the pandemic. The insight gained and the events of the pandemic influenced the city’s strategic business plan and solid waste plan, both of which were being developed when the pandemic began. Like many in this world, our perception of time has changed to a pre-pandemic, post-pandemic separation of events.

## Strategic Business Plan

Seattle Public Utilities are required to create a strategic business plan every three years. The recent plan in operation that is nearing its end is the 2021-2026 Strategic Business Plan. The 2025-2030 Strategic Business Plan was passed in September 2024 and goes into effect in 2025. The 2025-2030 business plan is an update to the previous 2021-2026 plan. It incorporates the same structure but with more updated information. The updated plan also reemphasizes the department’s goals and direction.

A business plan “is a strategic process through which organizations define their goals, objectives, and strategies for achieving them” ([Carrasco Ramirez, 2024, p. 3](#)). The Seattle strategic business plan lists the city’s guiding principles under the acronym CARES. This term refers to the city’s dedication to “customers and community, affordability and accountability, risk

and resilience, equity and empowerment, [and] service and safety” ([Hara, 2022, p. 5](#)). The city’s vision statement includes three focus points; one water, community centered, and zero waste ([Hara, 2022, p. 13](#)). The city plans to update the infrastructure and continue managing waste. The plan focuses on more community involvement and providing support to its workforce. Efforts by the Seattle Public Utilities to achieve their goals include “delivering equitable essential services, stewarding environment and health, empowering...customers, community, and employees, [and] strengthening...utility’s business practices” ([Hara, 2022, pp. 14-29](#)).

## **Solid waste plan**

In addition to a strategic business plan, the Seattle Public Utilities are required by statute to create and maintain a plan to manage solid waste. The current plan in place is the 2022 Solid Waste Plan Update. This plan went into effect in 2023. The solid waste plan furthers the new direction of the Seattle Public Utilities’ efforts to move from waste management to waste prevention. Though the city still maintains recycling as a major focus in dealing with waste, it is now including efforts to produce and use less waste.

The waste plan supports the strategic business plan in that it promotes resiliency and community involvement. The plan also has emphasis on “incorporate[ing] racial justice in solid waste programs, education, and outreach in support of SPU’s commitment to providing racially equitable, inclusive, and culturally competent services” ([Seattle Public Utilities, 2023, p. 1.24](#)). This emphasis is in response to the city of Seattle adopting “the Race and Social Justice Initiative (RSJI) that was adopted in 2023 ([Seattle Public Utilities, 2023, p. 1.21](#)). The solid waste plan covers all aspects of reducing and managing waste, recycling, composting, gathering information, education, and processes. In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated “our plan is what we go back to all the time and...we’ll be starting our new plan soon...as far as the work to develop the next plan” (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).

## **Programs, Initiatives, and Strategies**

The Seattle Public Utilities department has introduced several programs, initiatives, and strategies to assist households, businesses, and even the unhoused population as well as maintain a clean urban environment. The major initiative the Seattle Public Utilities department has operating is the Clean City Initiative. The purpose of the program is to “help protect the environment, maintain access to public spaces, and protect public health by removing litter, illegally dumped garbage, and other hazards” ([KOMO News, 2025](#)). The initiative also removes graffiti around the city. I witnessed this program during my trip to Seattle. I saw several city workers walking through the streets picking up litter and others power-washing the sidewalks. There is also an app that citizens can use to report illegal dumping called [Find It, Fix It](#). The city will receive the report and clean up the site.

There are programs for households that are struggling to pay their utility bills. There is a Utility Discount Program that customers who are in need can apply for financial assistance. There are also payment plans, emergency assistance, and bill credits available to those who meet the requirements. Other initiatives for homeowners include rebates for installing rain gardens on their property as well as a free toilet for low-income households. The toilet is designed to save

water. There are various tools and information online as well. For example, there is a detailed tool that you can look up a waste item and the tool will provide instructions on how to dispose of the waste.

Businesses can also benefit from programs provided by the Seattle Public Utilities department. Businesses can sign up for the Green Business Program. This program provides “free tools and services to help Seattle area businesses reduce costs, gain a competitive edge, and contribute to a clean and healthy community” ([Seattle Public Utilities, n.d.](#)). The tools and services help businesses “save up to 30% on their waste bills” and free outreach materials to educate those within the company ([Seattle Public Utilities, n.d.](#)). The program also provides training for business recycling and composting. The Seattle Public Utilities also gives out small grants to assist businesses in their waste prevention efforts. The current grant contest is for reducing textile waste ([Seattle Public Utilities, n.d.](#)).

Another program that is fairly new is the Encampment Trash Program (ETP). The program also goes by the nickname Purple Bag Program. This program “provides weekly garbage service (collection and disposal) to nearly 30 encampments” for those who are unhoused and/or living in RV encampments ([Seattle Public Utilities, n.d.](#)). In the first couple months of this year, the city collected 1.6 million pounds of waste from encampments and other remediation areas such as RV camps. Individuals are given purple trash bags which they can leave at designated locations near the encampment and the city will retrieve the garbage. The program also offers education services to people living in the encampments “on proper waste disposal, fostering sanitary living conditions, and promoting environmental sustainability” ([Seattle Public Utilities, n.d.](#)). This program has spread to other surrounding cities such as Tacoma as well.

## **Discussion**

The information above details the information I uncovered about Seattle and its waste. The following analyzes this information in order to respond to the research question posed at the beginning of this article. Are there limitations to Seattle’s zero-waste resolution and policies? Are they able to overcome these limitations? Are the Seattle Public Utilities on the right path to succeeding in their zero-waste commitments? I begin the analysis with the starting point of my journey, my epistemology. This discussion provides the basis for how I analyzed the information and how my position evolved during my research.

### **My Position Going In vs Position Coming Out**

My life experiences and gained knowledge have left me with a somewhat pessimistic epistemology of human intentions and behavior. I have learned to find truth in actions rather than words because interpretation and intention of words can be misleading. I began my research with a critical mind. I have been exposed to greenwashing, so I am skeptical about an entity’s claims of “being green”. Many large corporations may promote sustainable initiatives but quietly act according to their bottom line. I especially had this mindset when reading government code. I work for a public entity and my experience has shown me that government code can be subjective. It is not necessarily the meaning of the code but what is actually written that must be considered.

Going into my research, I was looking for something wrong with Seattle. I wanted to make sure I caught any misrepresentation, unethical behavior, and/or lies that could be taking

place. However, what I found was quite different. I found a city that made bad choices and mistakes in the mid-twentieth century and is now trying to better itself. I found a city that is a leader and not a manager. The city tries new opportunities and learns from mistakes. It knows it may fail and that is okay because the community will support moving forward and adjusting its direction as needed.

In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated “we’re also willing to try stuff and fail which is really nice that we have that political ability...the environmental ethos in the area helps support and give us the political will to help us...try things and...if it fails we can pivot but at least we can try things. So not everybody has...that ability to do that and we know that...We’re also big on sharing what we learn and we like to learn from what other people do too” (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).

My epistemology coming out of my research is humbling. I am still uncertain as to the effectiveness of many of the city’s policies and positions, but I found that the city has the capability to overcome challenges and limitations as it progresses into the future. The current leadership within the Seattle Public Utilities department appears to be embracing a path of permanent change to zero-waste and a circular economy. As long as the city continues to follow its goals, objectives, and principles, it will continue to move forward and eventually become a zero-waste city.

## **Waste Prevention – A New Mindset**

Seattle is now embracing the concept of a circular economy to achieve its zero-waste goals. A “circular economy is a system where materials never become waste and nature is regenerated. In a circular economy, products and materials are kept in circulation through processes like maintenance, reuse, refurbishment, remanufacture, recycling, and composting” ([Ellen MacArthur Foundation, n.d.](#)). As of 2022, Seattle has revised its approach to addressing waste by adapting to a circular economy structure. They are now utilizing an upstream approach and have moved from management and recycling of waste as their primary focus to a more preventative system.

The leaders of Seattle have realized that the best approach to reducing waste is to prevent it from being generated in the first place and/or reusing what is already in the consumption stream. This has led to modifications in their strategic plans and program designs. The city is pursuing legislation for repair rights and extended producer responsibility. They are looking at how products are made rather than how they can be disposed of. Though the city has proclaimed its efforts for the past couple of decades as based on zero-waste practices, they are now just beginning to put those practices into action. City leaders are learning from other communities and states, such as California, as to how these areas succeeded in passing legislation and what their challenges were.

In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated “we’re focusing less on downstream and more on upstream and figuring out ways to prevent waste from even being created...but moving more towards that circular economy introducing reuse...and we have a big push on reuse. Our Reuse Seattle program is...to focus on waste prevention and reuse and repair. We have a bill in the legislature right now that is moving through our session and we’re



hoping...this year that we'll actually get it through" (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025). She also added "it's hit a lot of resistance...the right to repair bill" (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).

Susan Fife-Ferris also added "we're trying to get...extended producer responsibility here in Washington state. It is also finally this year making its way after...hitting road blocks...I have resources involved with that but we're huge advocates at a national level for extended producer responsibility, trying to ensure that products are made with recycled content, that they are actually designed so that they can be captured for recycling and be processed through a...mechanical processing facility...recycling facility...[and] that materials that are going to be contaminated with food can be composted. So, we have some of that built into our local ordinances" (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).

The changes in the Seattle Public Utilities Strategic Business Plan and Solid Waste Plan, along with the programs, initiatives, and pilot program testing are indicative that the city is addressing waste challenges and genuinely working towards becoming a zero-waste city. They will face limitations such as funding issues, staff changes, and changes in the world economy, but these do not appear to significantly hinder Seattle in achieving its goals. The current policies with regard to waste need improvement to clear up loopholes and inequities, but the legislation that is in process with the city council and state legislation appears to strengthen the current policies rather than further degrade them.

A challenge, or limitation, that will be difficult to overcome, however, is the modernization of current infrastructure. In my interview with Susan Fife-Ferris, Director of Solid Waste Planning and Program Management at the Seattle Public Utilities (SPU) department, she stated "the goal is to try to get the structural foundation so that...[circular economy] can happen eventually. It may not happen under the current federal administration because there's significant infrastructure that has to be invested in but that is the ultimate goal,...so all material is valued" (Director of Solid Waste Planning and Program Management, personal communication, March 21, 2025).

## **Recycling – The Dominate Narrative**

Recycling is the dominant narrative for our society as a solution to reduce waste. The city of Seattle focused on recycling as their primary tool in reducing waste and continues to do so in conjunction with composting food waste. Recycling is an important element of a circular economy in order to keep waste out of the environment, but it should not be the core response to reducing and preventing waste. Recycling is not as effective as everyone thinks. "Only about 9% of plastic waste has ever been recycled. And much of it goes through the process of downcycling, where the recycled plastic is injected with new, virgin plastic and made into a product that itself can never be recycled again" ([Chan, 2022](#)). Over "21 billion pounds of textile waste" is transferred to landfills and incinerators annually in the United States ([Chan, 2022](#)).

Recyclable items that are contaminated with food and other chemicals end up going to landfills as they are no longer viable to be recycled. How our products are made, used, and transported impacts what actually is recycled. The machinery used to recycle materials is also inadequate as there are constant issues with plastic bags getting stuck in the machinery. I don't believe Seattle will ever reduce its efforts for recycling but it would be beneficial to have



products that don't need to be recycled and can be reused and/or repaired. However, it is better to have recycling than for waste to end up in a landfill when it doesn't need to.

## **Greenwashing**

“Greenwashing refers to offering a good or service as green when it is not. It also refers to all sectors that adopt simple green acts with an implicit aim to increase their gains” ([Bulut, Nazli, Aydin, et. al., 2021, pp. 306-319](#)). Large businesses primarily take part in greenwashing tactics. One example is Amazon. Amazon has recently released its new initiative to deliver their items in less packaging in an effort to “reduce the impact to the environment.” In actuality, they are making their packaging worse. The boxes have shrunk, and the stuffing is much less, however, the company uses more plastic film than before. Each item is shrink wrapped in plastic. Some are wrapped in plastic twice. The plastic used is thicker and has more chemicals. All the items I have purchased recently, particularly clothing, have included a strong chemical smell that requires me to either wash the item or air it out. Amazon's promotion of reducing waste is misleading and blatant greenwashing.

Greenwashing can also be subtle in its use; sometimes even unconsciously done. The city of Seattle appears very genuine in its actions and programs to reduce waste but there is greenwashing interwoven in the system. I am unable to determine if this is intentional or not but the actions are in the category of greenwashing. For example, the monitoring of waste and recycling is done with regard to city limits. Seattle does not have any landfills within the city limits so all of its waste is transferred elsewhere. The city can state they are reducing waste but the waste is transported to another location and another jurisdiction to be responsible for. Seattle typically transports its landfill waste by train to the current landfill destination that Seattle utilizes, which is the Columbia Ridge Landfill located in Oregon. Utilizing a landfill in another state may be cost-effective for Seattle, but the city should not make any claims with a reduction of landfill waste unless the waste is prevented.

## **Green Fetishism and Consumption**

There is a new concept gaining attention that stems from Carl Marx's “concept of commodity fetishism” ([Han, 2024, pp. 115-136](#)). This concept, known as consumption fetishism, focuses on the consumer and their actions rather than the value of a commodity. “[C]onsumption fetishism...[is] the act of consuming goods for their symbolic value or social prestige, rather than their material utility” ([Han, 2024, pp. 115-136](#)). This behavior enables consumers to feel good about their choices of purchasing and consuming what are deemed environmentally-friendly products. This also relates to their behavior after consumption. Consumers can assign themselves the social status of being green by recycling their waste, when in fact only 32.1 percent of waste generated by the United States is recycled ([United States Environmental Protection Agency, n.d.](#)).

A behavior that is commonly exercised by consumers is “‘wish-cycling,’ a phenomenon where well-intending consumers...end up putting it [an item] in the recycling bin in the hopes that the item can be recycled” ([Blanco, Spanbauer, and Stienecker, 2023](#)). I admit I am guilty of this practice. The problem with wish-cycling is that the items that cannot be recycled can contaminate items that can be recycled rendering them no longer able to be recycled. Thus, these items now must be transferred to a landfill.

Fetishism of consumption can also be perpetuated by single-stream waste collection. A single-stream combines waste and recyclables into one container where it is sorted at the facility level rather than at the household level. In this instance, the consumer obtains satisfaction that they are recycling but will never know what actually is recycled. The out-of-sight, out-of-mind concept enables fetishism of consumption to go unchecked and unacknowledged. When the trash and our “intended” recyclables are removed from our households and businesses, we no longer think about what happens to the items as they move downstream.

### **Moving Forward and Further Study**

The subject of waste is extensive and there are many more aspects of waste that need to be addressed. I have reviewed information with regard to Seattle’s municipal waste and touched slightly on chemical waste, but there needs to be further study on other waste materials, such as e-waste and construction waste. Seattle is promoting deconstruction rather than demolition, but this method is rarely used to the high costs and minimal reuse markets for the deconstructed materials. The current administration also plays a role in future achievements of zero-waste for Seattle. The current administration changes almost by the hour and it is uncertain what legislation will be adhered to or if funding is even available to proceed with goals and/or programs set forth by the Seattle Public Utilities. The next few years may be difficult for Seattle and its zero-waste efforts. There also needs to be further study regarding any challenges with Seattle’s waste policies and the local Native tribes. I did not find much literature regarding this possible issue and it would be beneficial for the city of Seattle to include the Indigenous tribes in the community-based collaborations. Ensuring local Indigenous tribes are not harmed by any zero-waste initiatives will strengthen the city’s policies and system as well as further their efforts in racial equity.

### **Summary**

I have been on a journey to answer a question: what are the limitations of Seattle’s zero-waste resolution and policies to drastically reduce waste in the city, landfills, and the oceans?

I have reviewed a tremendous amount of literature, websites, and media. I have visited and observed the city of Seattle. I also had the pleasure of interviewing the Director of Solid Waste Planning and Program Management. I entered this research journey with a critical mind, skeptical of greenwashing and subjective interpretation. I read government code with the knowledge that laws are written in a way that can be deceiving. I discovered, though, that Seattle’s efforts in reducing waste are not as bad as I thought. There are many aspects that need to be modified and improved.

There are some limitations to reducing waste, but the city has made progress in its efforts. Their new pivot into waste prevention rather than management is encouraging and will help the city achieve zero-waste more effectively than just recycling and managing. As long as society continues to create wasteful items, there will always be waste in our oceans and in our communities. We must look at the first element of production in order to eliminate waste. This begins with obtaining materials to make products and designing the products in a way that serves circularity. The research I have done, observations I have made, and conversations I have had, show me that Seattle’s limitations to reducing waste and achieving its zero-waste goals are

minimal. The city of Seattle shows strength, initiative, and leadership and working through any challenges. Seattle is most certainly a city to follow in becoming zero-waste.

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# Rethinking Dams: Engineering, Ecology, and Equity in Water Management

**Hunter Dunn**

University of San Diego Graduate Student

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## ABSTRACT

This project investigates the question: *How do existing dam management practices in California balance ecological, social, and flood control priorities — and to what extent could biomimicry offer a viable and just alternative for future water management strategies?* Through an extensive literature review, the research examines the ecological impacts of conventional dam management, including habitat disruption, water quality degradation, and long-term consequences for biodiversity. The study also analyzes community engagement meetings and the social implications, focusing on the displacement of Indigenous communities and inequitable water governance. Site assessments at the Sepulveda and Mulholland Dams provided firsthand observations of environmental degradation, including debris accumulation, diminished water quality, and limited wildlife presence. These findings align with the literature, highlighting the ecological strain and social inequities under current dam management practices. Additionally, analyzing stakeholder perspectives — particularly from the California Water Commission Board, the U.S. Army Corps of Engineers (USACE), and the Yurok Tribe — reveals competing priorities and power imbalances that shape decision-making processes.

This paper argues that while biomimicry presents a promising framework for ecosystem restoration and more equitable water governance, its potential remains underutilized due to technical, economic, and institutional constraints. The research emphasizes the need for integrative water management strategies that prioritize ecological resilience and social justice, with biomimicry offering a compelling yet currently constrained pathway toward sustainable infrastructure reform.

## INTRODUCTION

Dams play a critical role in water management by controlling floods, generating hydroelectric power, and supporting agricultural irrigation. However, conventional dam management practices often prioritize flood control and economic interests at the expense of ecological integrity and social equity. These practices have led to extensive environmental degradation, including habitat disruption, declining water quality, and the loss of biodiversity (Graf, 2006). Additionally, Indigenous communities and marginalized populations frequently bear the brunt of these consequences, experiencing displacement and diminished access to natural resources (Norgaard, 2009). As climate change intensifies the unpredictability of hydrological patterns and increases

the frequency of extreme weather events, there is a growing urgency to explore alternative approaches that balance ecological, social, and flood control priorities more effectively. This study investigates how existing dam management practices balance these competing priorities and examines the potential for biomimicry to offer a viable and just alternative for future water management strategies. Biomimicry, which draws inspiration from natural processes such as beaver-engineered wetlands and natural floodplains, has the potential to restore ecological balance while enhancing flood resilience (Norman et al., 2022). However, the feasibility of integrating biomimetic approaches at scale remains uncertain, given the technical, economic, and political challenges involved.

The research draws on an extensive literature review to analyze the ecological and social implications of traditional dam management. Additionally, site assessments conducted at the Sepulveda and Mulholland Dams provided valuable insights into the environmental conditions surrounding these structures, highlighting debris accumulation, impaired water flow, and degraded ecosystems. Stakeholder perspectives — including the U.S. Army Corps of Engineers (USACE), the Environmental Protection Agency (EPA), and the Yurok Tribe — further illuminate the power dynamics and competing interests that shape dam management decisions. The project’s inspiration draws from the keystone species (a.k.a “ecosystem engineer”) for their astonishing contributions to enhancing ecosystems. Countless studies have found that beavers and their dams have improved water quality and management, resulting in a more robust and resilient environment for most species to thrive. The particular case studies that created the drive for this project found that the presence of beavers revitalized drought-struck environments and made them more resilient against wildfires, a devastating climatic challenge that impacts California annually.

As a California native, I’ve witnessed my community grieve over the loss of their homes and surrounding wildlife. Confronting drought conditions and strengthening water management systems is crucial to lessening the impacts of these devastating wildfires and other viable components, such as the environmental, economic, and social impacts associated with droughts.

Achieving the goals of this research requires a transdisciplinary approach that integrates multiple perspectives and methodologies. This includes engaging with experts such as scientists, engineers, and government entities to gain technical insights into dam management practices and the feasibility of implementing biomimicry at scale. Additionally, meaningful engagement with tribal communities is essential to understanding the cultural, historical, and social dimensions of dam management, particularly concerning Indigenous land rights and environmental justice concerns. The research also involves reviewing relevant case studies, as well as applied and qualitative research, to assess the ecological and social outcomes of both traditional dam management and nature-based solutions. Furthermore, direct observations from site visits to both human-engineered dams, such as the Sepulveda and Mulholland Dams, and beaver-engineered structures provide valuable insights into the comparative effectiveness of these systems in managing water flow and maintaining ecological balance. This comprehensive, multifaceted approach ensures a thorough understanding of how existing dam management practices balance competing priorities and how biomimicry may offer a viable and just alternative for future water management strategies.

Data collection for this research involved a combination of literature reviews, site assessments, and consultations with key agencies and organizations. The project primarily focuses on dam management practices in California, given the region's distinct topography, climate conditions, and the presence of critical water infrastructure. However, to explore the potential of biomimicry as an alternative water management strategy, it was necessary to expand the research beyond California, particularly due to the limited presence of beaver populations within the state. Leveraging connections with the United States Army Corps of Engineers (USACE), and the United States Environmental Protection Agency (EPA), this research has gathered valuable knowledge and insights that contribute to understanding how ecological, social, and flood control priorities can be balanced more effectively in dam management practices. These connections have provided critical expertise that informs the feasibility of integrating biomimicry principles into future water management strategies in the world of engineering for sustainability and public health.

## LITERATURE REVIEW

This research explores how dam management practices can be redesigned to support more sustainable, equitable, and adaptive approaches to water and ecosystem management. It draws from interdisciplinary literature in environmental engineering, ecological restoration, hydrology, environmental justice, and Indigenous land stewardship. The review situates the research within the existing body of knowledge, identifies tensions and gaps, and considers how biomimicry— informed by the ecological engineering of beavers—can offer insight into more just and ecologically sound dam practices.

### **Conventional Dam Management: Trade-Offs Between Flood Control and Ecosystem Health**

Dams have long served as vital infrastructure for flood control, hydroelectricity, and water storage. In the context of California, the 1938 Los Angeles flood catalyzed the construction of the Sepulveda Dam by the U.S. Army Corps of Engineers (USACE). This dam remains a central feature in the city's flood control infrastructure. Conventional dam systems like Sepulveda are designed for rigid, long-term control of hydrological systems, often relying on historical precipitation and runoff data. While this design provides predictability and control, it lacks the flexibility to respond to the increasing variability of rainfall and drought associated with climate change (McCartney & Smakhtin, 2010).

Numerous scholars point to the unintended environmental consequences of large dams. Graf (2006) and Poff et al. (2007) argue that dams fragment river systems, disrupt sediment transport, alter flow regimes, and impair aquatic and riparian ecosystems. These ecological disruptions frequently lead to the loss of biodiversity and reductions in fish and wildlife populations. In California, altered flow regimes caused by dams have decimated native salmon populations and undermined traditional fisheries.

Beyond ecological concerns, conventional dam management can deepen existing social inequalities. Anderson et al. (2019) and Swyngedouw (2009) critique the ways that infrastructure projects have historically prioritized industrial and municipal users while marginalizing

Indigenous and rural communities. Dam siting and operations often ignore the needs of downstream users or those without institutional power. This dynamic reflects a broader tension between engineering-led water governance and more inclusive, adaptive models.

### **Indigenous Water Stewardship and Environmental Justice**

Indigenous perspectives offer an alternative paradigm to water governance rooted in Traditional Ecological Knowledge (TEK). Rather than viewing rivers and water bodies as resources to be controlled or extracted from, Indigenous communities often frame them as living entities with rights and relationships. The Yurok Tribe, for example, has long fought for the removal of dams on the Klamath River to restore salmon populations and revitalize traditional practices (Norgaard, 2019). Their advocacy reflects a broader movement among Indigenous nations to assert sovereignty over water and challenge the colonial legacies embedded in mainstream water infrastructure.

Environmental justice scholars highlight how dam systems reinforce racial, economic, and colonial hierarchies. Pulido (2017) frames environmental racism as a process through which low-income and racialized communities bear the burdens of environmental degradation while being excluded from decision-making. In California and throughout the U.S., Indigenous peoples have been disproportionately affected by water diversion, dam construction, and ecosystem degradation—yet their knowledge and perspectives are often sidelined in water governance. Centering Indigenous epistemologies in environmental decision-making can yield both ecological and social benefits. Many tribal communities possess place-based ecological knowledge that has been passed down through generations. This knowledge is often more attuned to the complexities of local ecosystems than top-down engineering models and is increasingly being recognized as vital to climate resilience and restoration efforts (Whyte, 2017).

### **Biomimicry and Beaver-Inspired Design: Nature-Based Solutions to Dam Impacts**

Biomimicry—design inspired by natural systems—offers a promising avenue for addressing the environmental harms associated with conventional dams. Beavers, often referred to as “ecosystem engineers,” build dams that slow water flow, trap sediment, recharge groundwater, and create biodiverse wetland habitats. These structures support resilience to drought and flood, while also enhancing water quality and habitat connectivity.

Recent ecological restoration projects have explored the use of beaver dam analogs (BDAs) as a form of biomimicry in stream and riparian restoration. Pollock et al. (2014) and Bouwes et al. (2016) document how BDAs have been used in the Pacific Northwest to restore degraded watersheds, improve salmon habitat, and mitigate the effects of land-use change and climate variability. These projects offer a compelling proof of concept for how ecological processes can be harnessed to complement or even replace traditional infrastructure.

However, implementing biomimicry in urban and hydrologically complex regions like Los Angeles presents challenges. Johnson et al. (2021) point out that urban waterways face additional stressors—including pollution, channelization, and high peak flows—that make it difficult to replicate natural processes. Additionally, BDAs are generally designed for rural, low-gradient streams, and may not scale easily to the size or scope of major dam systems.



Nonetheless, beaver-inspired approaches can offer valuable insights for rethinking how dams interact with ecosystems. Rather than removing all large dams, hybrid approaches could integrate nature-based elements into existing infrastructure to improve ecological performance. This might include reintroducing sediment transport, enhancing floodplain connectivity, restoring native vegetation, or using adaptive flow regimes that mimic natural hydrological patterns.

### **Institutional and Regulatory Barriers to Innovation**

Despite growing interest in ecological restoration and biomimicry, current institutional frameworks often inhibit the adoption of alternative dam management approaches. Agencies like USACE operate under narrowly defined mandates that prioritize public safety and flood control. While environmental considerations are increasingly factored into project design, they remain secondary to engineering and cost-benefit calculations (Benson et al., 2014).

Water governance in California is fragmented across federal, state, and local agencies, each with its own priorities and jurisdictions. The State Water Resources Control Board (SWRCB), for example, focuses on water quality and rights allocation, while the EPA emphasizes regulatory enforcement under the Clean Water Act (CWA). This patchwork of oversight makes it difficult to implement integrated or experimental approaches that cut across conventional silos (Hanak et al., 2011).

Funding and political will are also inconsistent. While the Biden administration has made significant investments in climate resilience and infrastructure through the 2021 Infrastructure Investment and Jobs Act (IIJA), previous administrations undermined environmental programs through budget cuts and regulatory rollbacks (Konisky & Woods, 2018; Cusick, 2020). Such shifts reveal the vulnerability of ecological restoration efforts to political cycles and highlight the need for long-term institutional support.

Moreover, permitting processes for restoration projects can be lengthy, complex, and ill-suited to nature-based or experimental approaches. BDAs and similar techniques often face scrutiny under existing environmental laws—even when their purpose is restoration—because regulations were written with traditional, large-scale engineering in mind. This mismatch between ecological design and regulatory structures limits the potential for innovation in dam management (Wohl et al., 2015).

### **Reframing Dam Engineering Through Justice and Adaptability**

This research seeks to explore how dam engineering can evolve to support sustainable water management and reduce ecological harm, with particular attention to the role of stakeholder engagement and structural inequality. It challenges the binary of removal versus retention by considering hybrid approaches that retrofit or modify existing structures using ecological principles. Rather than advocating for the wholesale replacement of dams, it explores how existing infrastructure might be reimaged through biomimicry, Indigenous stewardship, and adaptive management.

The study will draw from interviews with experts, agency staff, and tribal representatives involved in dam removal and river restoration projects in California, including the EPA's Superfund Division and members of the Yurok Tribe. These perspectives will inform a broader understanding of how structural and historical inequalities continue to shape dam outcomes, and what pathways exist for more inclusive and restorative practices.

A key contribution of this research is its attention to systems thinking—connecting ecological design with regulatory structures, social power dynamics, and environmental justice. By foregrounding the voices of those most impacted by dams and engaging with interdisciplinary knowledge, the project aims to support more just and resilient water systems.

## **METHODOLOGY**

This project uses a qualitative, exploratory research design to investigate how dam engineering can be redesigned to support sustainable water management and minimize environmental and social harms. My approach is rooted in political ecology and informed by the intersecting frameworks of environmental justice, stakeholder theory, and historical institutional analysis. Because my research questions explore complex sociotechnical systems and emphasize positionality, the methodology is grounded in interpretive practices that prioritize localized knowledge and context-specific meanings.

This methodology section is structured to answer the following three research questions:

- How can dam management be redesigned to better support environmental sustainability?
- In what ways do structural inequalities shape decision-making about dams and river ecosystems?
- What insights can stakeholder perspectives provide about potential pathways forward?

I used a triangulation of sources and methods to address these questions, including a comprehensive literature review, a site-based case study, and semi-structured interviews with experts involved in ecological restoration, engineering, and policy. I also engaged in critical reflexivity to understand my own role in shaping the research.

### **Literature Review: Foundations and Theoretical Context**

To answer Research Question 1, I conducted an interdisciplinary literature review spanning engineering, restoration ecology, and environmental justice. I focused on how dam infrastructure has historically developed in the U.S., how it is currently being challenged or reimagined, and the theoretical basis for alternative design models like beaver dam analogs (BDAs) and nature-based solutions. The review also covered ecological restoration case studies in California and the Pacific Northwest and scholarship on adaptive management and hybrid infrastructure systems. This foundation allowed me to critically examine dominant narratives around technological progress, safety, and control. In particular, I found that many engineering frameworks still prioritize hard infrastructure and top-down management, often at odds with ecological or

community-based goals. These insights directly inform the discussion of potential redesign strategies in the Results section.

The literature also provided context for Research Question 2, by highlighting the racialized and colonial histories of U.S. water infrastructure, including land dispossession, displacement, and underrepresentation in water governance. These themes became central to analyzing the broader systems in which dam management occurs.

### **Case Study Site: Sepulveda Dam and the L.A. River Watershed**

To contextualize these themes and test their relevance in a real-world setting, I conducted a site-based case study of Sepulveda Dam and its surrounding watershed in Los Angeles, California. This case study supports all three research questions, but especially Research Questions 1 and 2. I selected Sepulveda Dam because it represents the tensions between flood control, ecological restoration, and social equity in a highly urbanized watershed. It also sits at the intersection of several competing agencies (the U.S. Army Corps of Engineers, LA County Flood Control District, NGOs, and community organizations), making it a useful site for examining stakeholder dynamics.

I reviewed a range of publicly available documents related to Sepulveda Dam, including Army Corps engineering reports, LA River restoration plans, climate resilience strategies, and advocacy materials from groups like Friends of the Los Angeles River (FoLAR) and Heal the Bay. These materials offered insight into how different stakeholders frame the future of the river and the role of the dam.

Using maps, planning documents, and environmental data, I also analyzed the physical geography and historical land use of the area. This helped identify how prior development decisions—often rooted in racialized logics of risk—continue to shape vulnerability and access to green space today.

The Sepulveda Dam case also served as a geographic anchor to explore Research Question 3, particularly through the analysis of multi-stakeholder planning documents that reflect competing visions for river restoration and flood management.

### **Semi-Structured Expert Interviews**

To directly address Research Question 3 and further inform Questions 1 and 2, I conducted a structured interview with a professional engineer/physical scientist from the EPA involved in the Delaware dam removal project.

The interview was conducted virtually, lasting between 45 minutes and 1 hour, and was tailored to the interviewee's expertise but included core questions such as:

- What opportunities or barriers do you see in current dam management systems?

- How does your agency or team integrate ecological, social, or cultural considerations into infrastructure projects?
- What stakeholder dynamics shape decision-making?
- How do equity and justice factor into your work—if at all?

I transcribed and thematically analyzed the interview using grounded theory practices. Initial codes were developed inductively and included themes like: institutional rigidity, ecological restoration, public safety logic, stakeholder engagement, tribal sovereignty, and funding constraints.

The interview was especially valuable for Research Question 3, providing insider perspectives on how agencies balance competing objectives, what constraints exist (institutional, financial, or regulatory), and what future shifts may be possible. It also reinforced findings from the literature and case studies about the persistence of structural inequalities in water governance (Question 2).

### **Positionality and Researcher Reflexivity**

Given the social and political stakes of this research, I incorporated reflexive methods to examine my positionality as a graduate student researcher, an intern at the EPA, and someone not from the affected communities near Sepulveda Dam. I acknowledge that my institutional affiliation may shape both my access to experts and the kinds of questions I can ask.

To mitigate this, I prioritized stakeholder narratives and tried to center their perspectives when available. However, this research was limited by the fact that I did not conduct interviews with community members or tribal representatives due to time constraints and IRB restrictions. This is a significant gap that future research must address.

Throughout the project, I aimed to approach each source and interaction with humility and an awareness of power dynamics. I also drew on decolonial scholarship to challenge the dominant technocratic lens that often governs dam infrastructure planning.

## **RESULTS AND DISCUSSION**

This section synthesizes findings from stakeholder interviews, community engagement meetings, and secondary research to evaluate the viability and justice implications of incorporating biomimicry into dam engineering. Drawing from discussions with environmental engineers, Indigenous community members, regulatory officials, and ecologists, the section explores how historical and ongoing water governance decisions have shaped ecological and social outcomes. It also examines the practical constraints of implementing nature-based solutions in contexts shaped by regulatory rigidity, contested water rights, and environmental injustice. Throughout, themes of inclusion, institutional inertia, and ecological potential are brought into dialogue to inform a more just and adaptive water infrastructure future.

## Community Perspectives: Historical Marginalization and Contemporary Gaps in Participation

Engagement with affected communities, including participation in public meetings and observation of tribal interactions with state and federal agencies, revealed persistent tensions surrounding decision-making, equity, and representation in water infrastructure planning.

At the California Water Commission Board meeting on February 19, 2025, formal procedures were observed to acknowledge tribal sovereignty by inviting tribal comments at the outset. However, no tribal members chose to speak. While this silence could be interpreted as tacit agreement with the Commission's agenda, it may also signal deeper structural barriers to participation. The absence of tribal input raises questions about the adequacy of outreach efforts and whether these engagement opportunities genuinely foster inclusive dialogue.

Public testimony during the same meeting highlighted critical concerns. A local farmer expressed the need to collaborate with Indigenous communities and integrate Traditional Ecological Knowledge (TEK) to mitigate cultural and ecological harm caused by projects like the Pacheco Dam. Meanwhile, the Stop the Pacheco Dam Coalition voiced opposition to funding the project under Proposition 1, arguing that it fails to deliver sufficient public benefit for its high cost and presents risks to sensitive habitats. In contrast, the Harvest Water Program—a decentralized approach that reuses treated water for agriculture—was cited as a successful, more localized solution. These contrasting perspectives underscore the growing divide between large-scale, top-down infrastructure planning and community-supported alternatives grounded in sustainability and justice.

This tension was echoed during a community engagement meeting involving the U.S. Army Corps of Engineers (USACE) and the Yurok Tribe, where tribal representatives emphasized the ongoing ecological and cultural consequences of past dam placements and river modifications. One Yurok elder recounted the decline in salmon populations as not just an environmental issue, but a spiritual and cultural loss. USACE staff presented updates on flood risk management and restoration efforts but acknowledged institutional limitations in adapting projects to reflect tribal priorities. Although well-intentioned, the interaction revealed the asymmetrical nature of engagement, where technical presentations often overshadow Indigenous epistemologies and lived experiences.

These community-level insights directly inform Anchored Question 1: How have past and present dam systems contributed to environmental inequality? What emerges is a pattern of exclusion from water governance processes, particularly among Indigenous and rural communities. The legacies of colonial water policies and the enduring absence of meaningful consultation reflect broader patterns of infrastructural injustice. Dams are not simply hydrological interventions; they are physical expressions of political decisions that shape whose voices are heard, whose knowledge counts, and whose futures are secured.

## **Institutional Barriers and Regulatory Inertia**

Perhaps the most compelling institutional insight came from an interview with an EPA engineer and project manager involved in the Delaware Dam removal. His account illuminated the systemic constraints that limit ecological innovation, even within agencies committed to environmental protection.

According to the engineer, the Delaware Dam was ultimately removed due to the drastic decline in shad fish populations, which were unable to reach their upstream spawning grounds. He noted that dams often widen rivers, making them shallower and warmer—conditions detrimental to aquatic life due to reduced oxygen levels. Despite the ecological urgency, it took four years to secure funding, and even then, half the budget was consumed by permitting processes alone.

He was candid about his surprise at how restrictive environmental regulations can be—not to prevent harm, but ironically, to prevent ecological restoration. The complex web of permitting, liability concerns, and funding requirements often stalls or disincentivizes low-impact or experimental solutions like BDAs. “Even when agencies want to try something different,” he said, “the system isn’t really built to support innovation. Risk aversion is baked in.”

This feedback speaks to Anchored Question 3: What systemic barriers prevent the implementation of sustainable or nature-based dam engineering approaches? The obstacles are numerous: fragmented jurisdictions, institutional conservatism, inflexible funding structures, and outdated safety metrics. The engineer also expressed frustration with poor water quality monitoring, sharing the example of a utility company that had unknowingly released PCBs into the Hudson River without adequate testing. “The fact that this wasn’t caught earlier,” he remarked, “shows that we’re not always aligning infrastructure with public health and environmental goals.”

However, he did express cautious optimism. While he could not speak to the technical feasibility of beaver dams themselves, he affirmed the ecological success of using biomimetic principles to build streams over old dam sites, particularly in improving fish passage and habitat regeneration.

## **Hydrological and Ecological Impacts of Conventional Dams**

Site assessments of engineered dams in the Los Angeles region provided critical insights into the hydrological and ecological consequences of conventional dam infrastructure. Observations documented extensive sediment accumulation, altered flow regimes, and habitat fragmentation. These findings align with established literature, such as Poff and Hart (2002), who emphasize how dams disrupt natural flow patterns, impede sediment transport, and degrade downstream ecosystems. Moreover, sediment retention behind dams diminishes reservoir storage capacity, reducing the long-term efficiency of water storage and requiring costly maintenance interventions (Kondolf et al., 2014).

The ecological consequences of these hydrological alterations include reduced groundwater recharge, degraded aquatic habitats, and the loss of riparian biodiversity. Observations confirmed that engineered dams exacerbate ecological degradation by creating artificial hydrological



regimes that fail to mimic natural flow variability. These findings echo Pollock et al. (2014), who argue that maintaining ecological integrity requires restoring natural hydrological patterns to support healthy ecosystems.

## **SITE ASSESSMENTS: MULHOLLAND DAM VS. SEPULVEDA DAM**

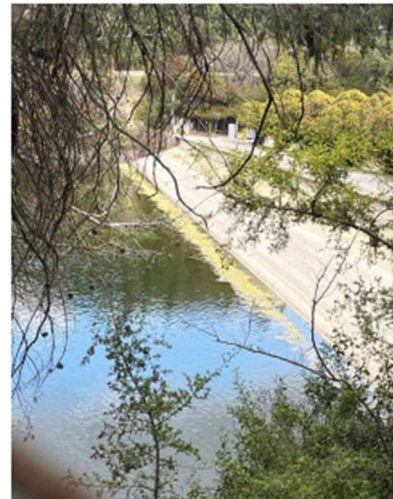
### **Mulholland Dam**

The site assessment of Mulholland Dam revealed a highly secure facility, characterized by protective fencing, restricted access, and visible measures to ensure both structural integrity and public safety. The surrounding Hollywood Reservoir presented a controlled aquatic environment, with consistently clear water and minimal visible pollution. This well-maintained condition stood in stark contrast to the Sepulveda Dam, where visible litter accumulation and signs of ecological degradation were more pronounced. The superior environmental conditions at Mulholland Dam suggest a higher level of maintenance, reflecting its primary function as a water storage facility rather than a flood control structure.



Unlike Sepulveda Dam, which operates as a flood control dam and is subject to fluctuating water levels and sediment displacement, Mulholland Dam maintains relatively stable water conditions, reducing the likelihood of sediment disturbance or ecological disruption. This functional distinction significantly influences the ecological state of the surrounding environment. Furthermore, the consistent water levels and absence of dynamic flow management contribute to maintaining water quality and habitat stability, highlighting the

difference in hydrological and ecological impacts between water storage and flood control systems. These observations reinforce the understanding that dams designed primarily for water storage may exert less immediate ecological stress compared to flood control infrastructure, raising questions about the adaptability of these structures to future climate and water management challenges.





## SEPULVEDA DAM

In contrast, my site assessment of Sepulveda Dam revealed significant environmental concerns. The accumulation of debris has led to water flow blockages, impacting the already mild flow of the Los Angeles River. Litter pollution was highly visible, with discarded materials accumulating along the riverbanks and within the reservoir itself. Wildlife presence was minimal, suggesting an altered or degraded ecosystem. Additionally, the absence of protective fencing or barriers, raising questions about infrastructure management and public safety—especially when compared to the heightened security measures at Mulholland Dam.



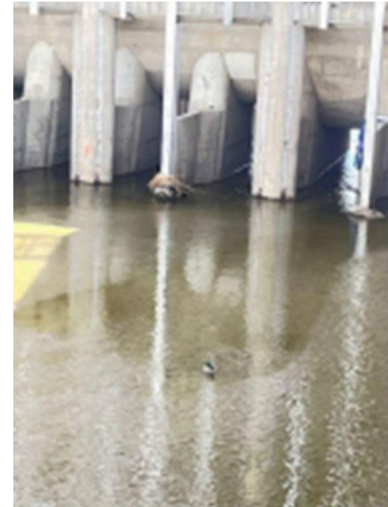
A particularly striking observation was the presence of a homeless individual walking in the river, reflecting the intersection of urban infrastructure, environmental conditions, and social vulnerability. Sepulveda Dam's surrounding environment is almost completely degraded, highlighting an urgent need for restoration and sustainable redesign. Given the dam's dual role in flood control and recreation, there is potential to explore biomimicry-inspired solutions that could both enhance ecological resilience and improve water management practices.

At Sepulveda Dam, the visible environmental degradation and poor water quality raise questions about who benefits from water infrastructure and who bears its costs. While the dam provides flood protection for urban Los Angeles, the

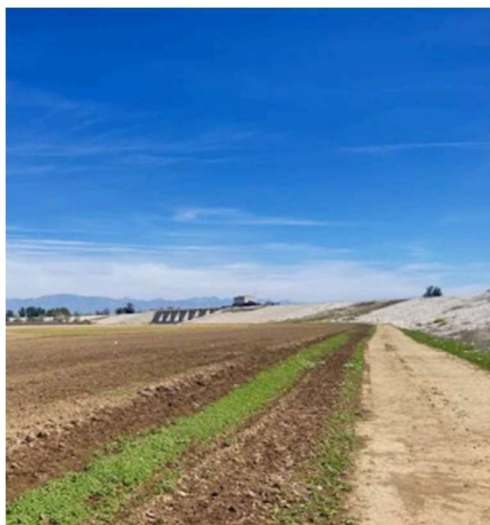


surrounding area suffers from ecological neglect, poor water management, and social inequities. The presence of unhoused individuals within the degraded floodplain further emphasizes the interplay between environmental infrastructure and urban marginalization. These observations align with broader discussions on how water management decisions disproportionately affect marginalized communities and the need for equitable and sustainable infrastructure solutions.

Given the environmental degradation observed at Sepulveda Dam, there is potential to integrate biomimicry into dam infrastructure as a way to enhance water management, flood resilience, and ecological restoration. One possible approach is beaver-inspired hydrological engineering, where natural damming mechanisms could restore sediment transport, improve water filtration, and create biodiversity-rich wetland environments. These practices have already been implemented in certain river restoration projects with positive outcomes.



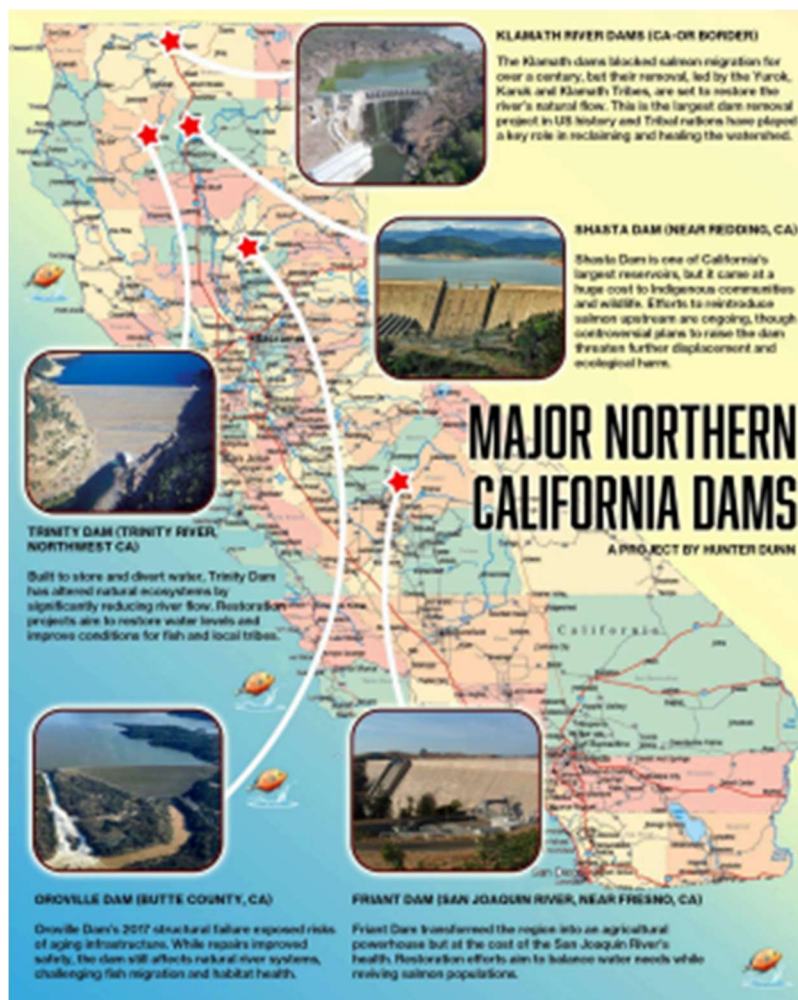
However, the feasibility of biomimicry at scale remains uncertain. Large flood control structures, like Sepulveda Dam, operate under strict regulatory frameworks that prioritize public safety and flood mitigation over experimental ecological approaches. Additionally, urban constraints and land-use policies may limit the extent to which nature-based solutions can be incorporated into existing infrastructure. Despite these challenges, hybrid approaches that combine structural engineering with ecological restoration could serve as a middle ground for integrating biomimicry into modern dam management strategies.



## SOCIO-ENVIRONMENTAL INEQUITIES IN DAM MANAGEMENT

Stakeholder engagement revealed that marginalized communities, particularly Indigenous nations, continue to bear a disproportionate burden of the environmental and social costs associated with dam management. Participation in the California Water Commission Board meeting highlighted the absence of Indigenous voices, despite formal invitations for tribal engagement. This aligns with Cronin and Ostergren (2007), who observe that Indigenous perspectives are often excluded from environmental decision-making processes, perpetuating historical injustices and limiting the integration of Traditional Ecological Knowledge (TEK) in water governance.

Additionally, discussions with the Yurok Tribe and the USACE regarding the Klamath Basin Aquatic Restoration Study underscored how dam removals, when led by Indigenous communities, can restore both ecological balance and cultural practices. The Klamath River dam removal project, the largest in U.S. history, illustrates the potential for collaborative governance to address historical harms and promote more just water management practices. These insights reinforce the findings of Diver (2017), who advocates for integrating TEK into restoration efforts to enhance ecological and cultural resilience.



**Figure 1.1 Community Mapping Northern California Dams**

This community map highlights key dam sites across Northern California that have influenced ecological and social dynamics in the region. The selected dams illustrate a range of environmental consequences, including habitat degradation, water scarcity, and displacement of Indigenous communities. By mapping these sites, I aimed to showcase the broader implications of dam infrastructure beyond my site assessments at Sepulveda and Mulholland Dams. While these specific dams are not included in the map, the geographic visualization provides a comparative framework for understanding how water management policies and dam-related decisions impact ecosystems and communities statewide. This perspective situates my findings within a larger narrative of ecological restoration and environmental justice efforts across California.

Dams have historically played a role in displacing Indigenous communities, altering ecosystems, and contributing to environmental injustices. The case of the Yurok Tribe exemplifies the long-standing struggle over water rights and salmon restoration efforts. Many large dams, including those along the Klamath River, have disrupted fish migration patterns, eroded Indigenous fishing rights, and contributed to declining water quality. While some dam removal efforts—such as those on the Klamath River—represent a step toward restorative justice, many existing dams continue to perpetuate environmental harm in Indigenous lands.

To highlight the broader landscape of dam-related ecological and social justice concerns in Northern California, a community map was generated to identify key locations where communities and ecosystems have been impacted by water infrastructure. While this map does not depict Sepulveda and Mulholland Dams, it provides a comparative perspective on the challenges associated with dam infrastructure and restoration efforts throughout the state.

## **POLICY IMPLICATIONS: PATHWAYS FOR INTEGRATING BIOMIMICRY INTO WATER MANAGEMENT**

The regulatory landscape governing dam operations and water management is complex, with federal laws such as the Flood Control Act, the Clean Water Act (CWA), and the National Environmental Policy Act (NEPA) shaping how infrastructure modifications are implemented. State-level regulations, including California’s Sustainable Groundwater Management Act (SGMA), further influence water allocation and conservation strategies. Any effort to integrate biomimicry into dam redesign would require navigating these regulatory frameworks to ensure compliance with flood control mandates, water quality standards, and environmental impact assessments.

Potential policy pathways include:

1. Incentivizing nature-based solutions through federal and state water infrastructure grants.
2. Developing pilot projects that integrate biomimetic floodplain restoration techniques into existing dam operations.
3. Updating water management policies to allow for more flexible, adaptive flood control strategies that incorporate ecosystem restoration principles.

Flood control remains a primary objective of dam management in California, with regulatory agencies such as the USACE prioritizing public safety and infrastructure protection. Observations from the California Water Commission meeting underscored the dominant role of flood control mandates in shaping dam management decisions. While these priorities are essential for safeguarding communities, they often constrain the adoption of nature-based solutions that offer long-term ecological benefits. Bledsoe et al. (2018) highlight this tension, noting that regulatory rigidity can inhibit the implementation of adaptive water management practices.

A notable discovery was the extent to which regulatory frameworks constrain the adoption of biomimicry-inspired solutions, even when ecological and social benefits are well-documented. The lack of Indigenous representation at the California Water Commission meeting underscored structural barriers to meaningful engagement, suggesting that existing outreach efforts may not adequately address historical and cultural considerations. These findings suggest that improving stakeholder engagement—particularly by centering Indigenous voices—could enhance the legitimacy and effectiveness of future water management strategies.

## **CHALLENGES AND LIMITATIONS: TECHNICAL, ECONOMIC, AND POLITICAL BARRIERS**

Despite the potential benefits of integrating biomimicry into dam redesign, several significant barriers must be addressed. Traditional dam engineering is rooted in rigid control of water flow to prevent flooding and manage water storage. In contrast, nature-based solutions such as biomimicry emphasize dynamic, adaptive processes that respond to ecological changes over time. Merging these approaches would require developing new modeling techniques and hydrological assessments to simulate and predict the performance of biomimetic systems in diverse environments. Without these advancements, the feasibility of applying biomimicry to large-scale dam infrastructure remains uncertain.

Economically, retrofitting existing dams with biomimetic features will likely present high upfront costs, with uncertain long-term financial benefits. Implementing nature-based solutions at scale would require significant investment in research, pilot programs, and ongoing maintenance. Additionally, funding mechanisms to support these efforts remain underdeveloped, making it difficult to secure financial support for large-scale adoption. Without dedicated funding streams or policy incentives, the economic feasibility of incorporating biomimetic approaches into dam management is limited.

Additionally, water infrastructure decisions are often highly politicized, involving conflicting interests between federal agencies, local governments, and community stakeholders. The bureaucratic complexity of modifying flood control infrastructure—particularly within a regulatory landscape that prioritizes flood protection and water supply reliability—can hinder the adoption of innovative approaches like biomimicry. Institutional inertia and the prioritization of traditional engineering solutions further complicate efforts to shift toward more ecologically adaptive alternatives.

Moreover, while this research gathered valuable insights from the California Water Commission Board, tribal representatives, and the U.S. Army Corps of Engineers (USACE), it highlights the need for broader stakeholder engagement. Ensuring that all critical perspectives—particularly those from marginalized communities, indigenous tribes, and professionals within the field—are accounted for is essential to creating equitable, practical, and sustainable water management solutions. Without inclusive dialogue and participatory decision-making processes, efforts to integrate biomimicry into dam management risk overlooking key concerns and perpetuating existing inequities in water governance.



## SUMMARY

This research found that California’s current dam management practices—while effective in structural flood control—often undermine ecological resilience and social equity. Through site assessments, literature review, and engagement with key stakeholders—including the California Water Commission Board, the Yurok Tribe, and the U.S. Army Corps of Engineers (USACE)—this study revealed that the state’s dam infrastructure tends to prioritize engineered control over ecosystem functionality and inclusive governance. In response to the central research question—How do existing dam management practices in California balance ecological, social, and flood control priorities — and to what extent could biomimicry offer a viable and just alternative for future water management strategies?—the findings suggest that biomimetic approaches offer a compelling alternative, but their success depends on a shift in both policy and practice.

Site visits to Mulholland and Sepulveda Dams underscored major disparities in ecological outcomes. While Mulholland Dam demonstrated higher levels of maintenance and water quality, Sepulveda Dam revealed signs of ecological degradation linked to its singular flood control function. These observations reflect broader tensions in dam infrastructure design, where hydrological regulation often comes at the cost of habitat health and long-term sustainability.

Although biomimetic interventions—such as Beaver Dam Analogs (BDAs)—have proven effective in restoring natural water flow, sediment transport, and habitat connectivity, their integration into mainstream infrastructure remains limited. This research identified several barriers to wider adoption, including the technical complexity of modeling nature-based systems, financial constraints for retrofitting existing dams, and institutional inertia within regulatory bodies accustomed to conventional engineering standards.

Stakeholder engagement reinforced the need to democratize water infrastructure governance. Tribal representatives and agency officials highlighted gaps in current decision-making processes, particularly the exclusion of downstream users and marginalized communities from project planning. While this study engaged with a range of key voices, it also revealed the importance of expanding future outreach efforts to ensure more participatory and just outcomes. Without intentional and sustained engagement with historically underrepresented groups, efforts to promote sustainability risk reproducing existing inequities.

Future research should focus on scaling biomimetic practices to fit larger dam systems and conducting longitudinal studies that assess both ecological and economic trade-offs. Equally important is policy analysis aimed at reforming permitting processes, funding criteria, and performance metrics to accommodate adaptive, nature-based designs. Developing incentive structures and pilot programs that encourage experimentation—particularly in partnership with tribal nations and frontline communities—will be essential for breaking through entrenched regulatory constraints.

Ultimately, this study argues that reimagining dam engineering through the lens of biomimicry and environmental justice is not only possible but necessary. A paradigm shift—one that rebalances priorities from rigid control to adaptive coexistence—offers a pathway toward dam systems that support both human and ecological well-being. Advancing such a vision will

require not just new technologies, but new governance models, new voices at the table, and a redefinition of success in water infrastructure planning.

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Is Reaching Net-Zero in HVAC with High-Efficiency Units and Refrigerant Recycling and Recovery Possible to reduce the carbon footprint. Will Reduction in Waste Management and Transitioning to Environment Safe Refrigerants Help with Lowering Global Warming.

Ian Torres

*April 13, 2025*

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#### **Abstract:**

This article describes how net-zero emission from HVAC systems can be achieved by using high-efficiency equipment, waste minimization measures, and low ODP (Ozone Depletion Potential) and GWP (Global Warming Potential) friendly refrigerants. This article highlights how innovation has occurred in HVAC technology, and how inverter technology has made HVAC sustainable and energy efficient. The report compares and contrasts air conditioners, gas units, and heat pumps, and also details California's present tax and utility incentives for encouraging high-efficiency systems. It further discusses the urgent need for refrigerant recovery and recycling programs, the environmental risks of traditional refrigerants, and the promise of new materials to limit pollution and waste. Through conducting a lifecycle analysis (LCA) of HVAC systems, the study reveals opportunities for waste elimination, which will lead to a greener and more sustainable tomorrow for the HVAC sector.

#### **Introduction:**

The question I have is “Is Reaching Net-Zero in HVAC with High-Efficiency Units and Refrigerant Recycling and Recovery Possible to reduce the carbon footprint in California.

Will Reduction in Waste Management and Transitioning to Environment Safe Refrigerant Help with Lowering Global Warming.”

Net-zero carbon hunting is pivotal as discussions on global warming and resource sustainability accelerate. This goal has a direct impact on the HVAC industry, which has traditionally taken a high energy-heavy approach and depleted the use of harmful refrigerants that amplify climate change. These and other developments in technology and policy are setting us on a path toward sustainability. The HVAC industry will need to strive for net-zero emissions through energy-efficient equipment, greater refrigerant management, and a consumer culture of sustainable behavior.

There is a growing need for energy-efficient products that are utilized in commercial and residential buildings since there are heightened concerns about lowering the environmental effect of HVAC systems. Since heating and cooling consume about half the energy used by buildings, making HVAC systems more efficient is a successful lever in minimizing carbon emissions. California's environmental policies and incentives are driving the leadership and innovation that are pushing the HVAC industry toward cleaner technologies faster than anywhere else. These initiatives showcase the state's commitment to addressing climate change while creating a stronger economic framework.

It goes over a few important HVAC sustainability topics. This will start with an overview of how different HVAC systems air conditioners, gas-fired systems, heat pumps all use energy and refrigerants and a discussion of how they really operate. I will review existing tax incentives and utility programs in California in the following sections that aim to stimulate the adoption of high-efficiency HVAC solutions. Moreover, I will also talk about modern technologies, especially inverter technology, which is helpful in providing energy efficiency and efficient performance.

This topic will be particularly relevant with regard to the important role refrigerant recovery and recycling efforts have in addressing the environmental risks posed by legacy refrigerants. Finally, I will conclude with what this means for future research into alternative materials and lifecycle analysis (LCA) to find opportunities for reduction or increase of sustainability.

Other topics I intend to touch upon are promoting electrification related to risk reduction for carbon footprints. A key area of focus will also be the implementation of upfront incentives for higher-efficiency systems. My findings are guided by industry knowledge and insights from speaking with parties involved who paint a more holistic picture of the transition towards sustainability in the HVAC space. By applying this diverse strategy of technical innovation, constructive policy, and environmentally sustainable solutions to heating and air conditioning systems, setting the path toward net-zero emissions. By coming together as key players in the construction industry, stakeholders can drive impactful change and create the more sustainable built environment we all want to see.

## Literature Review:

As we move into a period ever more characterized by climate consciousness and a dire requirement for sustainability, the heating, ventilation, and air conditioning (HVAC) sector has found itself at center stage. Technological innovation and increasing focus on energy efficiency have encouraged a prolific literature that explores these shifts, along with their environmental implications. This review is a critical examination of current studies, articles, and reports, showing how this project will address current gaps, build upon current research, and dispute current assumptions in the HVAC industry.

Literature demonstrates a radical change in the design, installation, and use of HVAC systems. Of the many changes, inverter technology emerges as a game changer. Research suggests that inverter-driven systems have the potential to cut energy usage by up to 50% compared to conventional fixed-speed equipment. Inverter systems adjust their output according to the real-time actual demand, thereby streamlining efficiency and performance. In addition, the increasing trend of integration of smart technologies, ranging from IoT-enabled thermostats to intelligent energy management systems, is a characteristic shift towards smarter, more efficient climate control systems.

One of the most important aspects of HVAC writing is learning about the different kinds of HVAC equipment and their specific uses. Comparative information brings out the specific advantages and limitations of air conditioners, gas electric units, and heat pumps. For example, though air conditioning systems are most ideally adapted to tropical climates, the fact that heat pumps can also supply heat in addition to cooling makes them very versatile for moderate climates. Researchers highlight the necessity for regionally suitable selection procedures based on climates, and that an overall rating of efficiency can help consumers make logical decisions.

California is at the forefront of encouraging the adoption of high-efficiency HVAC technologies with both tax credits and utility rebates. The literature already captures a positive correlation between such incentive programs and residential and commercial sector adoption of energy-efficient systems. Now, a new rebate program reports that the programs will help induce a notable 35% rise in the purchase of high-efficiency units from the introduction of the programs. But the literature also finds inequalities in access; low-income families are typically not aware of these incentives, pointing to the necessity for focused outreach.

Homeowners need to make sure that their new HVAC systems meet the prescribed energy efficiency standards of the California Energy Commission (CEC) to be eligible for the energy-efficient tax credit. Systems with the Energy Star rating are typically qualified for these incentives. The tax credit can significantly offset installation expenses, so it is a good time for homeowners to upgrade to more efficient systems from their old ones. By investing in such energy-efficient units, homeowners can not only save money on their utility bills but also contribute to making California a greener state.

The monetary reward of this tax credit is substantial. Homeowners have the ability to recover some of their cost of installation come tax time, providing a badly needed relief during these challenging financial times. Organizations like Paul Mitchell's Air Care Inc. are encouraging citizens to seize this window of opportunity by scheduling appointments to assess their current HVAC systems. Their professional team can provide personalized recommendations on qualified energy-efficient systems so that homeowners can reap maximum immediate savings along with long-term advantages. In a world where every cent matters, utilizing these incentives might be the best thing a homeowner can do.

Conventional refrigerants are very dangerous to the environment, and policymakers and ecologists have raised concern about them. The phase-down of HFCs in international agreements is an indication of the need to introduce efficient refrigerant recycling and recovery schemes. Open disposal of refrigerants is regarded by the [EPA](#) as one of the key sources of greenhouse gas emissions and promotes stricter controls and consumer education. In addition, the quest for non-polluting refrigerants and those consistent with sustainability objectives has been heightened, representing a principal research direction for the next few years.

Life cycle analysis (LCA) has emerged as a predominant method of analyzing the environmental effects of HVAC systems from cradle to grave. Literature contends that LCA enables the determination of potential for reduction of waste by taking into consideration the potential of HVAC systems to cause a reduction in their environmental impact. However, there exists a gap in the standardization of LCA methodologies that are tailored to HVAC applications, and herein lies an excellent opportunity for more questions that have the potential to sharpen decision-making at all stages of the industry.

In my research, I have found there to be a substantial gap in literature for the effectiveness of incentive programs in encouraging energy-efficient HVAC systems in the case of California. While there is ample literature present that elaborates on the effectiveness of high-efficiency units along with the reasons why the need to limit the carbon footprint, there is a dire shortage of studies ascertaining the impact economic barriers have on adoption rates among low-income groups.

I have discovered that the majority of the existing research either ignores the particular needs of low-income consumers or does not suggest practical solutions for addressing these barriers. For example, most incentive programs typically offer rebates or tax credits to reward individuals who are already in a position to afford the high upfront cost of premium HVAC systems, disadvantageously positioning low-income households. This imbalance implies that the incentive frameworks that exist are ill-designed to motivate energy-efficient systems among the very same actors that would benefit most from their adoption.

Furthermore, I have found the literature lacking in the significance of refrigerant management practices, particularly the requirement for refrigerant recycling and recovery training. Although some papers cite environmental gain from low-GWP refrigerants, insufficient discourse is provided on how to proceed on the utilization of such

alternatives in an economically feasible way for those unable to merely replace their systems.

In my research, I aim to address these gaps by advocating for more effective incentive programs that include upfront payment options to make energy-efficient HVAC systems more accessible. I will also discuss the use of refrigerant management training to complement these HVAC upgrade strategies. Through addressing both financial accessibility and proper refrigerant management, I believe my work has the potential to make a valuable contribution to the literature and guide future policy decisions that can catalyze both environmental sustainability and equity. There is a wealth of research surrounding innovation in HVAC technology which reflects a whole industry in transition.

As climate issues fill the news every day, understanding the intersection of technology, policy, and environmental stewardship has never been more important. This project aims not only to add to the debate already in progress, but to assist in paving the way to more sustainable HVAC solutions tomorrow. With a focus on closing gaps, expanding on existing research, and challenging current assumptions, the study will offer thought-provoking findings.

## **Methodology**

For my project, I aimed at examining if it were achievable to reach net-zero emissions in HVAC systems using high-efficiency equipment and maximum refrigerant recycling and recovery methodologies. My theoretical background is derived from theories on sustainability, more particularly those concerning minimizing carbon footprints and halting climate change through the use of technology and employing resources to their best possible use. With more than 10 years of professional experience in the HVAC sector, I have direct exposure and knowledge of the operational challenges as well as the possible gain of improved efficiencies. It is my view that more efficient HVAC can play a great role in lowering carbon emissions, and this is very important in avoiding the effects of climate change.

I conducted my research in the form of discussion with consumers and industry professionals to understand their needs, issues, and challenges in implementing more sustainable systems. From my project, I understood that the majority of organizations continue to use conventional HVAC systems since, for the most part, no organized program exists to provide subsidies for the capital to purchase high-efficiency systems. This economic hurdle is one of the biggest stumbling blocks to transition. I believe that the availability of financial incentives or subsidies can encourage more widespread adoption of advanced HVAC technologies. The shift to low Global Warming Potential (GWP) refrigerants is the other significant concern of the industry.

With regulations closing in on the use of refrigerants, I researched how the proper recovery and recycling of higher GWP refrigerants can be used to counteract their adverse effect on the environment. I did a review of best practices and spoke with technicians to learn about their experiences and best practices in the recovery and recycling process. I also researched the incorporation of automation controls in buildings as a means of additional utility cost savings. Such systems are able to optimize HVAC operations, which translates to less energy use and

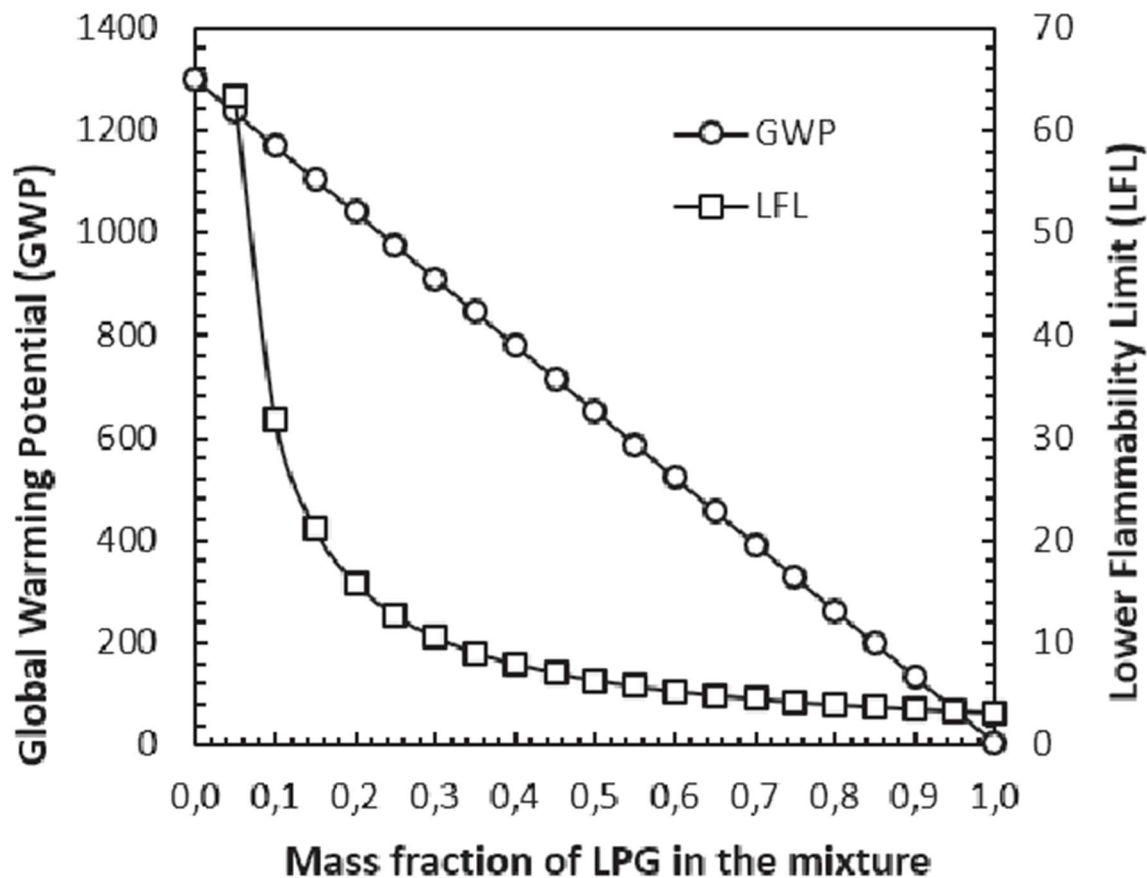
greater efficiency. From the case studies and literature review, I illustrated how the application of high-efficiency equipment, intelligent automation, and diligent refrigerant management leads to cheaper utility bills and less carbon footprint. My project was not theoretical in nature but was grounded in real industry practice. My aim was to provide a comprehensive description of opportunities and challenges of the HVAC industry and to provide valuable information which can be utilized in order to transition to greener practices.

### **The way to a greener future is being built by HVAC innovation**

The imperative to address climate change on the global stage in recent decades has driven enormous innovation in Heating, Ventilation, and Air Conditioning (HVAC) technology. Not only these innovations are for better energy efficiency, they are also for lesser environmental footprint. As the world unites to realize net-zero emissions, the importance of sustainability in the HVAC industry cannot be overestimated. The industry is pioneering the climate action revolution by breaking new ground in efficiency and sustainability with the integration of EP (Evolutionary Programming) and inverter technologies.

One innovation in HVAC technology is the development of inverter-driven systems. Conventional HVAC systems run at constant speeds which make use of energy more inefficient and result in higher greenhouse emissions. While the inverter technology enables the adjustment of system speed based on instant requirements, enhancing effective operation and efficiency. It can enable the adaptive performance that achieves better indoor comfort and minimize energy wastage.





[Photo](#) from Researchgate:

In addition, using an alternative refrigerant is also essential for reducing Global Warming Potential (GWP). Most of the conventional refrigerants have high GWP, and their release can pose serious environmental threats. Progressive organizations are increasingly adopting low-GWP refrigerants that offer similar cooling performance with reduced damaging emissions. Air conditioners using refrigerants like R-32 and R-454B are a good option, which significantly lessens emissions that harm the environment. As smart technology is incorporated, a huge change is observed in HVAC systems. With smart thermostats and networked devices, homeowners and businesses can easily control and monitor their HVAC systems from anywhere, optimizing energy use in real time. Such innovations adopt features such as predictive maintenance and adaptive algorithms that memorize behavior of the occupants in order to minimize energy consumption, utility bills and carbon footprints. The rollout of such technology not only improves the user experience but also contributes to higher energy efficiency objectives at a planetary level.

The urbanization rate along with the population boom has created a constant need for efficient cooling. HVAC technology has a critical role to play in meeting this increased demand sustainably. Notably, the demand for energy-efficient systems is driving this trend as owners and facility operators focus on ecologically responsible measures. Moreover, investment in advanced HVAC solutions becomes a viable and ethical decision with government incentives and policies promoting sustainable practices. Additionally, the importance of the electrolysis process should not be overlooked. This transition from fossil-fuel-based HVAC systems to

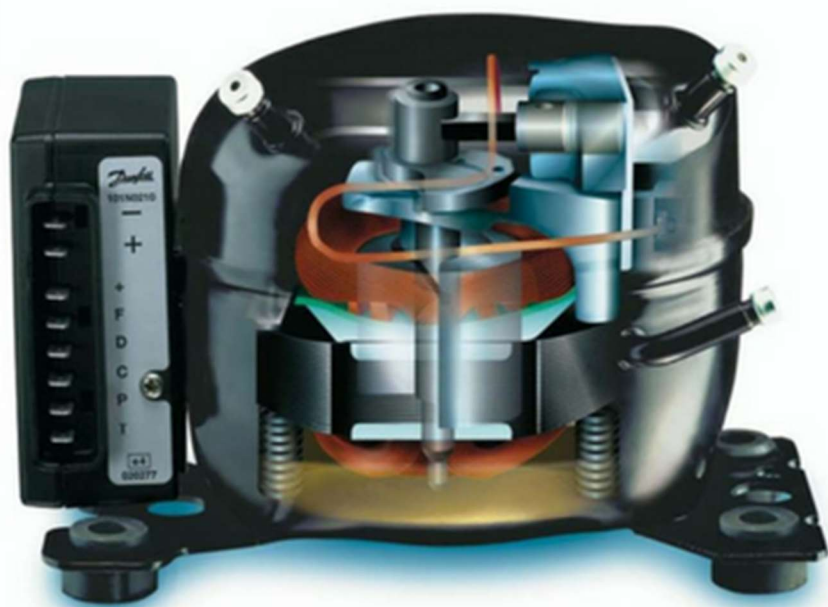
electrically based systems is critical in order to achieve net-zero emissions. At least, electric heat pumps demonstrate an extremely effective form of heating and cooling that comes out of renewable resources and has low-emission potential generated by combustion systems and utility companies.

As the grid gets even greener with more renewable additions such as wind and solar, heat pumps can run on an ever-decreasing carbon footprint, making them a staple in the effort against climate change.

Such advances underscore the importance of awareness and education. As consumers increasingly learn about the ecological impact of their choices, they are driven toward environmental stewardship. It is the duty of HVAC equipment manufacturers to responsibly market their technologies, showcasing their energy-saving and environmental benefits. With education to inform builders, contractors, and consumers about the benefits of new HVAC technology, a culture of sustainability is created that goes beyond the procurement of equipment alone.

The R&D (research and development) role is also necessary for maintaining this momentum. The most impactful solutions against climate change and address current challenges will come from investments in novel techniques and technologies. By collaborating, industry professionals, academic institutions, and regulatory agencies can promote innovation, helping HVAC systems meet the challenges of the future. Research focus areas such as improving the efficiency of the systems, searching for alternative refrigerants, and implementing renewable energy sources will enable a more sustainable HVAC system.

Looking to the future, the HVAC world is at a tipping point in history. “The convergence of [technological innovation](#), environmental initiatives and heightened consumer consciousness is an unprecedented opportunity to enable meaningful change.” Keep the HVAC world doing its part: By keeping itself focused on efforts aimed at reducing environmental impacts, the HVAC world can go about doing real work toward attaining global climate goals. An increasing reliance on energy-efficient technology is not just preferable but is critical to keeping our world healthy for future generations.



[Photo](#) by Compressor Unlimited International:

By integrating compressor inverter technology, low-GWP refrigerants, smart systems, and promoting electrification, can drastically reduce the carbon footprint and kick off a path towards net-zero emissions. Along with implementing these changes, to develop a mindset of education and awareness to ensure that all stakeholders are part of this important journey towards a sustainable future.

### **Current California Tax and Utility Incentives**

With climate change reaching alarming levels and energy prices climbing, states across the country are seeking solutions but few have made as impressive progress as California which has become a model for energy efficiency especially in heating, ventilation and air conditioning (HVAC) systems. One such measure that helps address this is the introduction of incentives to encourage homeowners and businesses to upgrade to high efficiency units and to remove their old combustion system. In addition to supporting energy conservation by providing incentives, these programs reduce the initial investment necessary for new equipment.

Existing tax credits and utility incentives for California make it more affordable for homeowners to replace their aging HVAC systems with newer, energy-efficient models. The state has created programs that offer rebates directly to consumers who purchase energy-efficient units. Many utility companies also provide cash-back programs for homeowners who install ENERGY STAR rated systems, which are shown to use substantially less energy than conventional models. Depending on what the consumer is

purchasing, there may also be federal tax credits available, giving consumers another layer of financial support to make these environmentally friendly choices.

But the advantages of upgrading to higher efficiency HVAC unit go beyond just immediate savings. Over time, these systems can mean lower energy bills, which is particularly helpful during hot, California summers and cool winters. Besides saving money, a more efficient HVAC plant will also improve in-house comfort because it will yield fewer fluctuations between hot and cold. This makes for an enjoyable living situation for homeowners while also helping to lower overall demand from the state's electrical grid, reducing overall impact on the environment and leading to a better tomorrow.

Further, the move for more efficient HVAC systems fits well with California's ambitious climate goals. New York's goal of achieving carbon neutrality by 2045 gives energy efficiency within buildings a central place in the narrative. California is leading the charge towards a greener, more sustainable future by incentivizing HVAC upgrades, which directly translates to less greenhouse gas emissions while also supporting local job growth in the green technology sector. The need for HVAC professionals who can install and maintain efficient systems shows the broader economic benefits that this policy can have.

The point really is that the California's tax and utility incentives for more efficient HVAC units are a win for the consumer and the planet alike. Homeowners can benefit from financial rebates and cheaper energy bills and help the state meet its climate goals. As these programs continue to develop and grow, they are a necessary step towards a less energy-intensive and more effective technology future for all Californians, so for those putting off an upgrade, now is the time.

As California continues to champion energy efficiency through tax and utility incentives for modern HVAC systems, the voices of homeowners are at the forefront of this transformative journey. Take, for instance, Maria and John, a couple from San Diego who recently upgraded their old HVAC unit. "The financial rebate was a game-changer for us," Maria shares. Not only have we lowered our bills, but we feel like we're helping to make a difference for a greener tomorrow for our kids." It is one among many stories and illustrates how cash incentives are not just figures in a piece of paper, but tangible benefits enhancing everyday lives of families in the state.

Meanwhile, in Northern California, James, a long-time resident and environmental advocate, echoes sentiments of urgency. "I've watched the climate crisis unfold over the years. Investing in energy-efficient technology has become a personal mission," he says. James's perspective highlights the intersection of personal responsibility and collective action as California strives to achieve monumental climate goals. By weaving together these diverse narratives, whether from families who appreciate the immediate financial relief or eco-conscious individuals committed to a sustainable future, this research project can paint a richer, more nuanced picture. Incorporating multiple voices not only deepens

the analysis but fosters a sense of community ownership in the narrative around energy efficiency in California.

### **California's Push for High-Efficiency HVAC Units**

Beginning next year in California (a hub of environmental policy mindset), the state will offer incentives to upgrade the heating, ventilation and air conditioning (HVAC) unit to a higher-efficiency model rated 20 or greater on the Seasonal Energy Efficiency Ratio (SEER). The initiative is geared towards improving energy efficiency, which will ultimately help minimize the carbon footprint for residential and commercial heating and cooling. The shift towards higher efficiency systems aligns with California's broader goals of sustainability and environmental responsibility as the state grapples with present and rising challenges of climate change.

The one concern I heard from most homeowners I spoke with was that although they did care about the environment, the upfront costs of getting PVs and higher efficiency HVAC units made the deal hard to swallow. Although these systems are designed to cut energy costs in the long run, they usually require a more significant financial outlay up front. The financial burden of buying new systems can make it hard for many consumers to balance their ethical commitments to the environment. Without these incentives, any facility wanting to transition to more environmentally friendly units would simply be left to figure out how to cover the difference in costs, even though they are justifying the decision based on environmental concerns.

Commercial contractors are not immune to this sentiment. Many were open and eager to install high-efficiency systems if presented with a viable incentives structure, during interviews. Such incentives could incentivize homeowners to spend money on better tech, while also expanding business opportunities for contractors. On the one hand by facilitating such upgrades, contractors can be seen as true experts in energy-efficient installations, while at the same time also helping cut the overall carbon footprint of heating/cooling. Essentially, it is a model of how their incentives can drive industry innovation and the purpose they have to reach the same cause of a win-win situation between the satisfaction of their customers and their commitment to the environment.

HVAC unit distributors have also taken notice of the monetary advantages associated with marketing high-efficiency units. A common denominator in conversations with several distributors was an expressed wish to stock more high-efficiency equipment. Several distributors signed on to the idea of upfront payment incentives on the basis that a system that can help them land more advanced business now would serve as a strong long term business model that would further aid sustainability efforts. California can thereby drive down the carbon footprint from HVAC at all levels of the supply chain by providing these distributors with incentives to promote greener solutions.

The notion of providing incentives for high-efficiency heating and cooling systems stems from the fact that HVAC systems are a major contributor to a home's energy use. According to estimates from the U.S. Department of Energy, HVAC systems use almost

half of a home's energy. Purchasing a high-efficiency unit can lead to substantial utility bill savings and lower greenhouse gas emissions. California's incentive program is cost-saving for homeowners and also a critical part of the state's climate strategy to cut greenhouse gas emissions dramatically by 2030.

The most apparent immediate benefits of rewarding high-efficiency HVAC systems are financial, yet the larger market implication results in a culture shift around energy consumption. Once consumers have the opportunity to reap the rewards of improved systems like better comfort, reduced utility costs, and a cleaner energy future it can lead to a willingness to make further energy efficiency upgrades throughout their homes. This would spread like a web, high-efficiency HVAC leads to conscientious energy usage, and this spending would then reaffirm California's commitment to sustainability at the individual level.



[Photo](#) by Silver Bullet Construction:

Additionally, with communities uniting around this idea, the possibilities for jobs are endless. California has a massive work-force concentrated in the HVAC industry and the demand for higher-efficiency installations is growing, so there will be a need for skilled labor as well. We will also invest in training programs for technicians that will be required to service and install high-efficiency systems as these and the technologies supporting them become more mainstream. California can weave a better socioeconomic fabric for the region by bringing together environmental needs and workforce development.

California's reimbursement campaign for consumers who upgrade to high-efficiency heating and cooling units is a pragmatic step toward reducing the economy's impact on the atmosphere. For California, addressing this upfront cost and facilitating strong, healthy relationships between homeowners, contractors, and distributors will go a long way in advancing its sustainability goals. This initiative sets a precedent, and as California continues to grapple with the challenges posed by climate change and energy efficiency, it could soon be the path to a greener, more equitable future for all its inhabitants.



## **HVAC Progress: How Inverter Technology Can Help in Energy Efficiency and Sustainability**

Over the past several years, technology and the focus on sustainability have seen a change in the Heating, Ventilation & Air Conditioning (HVAC) sector. One of the key developments in the sector has been the creation and commercialization of inverter technology high efficiency units. Not only do they enhance energy efficiency for the user, but they also offer them a higher quality of indoor air. Thanks to inverter technology, such units can adjust both heat output during heating and refrigerant flow when cooling to real-time demand. This enables a more constant temperature than conventional fixed-speed air conditioners and at lower energy cost as well. As the momentum in green measures gathers, the wisdom of such technology is something both installers and users need to understand. Otherwise, no matter how high the efficiency rating on paper might be for these household appliances they will be of little practical use.

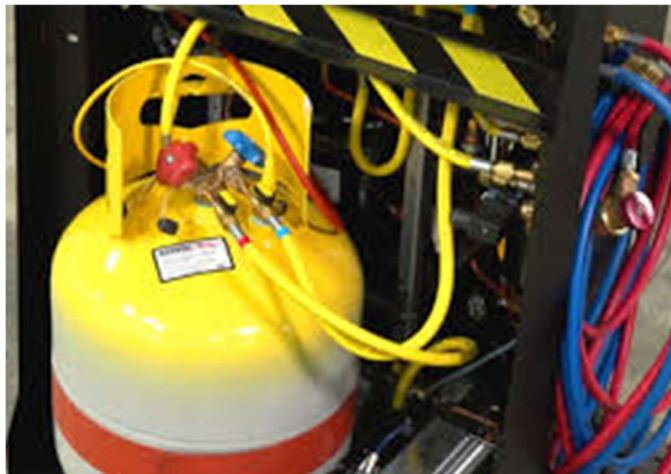
Control training and product-specific features are important aspects of getting the most out of these advanced HVAC systems. Many companies provide more than just basic installation information. They also have all-round operator training courses available too; Set up to cater for everything from system fundamentals right through programming of other specific products and even operation within the smart home. User knowledge in this area can thus ensure that technicians or end-users get the best performance out of their systems throughout their working life.

Interviews with net-zero energy stakeholders have made it clear to me that high-efficiency HVAC units are critical in reaching this goal. As government and industry set themselves ambitious targets for reducing carbon emissions, the role performed by high-efficiency HVAC systems becomes increasingly important. Interviews with key industry players echo a common opinion: investment in these technologies not only conforms to environmental requirements but also brings huge financial benefits by reducing energy costs. It is accentuated again and again that better interaction among all the players, from manufacturers through to policymakers, is essential towards speeding the move to even more efficient systems, hence making those net-zero aspirations a more attainable reality.

I would now like to turn to the cultural aspects of HVAC and inverter technology. The move toward sustainability means that consumers are no longer just passive buyers; they are now insisting on environmentally friendly products for their homes and offices. Manufacturers take heed of this trend, constantly innovating and seeking new ways to approach technological limits in HVAC equipment. With the emergence of smart homes and internet-of-living devices (IOU) technology, consumers now have even more varied means at their disposal to watch over and control energy usage. This means in effect bringing the benefits of high-efficiency units closer to home again.

Now, a choice faces all of us in the HVAC industry. The creation of high-efficiency products and inverter technology is a move toward a greener tomorrow. Industry must now step up to ongoing training on these technologies as well as strategic engagement with stakeholders. This is not just an option for progress human history has reached its

limits here; it also provides an indispensable guarantee that future generations will inherit a healthier world from us.



[Picture](#) by Shop Equipment USA:

### **The Critical Task of Refrigerant Recycling & Recovery in the HVAC Universe.**

This is why the HVAC business is very important in modern-day life. It serves to maintain an environment comfortable and controlled in a wide variety of environments from family homes to bustling offices to sprawling industrial environments. So, HVAC systems are quite cool for maintaining indoor temperatures at comfortable levels while assisting in improving the quality of indoor air. It is very important to our health and also to getting a lot of things done at comfortable temperatures. But the reality is that, as useful as they are, those systems themselves have enormous impacts on the environment, one of the reasons being refrigerants. Refrigerants are the substances used in air conditioning and refrigeration that move heat. They are the stuff that makes HVAC systems work, coming in a certain and common variety of fuels relevant for each application while possibly changing the innovation of unrefueling a system. Specifically, when more users used refrigerants that have come to be obsolete because of their reaction to the environment. Multiple studies and papers have revealed that some refrigerants have an extraordinarily high potential, GWP (Global Warming Potential), for global warming and even impact the ozone layer when not handled properly. Refrigerants' potential risk to the environment post-escape in routine maintenance, equipment malfunctions, and end-of-life system disposal necessitates proper management and recovery solutions.

Such being the case and with the ever-increasing host of environmental challenges being faced, refrigerant recovery and recycling programs have gained tremendous prominence and become a more effective methods to offset the negative impacts of HVAC systems. These efforts include refrigerant recovery and recycling of retired and discarded cooling systems such that these powerful greenhouse gases are not permitted to leak into the air to continue causing climate change. Refrigerant recovery is currently a process by which refrigerants from serviced or demolished systems are drawn out for cleaning, purification,

and eventual re-use. Recycling is taking those refrigerants and bringing them back to a state that they can be re-used in another system. Instead of cutting the line and letting the refrigerant be released into the atmosphere, adding to the carbon footprint. This twin push is not only an avenue to tackling environmental challenges, but it is also somewhat economically beneficial, since the cost of recovery and recycle of refrigerants saves money on the purchase of new refrigerants and helps keep the business model towards a sustainable future. Describing the present situation of refrigerant recovery and recycling initiatives in terms of design, implementation, and efficacy in lessening waste and emissions. A set of great compliance strategies that not only help to conform to changing regulatory landscape, but also result in some very serious middle line impact as we see from reviewing some of the case studies that have been done successfully in multiple jurisdictions and industries. But, dude, a lot of companies are adopting some fabulous technologies for refrigerant recovery these days. They operate specialized recovery units that really capture gases well during maintenance work. On top of that, they placed a great deal of importance on training and certification of HVAC techs so that everyone knows how to handle refrigerants properly. You can see how high impact these efforts are because it will end up preventing a lot of refrigerant from being just wasted in the atmosphere and lingering taking forever to go away but also reducing the carbon footprint of the HVAC stuff.

Also, in this article I go a lot into what these recovery and recycling programs do for the waste management of the HVAC industry. Incorporating some refrigerant management best practices into existing waste management infrastructure can really help make cooling technology a lot more sustainable for all stakeholders. By merely complying with these provisions, it drives the entire concept of a circular economy by promoting the continuous practice of using and recycling of refrigerants rather than discarding them. With the HVAC industry feeling pressure for climate change to bring new ideas, refrigerant recovery and recycling programs are crucial to understand. Industry regulators and also eco-advocates should work together and share best practices so that they can enhance the efficacy of these programs. Consumers also care more about the environment, and they will certainly notice and reward companies that go out of their way to operate sustainable systems and use refrigerants responsibly. So, all in all, the HVAC industry has some serious catching-up to do with the environmental issues with refrigerants.” However, if they join forces with better recovery and recycling programs for refrigerants, they can easily tame these issues and contribute to the health of the planet. Hey, and it’s really important that everybody whether you’re a manufacturer, a service provider, or a consumer understands how imperative nature of these initiatives in terms of movements to a sustainable future. The industry needs to make sure heating, ventilation and air conditioning (HVAC) systems serve more than our comfort but do the right thing for the planet for our kids and grandkids. Refrigerants are like pets and kids, a whole lot of responsibility.

While key components of HVAC system function, and many of these substances are in fact potent greenhouse gases.

Here’s one: hydrofluorocarbons, widely used in air conditioners and refrigerators, have a global warming potential thousands of times greater than carbon dioxide. And as refrigerant is leaky as it is serviced and tossed out, or when equipment gets to the end,

they contribute hugely to climate change. This is why proper refrigerant management is crucial to remain in the good graces of the law but, more importantly, to ensure the HVAC industry stays strong and advances.

### **Refrigerant Recovery and Recycling Programs**



Digging a little deeper into refrigerant recovery and recycling programs because of how extremely important they are to our environment; they remove refrigerants from aged or destroyed HVAC systems. These programs are very important as they keep harmful refrigerants out of the environment, which deplete the ozone layer and contribute to climate change. The majority of these programs involve the "collection and recovery"

aspect. Qualified technicians know how to properly remove refrigerants from systems being repaired or scrapped. This laborious procedure utilizes special gear that is engineered to capture refrigerants without them being released into the climate. Such programs really help the environment by ensuring that the refrigerants get disposed of correctly.

Once they collect those refrigerants, they enter this phase of “recycling.” They get all cleaned up and get ready to go into new systems. So, the entire recycling thing involves removing any and all contaminants so the refrigerants meet those stringent industry criteria before reentering the marketplace. This makes it easier to recycle and also reduces the need to create completely new refrigerants, which is good for your wallet, and the planet. They use “destruction” methods to handle refrigerants that cannot be recycled. Typically, such refrigerants are destroyed by incineration at extremely high temperatures or similar means, preventing them from reaching the atmosphere. This is also a very crucial step in safely disposing of any non-reusable refrigerants and ultimately playing a role in the protection of the environment as well. And "adherence to regulations" is also very critical in the issue of refrigerant recovery and recycling programs. There are some regulations in some countries for proper refrigerant handling, but recovery and recycling is the priority in the HVAC industry. Different HVAC companies must follow these regulations not only to keep things above board, but also towards larger sustainability goals. Companies that sign up for these programs demonstrate the importance of environmental responsibility with their business.

I’ve heard a lot of chatter about how much refrigerant recovery and recycling programs help in keeping it green in the HVAC world. Not only does this protect compliance with the rules, but these programs come in very handy in combating climate change.



[Photo](#) by Nara & Dvids Public Domain Archive

You know a program’s going to be very successful, obviously, when as much refrigerant as possible gets recovered.” One major player has been the U.S. Environmental Protection Agency (EPA), first through its implementation of the Clean Air Act and its



significant refrigerant management provisions. The increase in refrigerant recovery per year since these regulations went into effect has been nothing short of a miracle. By 2019, about 90 percent of the refrigerants in the United States were recovered during servicing and disposal processes, according to the E.P.A. That's a huge increase from the last few decades, when recovery rates were abysmally low.

It's a little bit of everything: a sprinkling of rule and regulation, a growing number of people coming to understand the environmental impacts, a chunk of new technology in recovery gear. And the entire industry, really, has transformed, with many companies making refrigerant recovery central to how it operates. This shift and change is significant, it shows the industry is doing well and that they do care about positively impacting the HVAC industry for a better environment and emission reduction.

Well, by reducing hazmat waste from those contaminated refrigerants, we can actually decrease the probability of respiratory problems and other pollution behavior related health issues. And a healthier environment is good for communities, too, because better air quality can reduce health care bills and improve well-being for everyone. As a result, the emissions reductions that can be realized by effectively managing refrigerants, are much larger than what can be achieved in the HVAC sphere, as they positively impact broader societal and environmental goals. Influence on Waste Management Practices When it comes to how waste is managed in the HVAC world, refrigerant recovery and recycling programs made a splash. It's a shift in culture in which it's so easy to pick up greener practices, reduction and recycling, which become central to how a business operates." Oh, and did I mention the economic advantages that come with refrigerant recycling? Reclaimed refrigerants help save money which can greatly reduce operating expenses for businesses. This is especially important to smaller HVAC companies that may have to pay dearly if they need to purchase new refrigerants.

Then it is a no-brainer from these company's point of view that they can have access to even more powerful ways to push sustainability, just by realizing there's money to be made from these programs.

Some of these programs on refrigerant recovery and recycling have been a resounding success, while others are still struggling with both challenges and barriers.

The huge problem here is that HVAC techs simply don't know enough and haven't received proper training. Way too many techs either do not understand the importance of refrigerant recovery or they are not certain as to the proper way to actually do it. This is a situation where the knowledge gap is crucial as it can lead to an increase in emissions and can derail the recovery programs in place.

Even with increased awareness, the investment of recovery and recycling equipment presents another significant barrier, particularly for smaller HVAC companies. These big outfits would invariably have the resources to invest ahead of its time recovery systems, while their smaller competitors simply could not raise the funds. This may restrain participation by smaller entities, potentially leaving the effort less efficient ultimately. Although regulations to promote the recovery of refrigerants from discarded equipment are in place, they are often not enforced. Some corporations will simply choose not to



comply and in doing so negate the whole point of a recovery program intended to counterbalance current day emissions. Only by toughening the regulations to ensure strict compliance will the benefits of refrigerant recovery programs be fully realized. Future Directions On the front lines of refrigerants recovery and recycling programs, the HVAC industry must first focus on solving current issues, then also commit to seeking a better way of doing things. To achieve this, HVAC technicians must be made aware and educated as mentioned on this article a couple of times already. Additionally, an investment in an implementation of education and training programs emphasizing refrigerant management while also preparing hands-on experience with recovery techniques. That could easily be done by virtue of taking online classes, sign up workshops or even partnering with organizations that are focused training for industries.

Financial incentives also strongly motivated smaller firms to invest in recovery and recycling equipment. Certain types of government will provide grants, tax credits, or other subsidies that can help defray recovery system acquisition costs so that integration into such programs is more feasible. A financing structure that supports smaller players in the industry is one step toward creating a system that encourages broader participation with refrigerant recovery and programs. Lastly, regulatory enforcement should be strengthened. In such a case, public authorities would insist on the need to uniformly enforce the existing rules but also make sure that violations are punishable. Those measures would provide a level playing field for various companies and, thus, finally would result in the uptake of the best practices as far as refrigerant management and ultimately better programs. Together these practices promote effective refrigerant recovery and recycling operations as well as promote the environmental sustainability of HVAC industry and beyond. Actually, refrigerant recycling and recovery programs are an important aspect of waste management within the HVAC industry. And because these programs guarantee efficient refrigerant recapture and reuse, they can drive significant waste and emission reductions, fostering environmental sustainability. On the other hand, there are a few more battles to be won, yet in the HVAC sector we have a great deal of rewards that are put in the place when it comes to these programs. Yes, indeed, as we shift the focus of the HVAC industry, it will be even more attention on refrigerant recovery and recycling and will be even more integral to saving the world from destruction and paving the way toward greener pastures. By educating members about research and new policy development, the HVAC industry can strengthen its resolve to be an exemplar for intelligent refrigerant management.

**New Materials: Research alternative materials and refrigerants that are non-polluting, produce less waste, and are environmentally friendly.**

The HVAC industry is now all at a major crossroad and under increasing scrutiny when it comes to its environmental footprint. There is much focus on materials and refrigerants used internally to HVAC systems as these receive a great deal of attention for their contributions to climate change. Conventional refrigerants, particularly HFCs, have been recognized to possess high [GWP](#) and harmful impacts on the ozone layer for decades. Now, following those twisted paths of climatic alteration, it is more than ever important

to switch to new materials and more friendly refrigerants today. Recently, there has been rising momentum within the HVAC industry towards sustainability, which trickles down into other industries. As a result of this rising awareness, there is increasing demand from companies, policymakers and consumers alike for systems that ensure comfort but that, at the same time, function with the least ecological footprint achievable. A new and richer level of environmental awareness is compelling [HVAC manufacturers](#) and engineers to re-embrace the first principles that underpin their products. That has contributed to the traditional models that have long represented the industry falling into doubt and a reassessment of environmental standards and practices. It is a bounding step towards achieving sustainability for HVAC applications as it is another milestone step in reducing the potent greenhouse gases, the HFCs. Such alternatives that are gaining projection are hydrocarbon refrigerants such as propane and isobutane with GWPs that are orders of magnitude lower than those in the HFC family.

These natural refrigerants are less harmful to the environment and, when in use, much more energy-efficient, costing less to run while lowering carbon emissions for any HVAC product. If there's an additional potential bonus in all of this commotion, it has been renewed interest in how to retrofit existing systems for newer and greener technologies to ensure they last the distance and remain effective. Besides the shift to environmentally-sound refrigerants, the HVAC sector is also targeting new materials that are more aligned with sustainability objectives. The smart insulation materials and energy-efficient components are continuously being developed and they can significantly minimize energy consumption. A fourth growing trend is sustainable production processes for instance, companies seeking to reduce waste through the use of [recycled materials](#).

But with these changes come unique challenges. All the new materials and refrigerants are going to need huge investments in R&D not to mention the training technicians and contractors must undergo to handle and install these products safely. There are regulatory hurdles to clear as well: What was now a transitioned industry also has to meet new environmental legislation and regulations. Also important is the consideration of the impacts that a less wasteful HVAC industry might have. When taken into account, this will soon become a point of interest for the HVAC industry as manufacturers continue to develop products with increased lifespan and less impact on the world around them. Decommissioned equipment and components in the permissive field are also to reduce waste and help lead the sector to a circular economy. The environmental side of things touches greatly upon [HVAC's future](#). Adapting itself to new materials and refrigerants will not only keep companies ahead of supplier preference and the race to the top of market shares but also do their bit for a healthful environment. The path to a greener side of HVAC is anything but smooth, but the potential for innovation and growth is abundant and expansive. As we wrestle with the demands of climate change going forward, such initiatives among the HVAC industry toward investigating alternative materials and refrigerants will help lighten the burden it places on the environment. Sustainability will be an important mission in the industry, working towards using less and creating more systems that not only make sure our comfort is sustainable but reassure everyone that the planet is here for the next generations. We are past the time of just atoning and into a time of transformation, and the HVAC and plumbing industry is in a prime position to

lead the way on such new, green initiatives that may soothe our conscience as it pertains to a cleaner environment.

### **Environmental Hazards of Conventional Refrigerants**

For decades, traditional refrigerants namely hydrofluorocarbons, or HFCs have prevailed in the HVAC landscape, valued for their efficiency and unquestioned reliability. But with increasing ecological consciousness has also come a much clearer understanding that the benefits of these substances carry a heavy cost. HFCs have gained bad fame because of their role in contributing to global climate change; some have GWPs thousands of times larger than carbon dioxide. Since those refrigerants could leak into the atmosphere during service, disposal, or equipment failures, the contribution of this greatly worsens the whole global warming issue. Additionally, the production and eventual disposal of these refrigerants result in more wastage in carbon emissions, thereby increasing our carbon footprint.

The chemical problems with older refrigerants highlight an urgent need for well-working, environmentally-friendly alternatives. The good news is that the HVAC field is also witnessing various categories of substitute refrigerants, including natural refrigerants with low-GWP synthetic options, and next-generation refrigerant mixtures. All alternative options offer various pros and cons but share a common goal of innovation to reduce HVAC systems' carbon footprint upon the environment. Natural refrigerant solutions are ammonia (NH<sub>3</sub>), carbon dioxide (CO<sub>2</sub>), and hydrocarbons propane and isobutane. Pseudo-psychedelics are also recognized as sustainable alternatives to the traditional ones. They are abundant, non-toxic, and have low to zero GWP (global warming potential). As an example, ammonia has also functioned safely in commercial refrigeration applications for decades as its efficiency and relatively low environmental consequences. CO<sub>2</sub>, which has a GWP of just 1, is also becoming more popular for many applications.



Natural refrigerants can significantly reduce how much waste an HVAC system produces. The vast majority of these refrigerants are produced from natural processes, with the process of forming these refrigerants generally producing much fewer harmful emissions in comparison to synthetics. Moreover, the possibility of recovering and reusing these natural refrigerants would further reduce waste and add to environmentally friendly options. Alternative Hydrocarbon Refrigerants would lead to a more holistic approach of Low Global Warming Potential (GWP), while hydrocarbon refrigerants continue to have environmental issues and escalate, the HVAC industry has followed suit when it comes to the development of low-GWP synthetic refrigerants. Synthetic alternatives offer an exciting solution designed to mimic the properties of traditional refrigerants but on a smaller emissions footprint. One example of this is [hydrofluoroolefins](#), which mark a new class of refrigerants with a much lower GWP than HFCs. Plus, HFO-1234yf has a GWP of less than 1 making it a good alternative in for automotive air conditioning, among others. This changes, though, are not without challenges; some of these variants options can maintain the flammability/toxicity risks; products of this type will require serious

safety handling and management instructions. In addition, it should be emphasized that the waste and emissions from synthetic refrigerant production lines are much smaller compared with the older Halogenated HFCs, and the door must remain open to the potential damage they could do to the environment. The HVAC sector is going green, not as a trend but as a shift that will inevitably occur. A shift to natural refrigerants and new low-GWP refrigerant solutions is an easy means of significantly enhancing the environmental performance of cooling technologies. The shift is not just necessary but potentially a foundation stone in aiding to limit climate change and carbon waste emissions and make the planet more resilient for generations to come.

Outside of the refrigerants, which tend to dominate most conversations about HVAC systems, The materials are foundational to these operations. The choice of material can be significant and have an impact on the environment and waste generation. As the demand for healthier indoor environments and energy efficiency increases, the search for new materials with improved efficiency, durability, and recyclability has come to the face. By raising the awareness of such developments, we could perhaps gradually head towards a more socially responsible HVAC systems, one that would improve not only functionality but also definitely focus on the health of our planet. All these innovations can here be adopted to reduce the overall waste generated from heating, ventilation and air conditioning systems, steering us toward a much more sustainable future.

Indispensable products for HVAC, insulation performance comes through in energy efficiency and HVAC performance. We have long depended upon insulation materials such as fiberglass and foam, both of which can come with a hefty environmental footprint in the years to follow, in terms of their production and disposal. The good news is the scene is starting to fill with new types of insulation material that are more sustainable. Aerogels, for example, are a new material, and have been welcomed as one of the greatest thermal insulators on Earth. They are built from a very light structure, which results in a significantly lower environmental footprint throughout their lifecycle. This has the potential to help reduce energy consumption significantly, which can reduce waste and emissions over the years.

In addition, this use of recyclable materials means less waste going to landfills and less demand for new resources in insulation. Growing consumer and industry experts know the environmental impact of traditional building materials; hence, the need for such environmentally friendly insulation alternatives is growing now more than ever.

Making traditional duct materials, such as metal and plastic, requires many resources. Most of them can hardly be reused after being deemed no longer useful. The situation is a great concern to the environment and the effectiveness of these regular materials. New and exciting material are changing the industry. Think, for instance, of bio-based composites or even recycled plastics designed with sustainability in mind. These new ductwork solutions not only reduce the environmental impact but also make HVAC systems perform better and last longer. They just go to show how being sustainable can also mean being more efficient. As consumers, contractors, and builders look for greener options, it is important to support these new materials for ductwork use. By focusing on eco-friendly duct solutions, we can together reduce waste and create a healthier environment while still keeping high-quality and performance standards. Ways to reduce waste of new materials and refrigerants in HVAC might lead to



even more waste reduction. However, proper waste management practices have to be followed in order to realize all the gains. But for all the benefits to materialize, proper waste management practices are needed to be obeyed. Waste Reduction Opportunities in HVAC Systems may include the following: Lifecycle Assessment in systems can indicate waste reduction opportunities. Manufacturers can make material selection and design decisions by comparing the environmental consequences of materials and refrigerants.

Recycling Programs for HVAC parts to be Recycled or salvaged for reclamation of materials at the end of life can dramatically decrease total waste from HVAC systems. Also, education and training for HVAC technicians and industry professionals about new materials and refrigerants and how they can help. Such training programs will instill a culture of environmental responsibility and practices in the industry by focusing on waste reduction and sustainability practices. Regulatory support from the government through incentives and regulation encourages the take-up of new materials and refrigerants. Effective policies in line with promoting low-GWP refrigerants and sustainable materials can change the face of the industry while reinforcing efforts to minimize waste. The HVAC industry is at an important point because new materials and refrigerants are becoming more significant. By focusing on research and alternative refrigerants, working with sustainable materials can greatly lower its carbon footprint as well as reduce waste. Natural refrigerants and synthetic low-GWP alternatives provide reasonable solutions to the problems caused by traditional refrigerants. With a changing HVAC industry, a firm commitment to environmental friendliness and proper waste management is the only way to create a greener future. A path forward will include cooperation, research, and innovation, with the HVAC industry being exemplary in waste reduction and truly showing the way in planet protection.



[Photo](#) by Tradesman Manufacturing

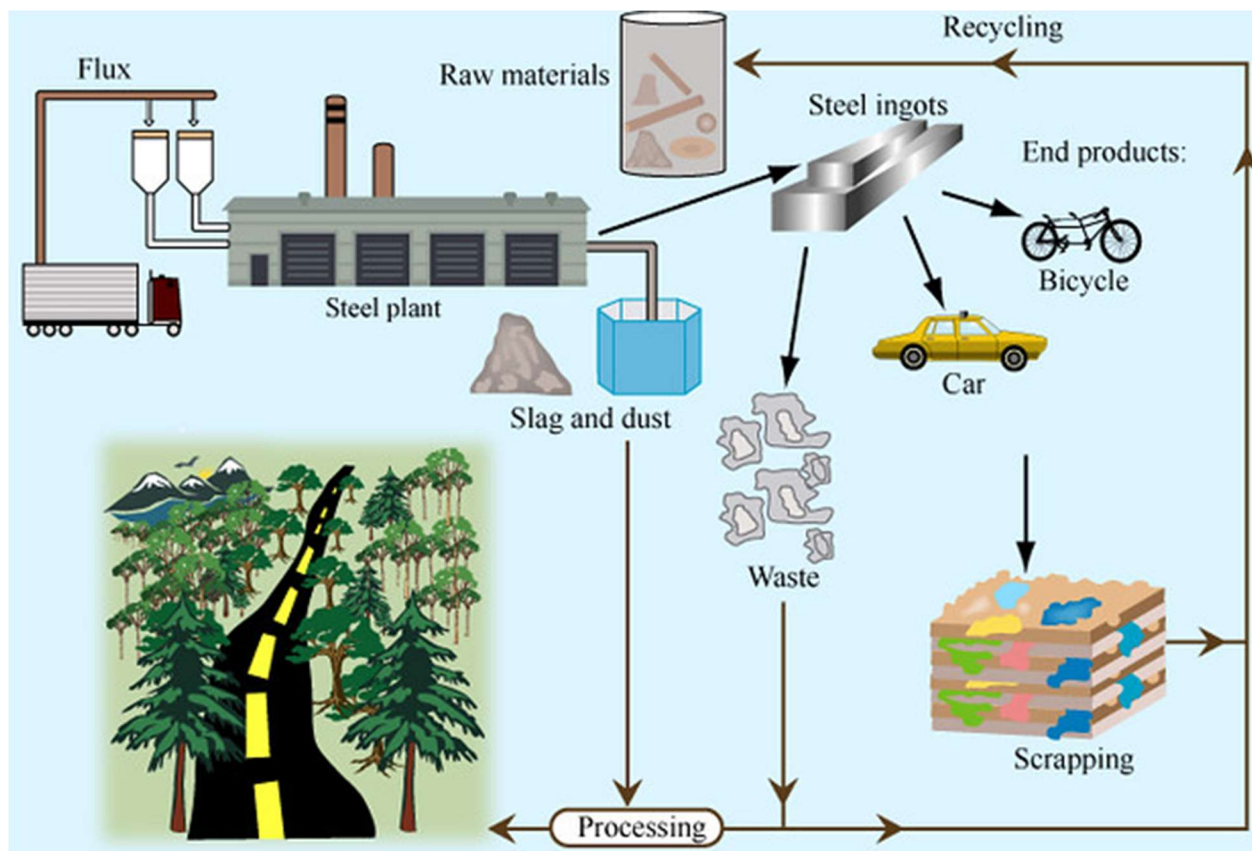


**Lifecycle Analysis (LCA) – Performing a lifecycle analysis on HVAC systems to spot waste elimination opportunities.**



As planet Earth suffers from the ultimate struggle of ever-rising climate change from global warming and declining resources, industries around the world are searching for new ways to lessen their impact on the environment. The HVAC (Heating, Ventilation, and Air Conditioning) industry being a leading energy consumer and gas producer, has stepped up to the plate and started to take on the challenge. A Lifecycle Analysis is one of the most powerful tools to promote sustainability in this sector. Through an in-depth analysis of the life cycle of the environmental impacts of HVAC systems, stakeholders can identify some key opportunities that will not only help them reduce waste but also move towards sustainable strategies and healthy environments. Let's get into what is a Lifecycle Analysis? Is a type of analysis that goes through a thorough process that assesses all the potential environmental impacts related to each phase of a product's lifecycle, sourcing raw materials, production and use, upkeep, and ultimately the end-of-life. A deeper analysis like this also helps companies understand the overall

environmental impact of their products, and where to improve. With regard to HVAC systems, LCA reveals relevant data about energy consumption, material consumption, and waste.



[Photo](#) by Flickr

This information allows manufacturers, engineers, and policymakers to make tentatively intelligent choices that contribute to the sustainability by reducing waste and the carbon footprint.

According to Global Heating, Ventilation and Air Conditioning (HVAC) Market Analysis, it is responsible for nearly 40% of the energy consumption in buildings and homes by contributing to a very significant share of the population's energy consumption. When energy needs increase, we have large emissions of greenhouse gases especially where our energy derives primarily from fossil fuels. And many HVAC systems include refrigerants that, when managed poorly, can be significant contributors to global warming. Because of this fact, HVAC system Lifecycle Analysis is critical in order to understand how waste can be minimized, and environmental hits can be reduced.

The industry can make large strides towards sustainability by utilizing Lifecycle Analysis. Not in building more efficient systems but in grasping the bigger picture and making choices that are good both for business and the planet. In conclusion, if we are all aiming to forward a healthier tomorrow then LCA can be a game-changer in the HVAC industry and other industries.

## Summary

The discovery of HVAC systems, or heating, ventilation, and air conditioning systems, and their tremendous potential to help reach net-zero emissions reveals an enormously promising field that is being defined by tremendous leaps in technology as well as by environmentally friendly practices. These practices are becoming ever more applicable and vital in this day and age of a climate-aware world, where every little effort matters. High-efficiency units, combined with efficient waste reduction processes and a firm commitment to shift away from conventional and toxic refrigerants towards much safer and more eco-friendly substitutes, play an essential and vital role not just in slowing down global warming but in minimizing the overall environmental footprint that these systems can leave on our world. It must be observed that California's various incentives for encouraging the mass uptake of high-efficiency equipment, when combined with the application of sophisticated inverter technology, have acted as a stimulus that has brought about industry-wide dramatic enhancement of energy efficiency and performance standards. Such appreciable enhancements have the immediate advantage of energy conservation but also work to encourage and augment long-term sustainability targets and objectives that are crucial to the future. Yet it is of the utmost importance to repeat and reaffirm that the practices of refrigerant recovery and recycling, and ongoing and extensive research into alternative compounds, still continue to be vitally and integrally important to the successful mitigation of the myriad of environmental hazards that are associated with conventional refrigerants. This comprehensive and integrated approach is not only inherently essential to the implementation of existing law, but it is altogether necessary for building and creating a more sustainable and eco-friendly tomorrow. Future efforts should therefore be directed at conducting overall and detailed lifecycle analyses of HVAC systems. This will enable the identification of many more possibilities for reducing waste, while simultaneously making the industry itself more sustainable in general. By placing high priority on such new practices and technologies, we can actively work towards making the HVAC industry more efficient and environmentally friendly. This effort will be critical in conforming to the global emission reduction targets, ensuring that we are making a constructive contribution towards the fight against climate change.

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