Climate adaptation for the built environment:

Lessons from the USA for Aotearoa

Jym Clark
February 2024
Harkness Fellow 2023 recipient

CONTENTS

01. INTRODUCTION

Climate change is the existential crisis of our age, that now requires us to confront the elevated risks it presents. Climate mitigation has been the focus for the last thirty years, but due to lack of action we must now double down on our climate adaptation efforts.

The climate change clock has already indicated we are going to tick past 1.5 degrees of average global warming. We are also likely to see sea level rise in the near future, perhaps 0.3M by 2050[1], or even more by some emerging predictions, which have forecast 0.5M by 2050[2]. Even with a massive cut to emissions in the short term, we must anticipate decades of climatic change. More than 100 years of industrialisation and loss of forests means change is inevitable.

However, the co-authors of the recently published U.S. Fifth National Climate Assessment found some reasons to be optimistic. In the United States, emissions dropped 17 per cent between 2005 and 2021. They suggest that reducing emissions could continue, halving by 2035. Simultaneously, household expenses could fall by $350 USD per year as the population switches away from fossil fuels. These savings will encourage the switch further, as will the co-benefits that can be achieved through avoiding or reducing the adverse effects of climate change.

Climate adaptation takes many forms in the USA to respond to regional differences and the needs of different communities. Tribal, city, county, state and federal agencies all have a role to play. In 2021, President Biden issued an executive order to direct federal agencies to pursue actions that will help avoid impacts from catastrophic events caused by a changing climate. The order commits the United States to move quickly to build resilience.

Achieving equality of action and protection for all communities, particularly more vulnerable communities, will be difficult. Attempts to provide funding and attention to tribal, Indigenous, and underserved communities is underway. These communities need to lead the work themselves with government support, rather than have climate adaptation done to them, to ensure the communities can maximise the co-benefits they want to prioritise.

My opportunity to learn about adaptation in the USA for the built environment

The focus of my fellowship was to learn about and witness climate adaptation approaches in the USA, particularly for urban environments, from the perspective of urban planners and policymakers. I explored the approaches that planners are taking and how they work with decision-makers, local and Indigenous communities to achieve adaptation for urban areas.

I chose to focus on urban adaptation because of my previous experience as a planner. I am a current member of the urban policy team at the Ministry for the Environment. The built environment is key to achieve climate adaptation action and sustainable development. However, cities are complex systems that call for careful responses, such as avoiding maladaptation. It is essential that infrastructure which supports cities is provided for, as it is likely to account for 88% of all adaptation costs[3].

This report is intended to cover some of what I saw, heard, was told, or read while I was in the USA that I thought would be useful to planning and policy practitioners in Aotearoa. The four-month fellowship from August to December 2023 was funded by the Harkness Fellowship and Te Kawa Mataaho Public Services Commission.

1 https://www.noaa.gov/news-release/us-coastline-to-see-up-to-foot-of-sea-level-rise-by-2050

2 https://sealevelrise.org/states/hawaii/

3 Infrastructure-for-climate-action_EN.pdf (unops.org)

Where I was based and where I visited

I was hosted by the Indigenous Design and Planning Institute (iD+Pi) at the University of New Mexico (UNM) in Albuquerque and was privileged to become part of their whānau. I also visited the states of California, Alaska and Hawai'i where I met with planners, allied professionals and academics working in climate adaptation. These are also states where Indigenous Planning is playing a greater role than many others. I attended conferences, site visits, and met with researchers, planners, policy makers and community leaders.

New Mexico is one of the newer states of the US and was granted statehood in 1912. The landlocked state is located in the arid south-west with Arizona to the west, Colorado to the north, Texas to the east and borders Mexico to the south. The Rio Grande River flows through the centre of the state, collecting water from surrounding mountain ranges which make up the southern extent of the Rocky Mountains. We lived in Albuquerque, the largest city in the state with just over 550,000 people (32nd largest in the USA), an hour's drive or train ride from the state capital, Santa Fe. The surrounding desert environment is stunningly beautiful and climatically extreme. Indigenous peoples and more recent Spanish, Mexican and Anglo settlers have adapted the environment or adapted themselves to live in arid and extreme temperature conditions. Farming and stone house construction traditions date back many hundreds of years. With climate change, New Mexico is predicted to get hotter and drier, with heaver rain fall events. In future, New Mexico is preparing for bigger wildfires, worse heat impacts on human health, lack of water for farming, and greater risk of flooding.

Alaska and Hawai'i are also newer states, both were granted statehood in 1959. Like New Mexico, they are home to the highest proportions of Indigenous people in the US, with similar percentages to Aotearoa. These coastal states have seen significant flooding and coastal inundation already. As seen recently in Lahaina, Hawai'i, wildfire is a risk to life, as is the impact of heat on human health. California is also dominated by the sea and hosts 39 million people with 28 million living in a coastal county.

Acknowledgements and thanks

I would like to extend a thankyou to everyone who has helped me with this project and hosted me in the USA including those named and not named in this report. I am also very thankful for the Harkness Fellowship for making it all possible by providing a very generous scholarship for my whānau and I to travel and stay to the USA. In particular I would like to thank the Harkness Fellowship interview panel Chris Seed, Aphra Green, Pattrick Smellie (chair) and Heather Baggot.

I am very grateful for the support of Indigenous Design and Planning Institute's Distinguished Professor Regents, Dr Theodore Jojola and staff Michaela Shirly and Chealsey Begay who warmly accepted me and my whānau into their world.

He mihi nui ki Biddy Livesey for supporting the trip and being a great co-ambassador for Aotearoa New Zealand along with our daughter Awanui Clark.

Photo: Acoma Pueblo, New Mexico (Photo by Biddy Livesey)

02. EXECUTIVE SUMMARY

Urban climate adaptation is an extension of work already underway to avoid or mitigate natural hazards, except the pace and scale of delivery is increased. We need to act now or very soon to adapt to our new and evolving climate.

Multiple actions are needed by multiple government agencies at all levels. Community groups and tribal authorities need to be part of the decision-making to ensure we address the challenges of climate change in efficient and equitable ways.

Being efficient with limited resources means working with nature to find solutions. Hard engineering solutions, such as seawalls, are too costly to build and maintain to apply everywhere. These solutions can cause maladaptation or a false sense of security and contribute to other unintended consequences.

Focussing on co-benefits of adaptation is important to avoid simple fear- or disaster-based narratives which can shut down engagement by people and communities. Climate adaptation offers the opportunity to bring back nature and better connect communities to their environments, such as coastlines, rivers and wetlands that are inaccessible or have been modified beyond a state which has a life supporting capacity. Trees are a key urban climate adaptation measure, reducing heat impacts on human health. Increasing urban trees provides the co-benefits of supporting biodiversity and making our cities more attractive and comfortable.

Different levels of social vulnerability and equity needs to be considered in decision-making. People must be involved in the decision-making for adaptation options, usually at a local level. Implementation of community-initiated plans should be supported financially by government to deliver adaptation at pace.

Adaptation efforts need to take account of the local variations that may have unique climatic changes. Indigenous knowledge will help provide a broader and deeper understanding of place, both past and present, utilising place knowing and a seven generations model. This will help to ensure adaptation is appropriately applied and scaled.

We need to be prepared for unprecedented change and significant events which we may not be able to predict. Plans need to be responsive to change, for example, to respond to the speed of sea level rise which is not fully understood.

03. OVERALL CLIMATE ADAPTATION APPROACHES IN THE USA

The US Federal Government and national institutes including publicly funded bodies are assessing climate adaptation approaches, and helping to provide advice to their other agencies, states, local and tribal governments.

Initiatives include:

State level climate plans

There are many climate adaptation plans (called many different names) across the US. They vary in content from specific challenges such as avoiding natural hazards like flooding through to wider community resiliency matters like healthy and affordable housing and food security. Wider community resilience issues are likely to worsen as climate effects take place, for example food prices increase as farming production is vulnerable to an increasingly volatile climate and supply chains are disrupted by extreme weather events.

Climate adaptation professional network

Climate adaptation as a specific subject matter is new and evolving. It is also a relatively new professional area of expertise. The American Society of Adaptation Professionals (ASAP) began in 2011 for people working on climate change adaptation. ASAP is cautious of the word professional as it may exclude important actors working in their communities who may not ascribe to the word professional.

Tribal climate adaptation plans

I was especially interested in understanding the sovereignty of communities to make their own climate adaptation plans. Nowhere is local sovereignty more profound in the US than on tribal reservation lands, such as the 19 pueblo communities in New Mexico. The Federal Government has financed some of these tribal plans, while other tribes have funded them themselves. Federal funds are available for tribal communities to implement these plans and this is starting to occur. I visited Jemez Pueblo, an Indigenous community outside of Albuquerque, who are addressing resiliency now. In Jemez, I met Sheri Bozic the Director of Planning who is shepherding the construction of higher bridges to avoid them being overtopped (as they have been recently) so their community can remain connected in extreme weather events. Bozic showed us one of the bridges that incorporates local art and maintains physical connection to the river so the community can continue to practice cultural traditions (see list of Tribal climate adaptation plans in Appendix C).

Universities

Universities and other institutes are also focusing on climate change. In Hawai'i, I spoke with Makena Coffman, Director of the University of Hawai'i Mānoa Institute for Sustainability and Resilience. The Institute are looking at range of matters including assessing the economic risks and benefits of allowing private sea walls or allowing the sea to move which often result in the loss of adjacent beaches.

National Climate Assessment

The Global Change Research Act of 1991 mandates that the US Global Change Research Program (USGCRP) deliver a report to Congress and the President not less frequently than every four years that "integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings; analyses the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and analyses current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years."

The Fifth National Climate Assessment was released on 14 November 2023. I reviewed the built environment

chapter and the chapters for each of the states I visited. Makena Coffman who I met in Hawai'i is one of the report authors of the built environment and Hawai'i chapters. Three of the four key messages in the built environment chapter 12[4] are focused on climate adaptation:

1. **Attributes of the Built Environment Exacerbate Climate Impacts, Risks, and Vulnerabilities** - Urban development patterns can exacerbate climate change impacts such as increases in heat and flooding. Climate change is amplifying existing loads and stressors on the built environment, and this is expected to continue. Urban areas face elevated risk as both people and the built environment are exposed to climate hazards, and these risks are distributed unevenly across the population.

2. **Urban Environments Create Opportunities for Climate Mitigation and Adaptation** - Cities across the country are working to reduce greenhouse gas emissions and adapting to adverse climate impacts. Some states and cities are integrating climate considerations into relevant codes, standards, and policies. However, the pace, scale, and scope of action are not yet sufficient to avoid the worst impacts, given the magnitude of observed and projected climate changes.

3. **Community-Led Actions Signal a Shift Toward Equitable Climate Governance** - There is varying progress in considering who benefits from, or bears the burden of, local climate actions. The emergence of local and community-led approaches—coupled with increasing collaboration among city, Tribal, state, and federal governments—indicates a movement toward more inclusive planning and implementation of climate actions.

The National Climate Resilience Framework

The Framework[5] articulates the Federal Government's role in advancing climate resilience and identifies six core objectives to strengthen protections against the impacts of climate change.

The Framework details Opportunities for Action for each of the six objectives:

1. Embed climate resilience into planning and management.

2. Increase resilience of the built environment to both acute climate shocks and chronic stressors

3. Mobilize capital, investment, and innovation to advance climate resilience at scale

4. Equip communities with information and resources needed to assess their climate risks and develop the climate resilience solutions most appropriate for them

5. Sustainably manage lands and waters to enhance resilience while providing numerous other benefits

6. Help communities become not only more resilient, but also more safe, healthy, equitable, and economically strong

Objective 2 above seeks to ensure public infrastructure is built to avoid climate shocks. This means changing engineering and building codes so development can withstand extreme events, ensuring housing is kept away from hazard zones and urban intensification is focused in lower risk areas only.

Climate Adaptation Science Centers

The National and Regional Climate Adaptation Science Centers are a partnership-driven network that teams scientists with natural and cultural resource managers and local communities to help fish, wildlife, water, land, and people adapt to a changing climate. The network is comprised of a National Centre and nine regional Centres, covering the continental US, Alaska, Hawai'i, the US-Affiliated Pacific Islands, and the US Caribbean. The centres are funded by the Environmental Protection Agency.

I met with the South Central Climate Regional Centre who has investigators and staff based in Albuquerque. Sharon Hausman is a climate adaptation planner and research scientist who is also a member of the Indigenous Design and Planning Institute. She was a significant contributor to my understanding of climate adaptation in the US.

The South Central Centre covers New Mexico, Oklahoma, Texas and Louisiana. They are working with

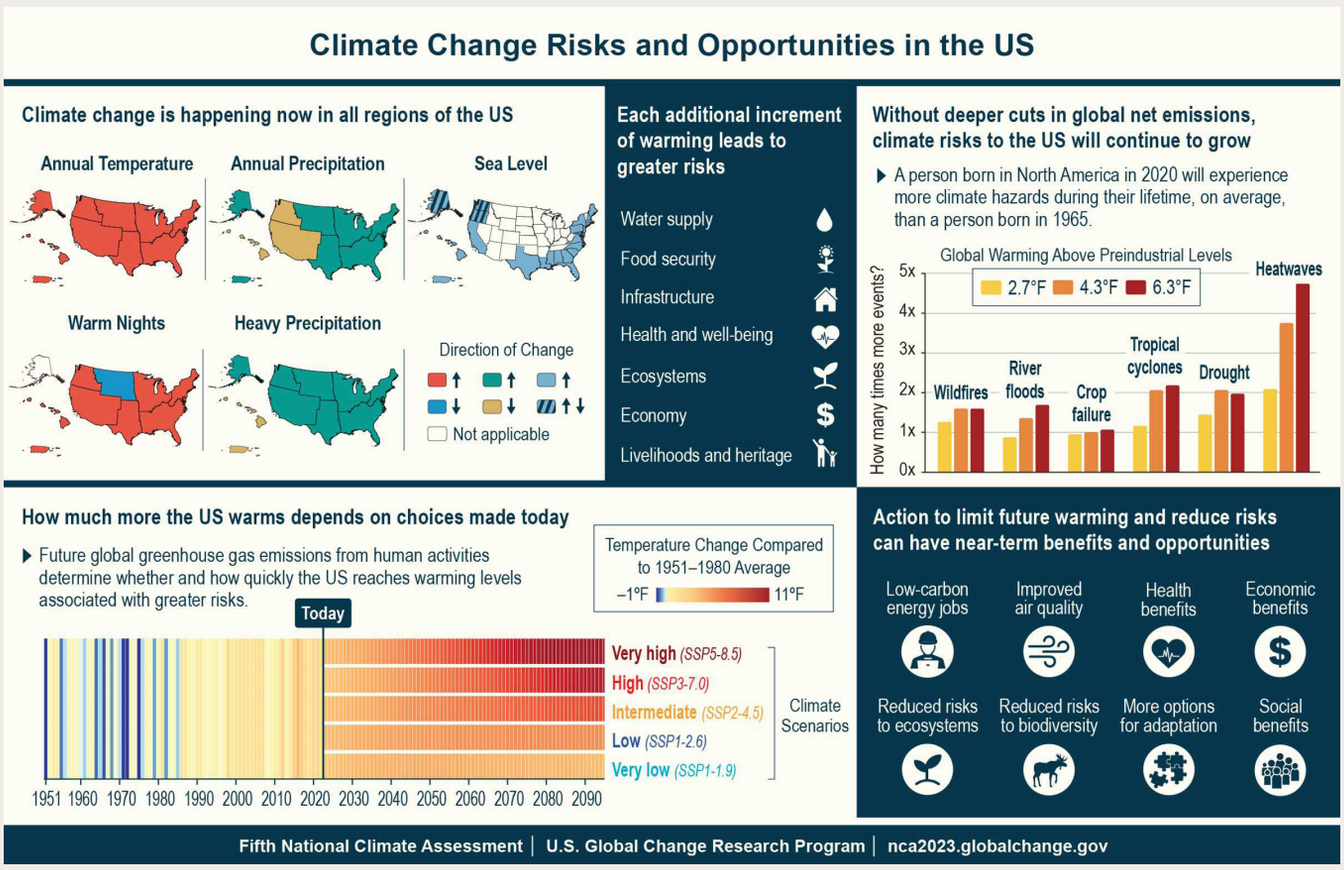
4 https://nca2023.globalchange.gov/chapter/12/
5 https://www.whitehouse.gov/wp-content/uploads/2023/09/National-Climate-Resilience-Framework-FINAL.pdf

communities and government to help them to adapt their resources and people to respond to climate change. Their approaches range from using climate adaptation and vulnerability assessments to predict and prepare, such as ensuring culverts under road and rail corridors will be large enough to accommodate flash floods, through to identifying where heat-related illnesses are most likely to be found. The South Central Centre has produced resources including the Community Resilience Planning Guide, the Tribal Climate Change Planning Initiative, Climate Vulnerability Assessment tools and individual State Climate Change Summaries.

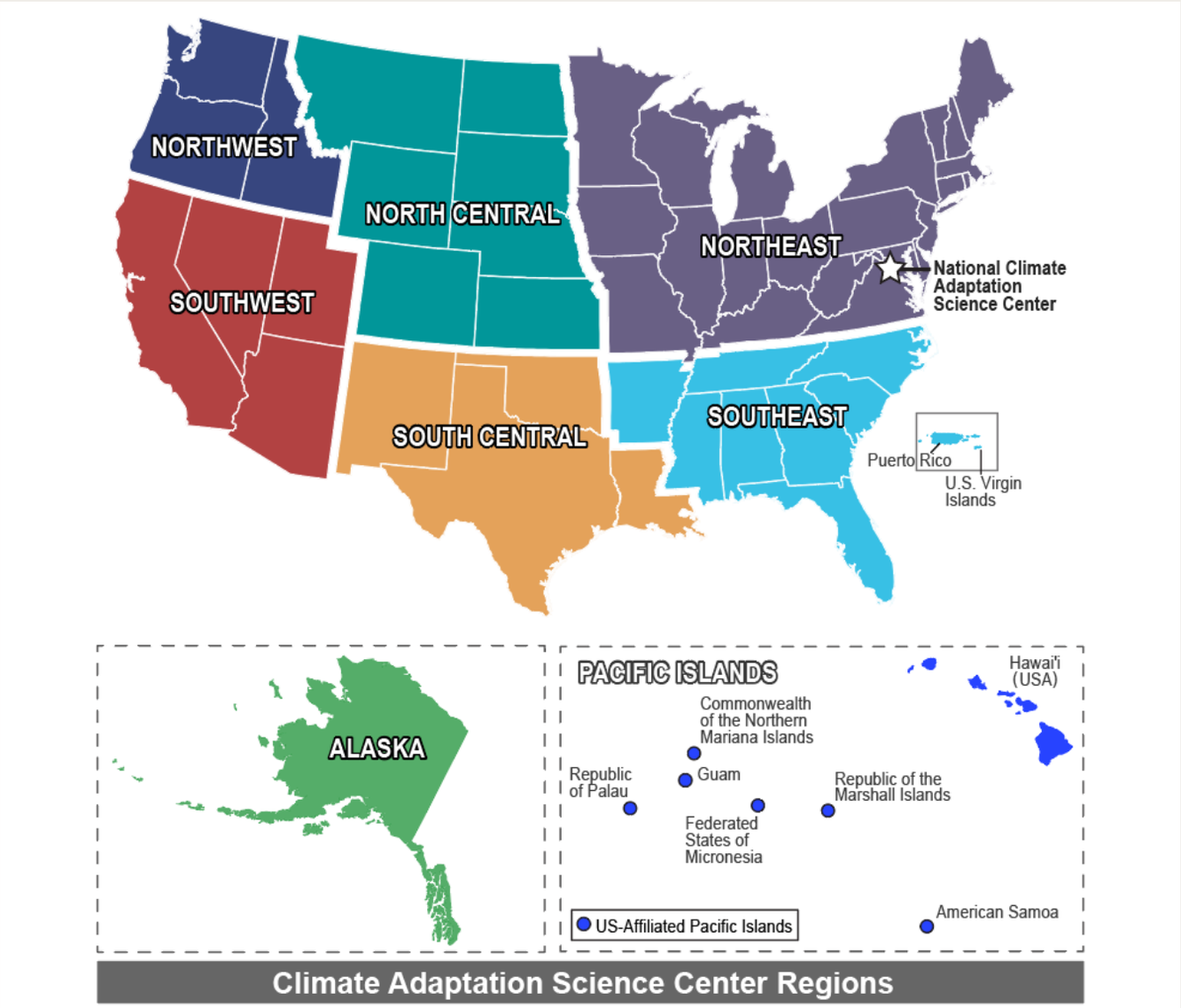
US Commitments to United Nations Climate Change Conference (COP28)

The US makes a significant contribution to the UN Climate Change Conference and is demonstrating leadership in adaptation globally. In December 2023, COP28 Parties agreed on targets for the Global Goal on Adaptation and its framework, which identify what the world needs to achieve in order to be resilient to the impacts of a changing climate and to assess national efforts. The Global Goal on Adaptation framework reflects a global consensus on adaptation targets and the need for finance, technology and capacity-building support to achieve them. Urban and infrastructure is an interlinking theme across the framework, and food system resilience became a new goal.

The US has committed $3B USD in new money to the Green Climate Fund, which aims to put at least half of its investment dollars into adaptation projects. The Green Climate Fund is a result of the Paris Climate Agreement mandated to support developing countries to realise their nationally determined greenhouse gas reduction contributions.



Graphic: The Fifth National Climate Assessment Dashboard *(2023)*



Graphic: Climate Adaptation Science Center Regions

04. ENVIRONMENTAL JUSTICE IN CLIMATE ADAPTATION

Environmental justice and human rights are a key concern among climate adaptation practitioners. People and households with low incomes are more vulnerable to shocks than those who are wealthier. Climate change will exacerbate existing inequalities. Lower-income communities are likely to be worse effected by flooding and other climate-exacerbated environmental hazards.

Environmental justice, according to the National Resources Defence Council, means that "everyone—regardless of race, color, national origin, or income—has the right to the same environmental protections and benefits, as well as meaningful involvement in the policies that shape their communities."

There are many examples of minority communities experiencing long-term environmental hazards. In Los Angeles I spoke with Assistant Professor Liz Koslov at the University of California, who recommended a new book entitled 'California Against the Sea'[6]. Published in September 2023, the book includes the example of Marin City, a neighbourhood situated next to the very affluent Sausalito community north of the Golden Gate Bridge in California. Marin City is located on tidal mudflats that were quickly transformed during the second world war into a shipyard to build battle ships. Black people moved to the area from across the country to help build the ships, where many of their descendants remain today. However water is trying reclaim its space and over past decades Marin City has flooded whenever heavy rain arrives, particularly on a high tide. Community leaders have been trying to get the attention needed to address their concerns for a long time. Finally funds from the federal Bipartisan Infrastructure Law, intended to rebuild crumbling roads and bridges, could help fix flooding issues in Marin City.

I found that professionals such as planners and climate adaptation specialists are aware of the need to provide equitable climate solutions. The American Planners Association has an extensive policy guide for planners on how to integrate equity into policy-making, similar to many other professional bodies. Many climate adaptation associations and groups provide equity training in their modules, including the American Society for Adaptation Professionals.

There has been some response from government to the need for equitable adaptation. I spoke with the Marta Segura, new Chief Heat Officer in Los Angeles, and her team who report to the Climate Emergency Mobilization Commission. The commission was established in 2022, to advise the City Council and Mayor in creating equitable climate policies. The Commission has 19 voting members, with seven members representing the most vulnerable areas of LA, defined as the areas burdened with the most pollution. Other positions represent youth, labour, Indigenous Tribal leadership, and climate health experts. The commission is intended to co-create equitable climate policy and investments with the Climate Emergency Mobilization Office, including an Equitable Climate Action Roadmap to be developed. So far, the Commission has helped influence heat mitigation messaging and provide comment on climate mitigating building regulations. A new commission was recently appointed. The Justice40 Initiative, which directs 40 percent of federal investments in climate and clean energy toward disadvantaged communities, is a further example[7] of advancing equity through adaptation.

6 California Against the Sea, Rosanna Xia, 2023
7 https://www.whitehouse.gov/environmentaljustice/justice40/

Photo: Mānoa Heritage Centre, Hawai'i (Photo by author)

05. COMMUNITY- & INDIGENOUS-LED CLIMATE ADAPTATION EFFORTS

All of us are decision-makers for our climate futures. Within communities, organizations and groups are working to bring attention to the climate crisis and seeking community involvement to make positive change.

I met with Captain Mark Ellis of the Polynesian Voyaging Society at their base in Honolulu, Hawai'i on a very wet day. Low level surface flooding was everywhere around the base on the reclaimed lands of the Pearl Harbour area when I visited. Captain Mark and the rest of the crew have embarked on a multiyear Pacific Ocean circumnavigation to inspire 10 Million 'planetary navigators'. Hōkūlea is the name of their waka hourua (sailing canoe). Their intention is for these navigators to pursue critical and inspiring 'voyages' to ensure a better future for the earth, and connect Pacific cultures for "collective action around common challenges and a shared sustainable destinies".

Captain Mark told me about how they are inspiring this collective action and what they have seen and done so far. From his perspective, collective action is largely about goal setting. Navigators at sea have two decision-making moments in the day; at sunrise, deciding where you are; and at sunset, deciding where you are going. There is a flow to making these decisions - firstly making observations; secondly identifying choices; and finally deciding.

Hōkūlea, a waka hourua is sailing around the Pacific 2023 – 2027 for Moananuiākea – 'a voyage for earth'.

Purpose: To ignite a movement of 10 million "planetary navigators" who will pursue critical and inspiring "voyages" to ensure a better future for the earth. We do so by developing young leaders and engaging communities around the world while amplifying the vital importance of our oceans, nature, science and indigenous wisdom.

I visited Mark and the Polynesian Voyaging Society because I am a crew member of the sister organization Te Toki Voyaging Trust in Aotearoa. I also wanted to be able to think further about how traditional sailing and navigating can help influence our shared climate adapted futures. Our conversation allowed me to get clarity about the benefit of having a clear objective for our future and the power of organisations such as Polynesian Voyaging Society for others to realise this too.

"Social infrastructure is more important than physical infrastructure"

Working with or alongside communities on climate adaptation is often more important than focusing on big infrastructure projects. All places are subject to risk and no amount of public investment will ever completely eliminate risk, nor will there be enough resources to cover all the places that might need help. In contrast, enhancing a community's ability to address risk itself or be ready to respond when disaster does strike can be more effective.

As an example, the community at Ko'olauloa on the North Shore of O'ahu, Hawai'i is working to strengthen the resilience of its community to prepare for disaster. I met with Dotty Paddock, Ken Furakawa and Dr Miriam Chang, three of the members of the Ko'olauloa Community Resiliency Hub on the site of a future shelter facility that overlooks the settlement of Hau'ula and the Pacific Ocean to the east. They told me they realised after the close brush with Hurricane Douglas in 2020 (the closest passing hurricane to O'ahu on record) that, had it made landfall, 85 per cent of houses along the Ko'olauloa coast could have been lost to storm surge along with the only road in and out, and a community facility currently used for distributing aid. The group has since leased Hawai'ian state land to prepare plans to develop it into a climate resiliency hub. The designs look not unlike a ship or ark, and would provide shelter for 2,000 residents (and their pets), along with space for medical services, food, ice, water and electricity which could sustain another 10-15,000 people in need for up to 30 days until a new link can be made back to Honolulu.

The Ko'olauloa Community Resiliency Hub is an example of a community doing the work to plan for climate adaptation themselves. They have done it with

Ko'olauloa community adaptation leaders: *(From left) author, Dotty Paddock, Ken Furakawa, Dr Miriam Chang and Cody Winchester (supporting consultant at G70) at the site of the future resiliency hub (image by author).*

a cross section of the community and have trained themselves up to do the work. They have become well connected, being able to secure funding for design work and investigations and are aligning themselves with government agencies in order to secure funding for construction ($25 - $35M USD).

Community-led and culturally responsive solutions are critical particularly when relocation is required. I spoke with Anthony Fettes, an Associate Professor of Landscape Architecture associated with the Indigenous Design and Planning Institute (iD+Pi) about Golovin, one of the most climate threatened communities in Alaska. He had traveled there with iD+Pi Director Theodor Jojola to help the community decide to what to do after a serious storm surge event with waves cresting over 5 meters above mean high water springs. Some households have chosen to move to the nearby bluff or lift their houses. However, critical social and physical infrastructure is still located on the at-risk spit area. Fettes, Jojola and others assisted the community to articulate their priorities for their town and start to see a different path for retreat, one that remains responsive to their needs of maintaining a strong town.

I found that art is an important tool for communicating a wide variety of subjects including climate change adaptation. I met with Marisol Meyer and Tybur Casuse-Driovinto, two of the leaders of Shared Futures, an art science collaboration based in Albuquerque. Shared Futures pairs scientists and artists to address and communicate 'wicked problems'. The annual project is conducted over four months. The resulting work is displayed at Explora! The Albuquerque Science Museum. Climate change mitigation and adaptation has featured often over the four years the programme has been running. Meyer says that art has the ability to communicate science to a wider range of audiences, and is more likely to elicit an emotional response. Art helps to envision possible futures that are engaging for the public. Combining art and science can also move away from compartmentalising issues, instead showing the interconnected impacts of decision-making on our world. Art has also been used to great effect in the recent 5th National Climate Assessment to help convey climate messages.

Indigenous-led climate mitigation

Continental USA has a system of tribal reservations which allows tribal government sovereignty to govern their territories. In New Mexico there are 24 recognised tribes, 19 are Pueblo Indigenous Tribes (known for living in compact permanent settlements, called pueblos, a Spanish word for village), three Apache tribes and the Navajo nation. During my stay in New Mexico, I was fortunate to be invited to visit the pueblos of Isleta, Sandia, and Jemez. I also visited the pueblos of Acoma and Taos as a tourist. I was able to meet people from other pueblos and tribes at different events, including at the Tribal Planners Round Table that was hosted by Jemez Pueblo.

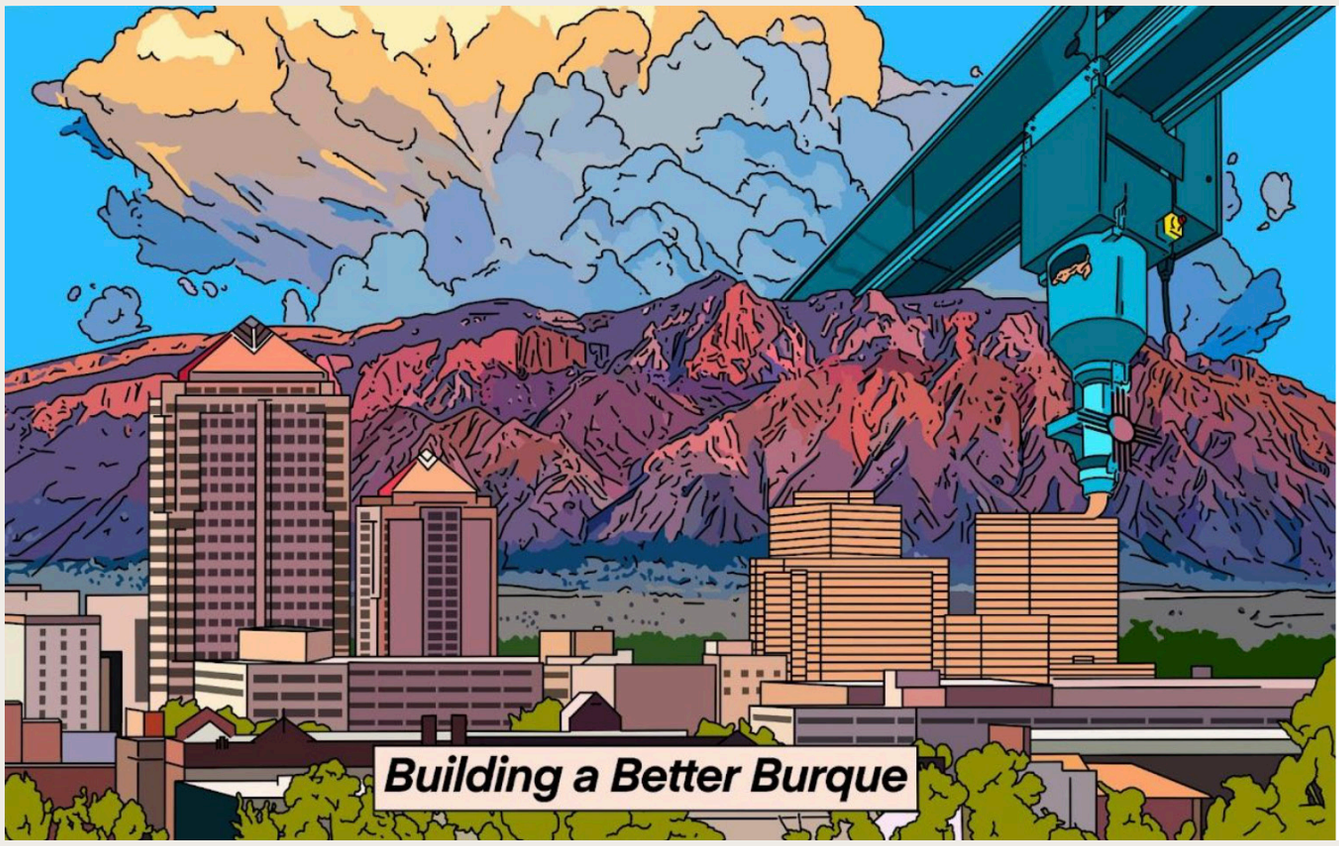
Tribes are taking matters into their own hands to protect their people from climate change effects

Tribes are preparing climate adaptation plans for their communities. Some plans are now being funded by Federal Government to ensure communities will remain resilient.

Like many climate adaptation plans, a wide range of issues are normally included beyond just predicting and preparing for increased prevalence of natural hazards. The holistic approach of tribal plans may include other subjects like language revitalisation, animal management and pressing environmental challenges such as remediating contaminated land and improving water quality. Matters which proceed the climate emergency such as drinking water access and access to healthcare are also included, reflecting the wide range of factors tribal communities are addressing on their lands. The breadth of these plans also speaks to the hope that focussing on the shared challenge of a changing climate may help to address issues which have affected tribal communities for generations. Examples of tribal climate adaptation plans are listed in Appendix C.

Sharon Hausam and Jake Pallazi, who works with Hausam as a tribal liaison, introduced me to the Tribal Adaptation Menu, produced by the Anishinaabe Nation located in the northern Great Lakes area. The Menu provides a range of approaches to understand Indigenous stewardship and helps to bridge the gap between non-tribal people interested in Indigenous approaches[8]. The Menu has become a go-to for some climate adaptation professionals. It is particularly useful for them when they work with Indigenous communities. Tribal communities use it to help prepare adaptation

8 Tribal Adaptation Menu Team. 2019. Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu. Great Lakes Indian Fish and Wildlife Commission, Odanah, Wisconsin. 54 p. https://glifwc.org/ClimateChange/TribalAdaptationMenuV1.pdf



Manuel Peralta II & Daiquiri Zozaya, 3-D printing a path to a more sustainable future *(2023, Digital illustration on poster), from Shared Futures*

Ellen Anderson, Cheryl *(2021, oil on canvas). Featured in 'Art × Climate' of the National Climate Assessment.*

Artist's statement: Cheryl is a very real person in Milwaukee, Wisconsin. She works at a social services non-profit and is a member of our gay community. I painted her to show her confidence and triumph over urban challenges. This painting depicts the density of urban life and the spirit of the individual in it. The power of the individual, for climate change, social change, and personal change is embodied in this painting.

plans for Indigenous communities on or off reservation. The Menu contains practical guides on topics such as approaching traditional knowledge holders, supporting an altered ecology, and thinking about all living things - not just humans - when adapting for climate change.

PlaceKnowing – an Indigenous planning model to inform actions, including climate adaptation

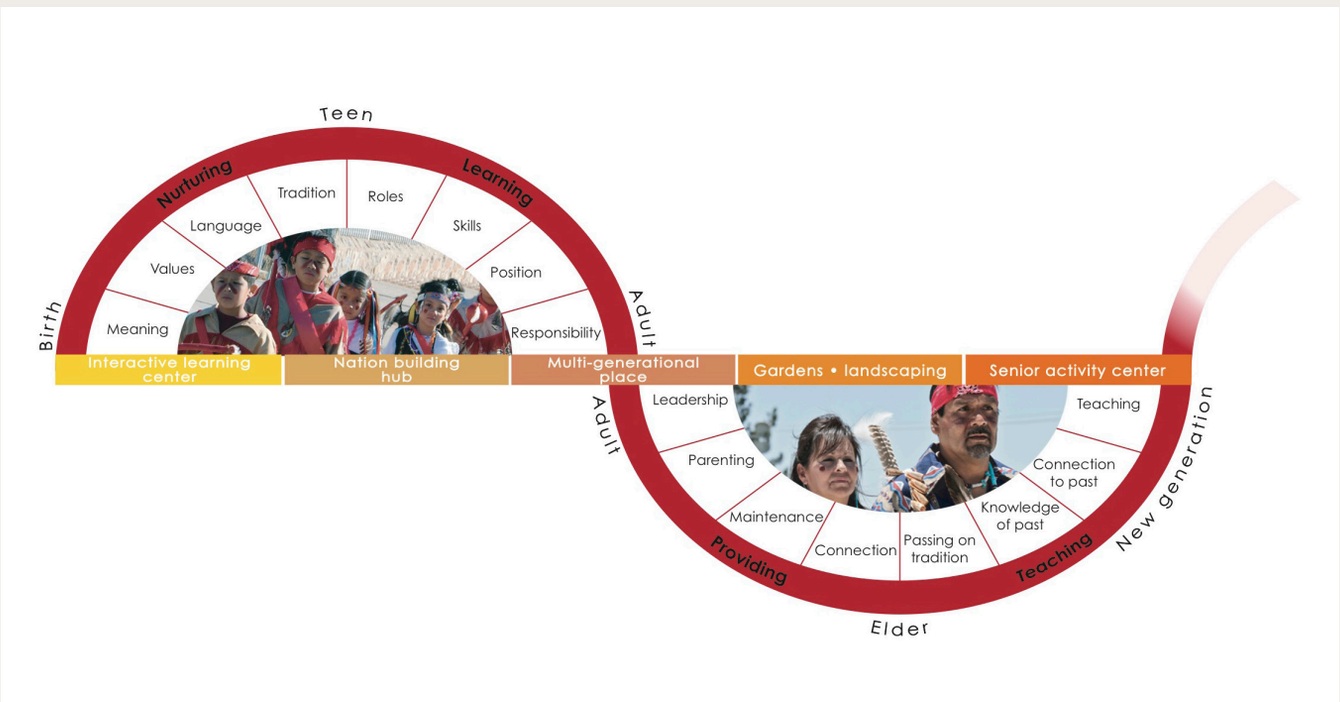
The Indigenous Design and Planning Institute (iD+Pi) where I was based has theorised and developed approaches to understand place. PlaceKnowing is a process and outcome to understand a place and what might be achieved by acknowledging the past to determine how it influences the present. It could be used to inform any place-based project, including climate resilience. Ted Jojola describes PlaceKnowing as:

> *PlaceKnowing is grounded in the idea that places have been inherited and that the role of community is to both acknowledge and sustain the meanings of culture and identity into the future.*
>
> *This process is characterized as Seven Generations planning and it acknowledges that the meaningful staging of events cannot be understood unless we first acknowledge the past, determining how it influences the present and is staged to inform and project into the future.*
>
> *Moreover, it restructures the conversation away from the notion that traditional knowledge has been lost, but that it has only been forgotten and can be reinstated when culturally appropriate. The weight of this understanding is critical for both planners and designers when they work with place-based Indigenous communities.*

The Seven Generations model aligns with literature on climate adaptation, that to address the future we must understand the past, and the problems are going to take multiple generations to rectify. The Seven Generation model places our current generation in the centre, from which we look back three generations to our great-grandparents for guidance, and forward three generations to our great-grandchildren for results. In the past, the Indigenous people who live in the area now known as New Mexico made plans to construct significant stone and wood-built settlements that they knew would take successive generations to complete. Each subsequent generation looked to the elders to understand what they needed to do to complete their role, while knowing they would never see the end result. Today, there is a recognition that addressing the climate issues and rebalancing the environment more generally is going to take successive generations to resolve; it has taken many generation to create the issues that we have now.

Indigenous adaptation in many respects is an extension of the work of Indigenous communities since settler colonisation - attempting to protect and maintain culturally significant sites, food growing and gathering areas and ultimately, the identity and legacy of their people.

Indigenous communities can draw on their ancestral knowledge to consider climate adaptation approaches. In New Mexico and Arizona, for example, some Indigenous people are returning to dryland farming. A technique developed over centuries has become largely forgotten as dry land farms were abandoned for more irrigatable land elsewhere. Bringing this knowledge back is happening with the help of university programmes, working in partnership with Indigenous communities. As part of my contribution to id+Pi, I was asked to help review a graduate landscape architecture pin-up exploring alternative farming techniques that students were recording though drawings, text and images. Sharing knowledge about dryland farming helps to support the revitalisation of knowledge about plants, water harvesting and soil management which will make growing possible again in arid environments. This knowledge can be used to support adaptation in the south-west, as more additional Indigenous and non-Indigenous lands become arid.



Graphic: Seven Generations Model. *Ted Jojola, Indigenous Design and Planning Institute, University of New Mexico.*

06. SPECIFIC RISKS POSED BY CLIMATE CHANGE TO OUR URBAN AREAS: COASTAL, FLOODING, HEAT & WILDFIRES

Climate change poses a wide scope of additional risks across our urban areas. Below, I explore four areas of risk relevant to our urban areas in Aotearoa New Zealand.

6.1 Coastal erosion, coastal flooding and rising ground water as a result of sea level rise directly threaten our coastal settlements and the places we love

The Pacific Ocean, which connects the states of California, Alaska, Hawai'i with Aotearoa New Zealand and many other nations presents a significant risk to our coastal urban environments. Like other oceans and seas, it will become a greater threat as sea level rise occurs and as storms become more frequent and severe. Many individuals and communities are trying to stand firm to save their houses and others, including corporations, are still building dangerously close to the sea.

I met with Makena Coffman, director of the Institute for Sustainability and Resilience at the University Hawai'i campus located in the lush Mānoa valley, a short bus ride from downtown Honolulu. We talked about the challenges facing Hawai'i and other parts of the US due to flooding. Makena has recently shifted her focus to climate adaptation rather than climate mitigation, as a result of seeing the loss of the Hawai'i Kai beach in east Honolulu she played on as a child. Beach sand has been lost due to sea walls built to hold back the rising sea.

Beach loss is inevitable when seawalls are used. Seawalls have a significant private benefit to protect individual or groups of homes, but loss of the beach in front of the wall is nearly certain, and beach loss further down shore is also likely as lateral drift of sand is interrupted. Seawalls have not been allowed as-of-right in some states including California and Hawai'i since the early 1970's, and there are significant pressures on public agencies to approve applications. Illegal walls have also been erected by landowners who then challenge the state via lengthy court processes. Even bodies set up to protect the public interest in the coast such as the California Coastal Commission have struggled to prevent or remove walls legal or illegal.

Makena Coffman told me about a study trip that she took to Boston, Miami and Charleston (South Carolina), that looked at the impact of sea level rise on these low-lying cities[9]. Among other things, they found that rising ground water near the coast due to sea level rise and additional rainfall exposes underground services to damage, due to water incursion and corrosion as groundwater may become saltier. In these situations, flooding even when there is no rain, or 'sunny day flooding' as it is called, occurs more often on king tides.

Researchers such as Makena are concerned that the scope of climate adaptation in the US risks being narrowed to costly hard engineering solutions. For example, the US Army Engineering Corps design and build hard urban defences such as levees and water races. These solutions usually exclude space for biodiversity, impose maintenance costs on communities, and can limit access to or destroy culturally important sites. The Corps come with the incentive of significant federal financial investments, unlike nature-based and living solutions that must be funded from other sources.

9 https://manoa.hawaii.edu/wp/wp-content/uploads/2020/03/isr-slr-learning-trip-report.pdf

6.2 Flooding in urban environments is already a significant problem that will become worse

Albuquerque, New Mexico has historically experienced significant flooding. Major artificial water deviations known locally as arroyos made of earth embankments and concrete were built from the 1960s. They are a striking feature on the landscape which I was able to explore by bike as many of the bank tops are cycleways. The arroyos quickly take water to the Rio Grande River and when paired with dams and levees have significantly reduced flooding. However, they come with issues. Water in the southwest is a very precious commodity, so a system that chutes water away rather than encouraging it to recharge the aquifer is a lost opportunity. They pose a high hazard risk as people will enter them despite numerous warnings. Their appearance is considered to visually detract rather than contribute to the environment and they provide very little habitat. The Albuquerque Metropolitan Arroyo Flood Control Authority which builds and operates the system has introduced sediment management pond, and other devices to attempt to improve the water quality that enters the Rio Grande. However, it is very difficult to manage non-point source pollutants such as trash and pet faeces.

Overall, New Mexico is likely to see less water but when rainfall and floodwaters do come it is likely to be more severe due to the effects of climate change. The effects have already been felt as spring snow melt in the headwaters is now more rapid. Recent significant wildfires have also created ground scarring which causes water to move more quickly, picking up sediment.

Ultimately making space for water is necessary to uphold the health of the water and avoid flooding of the built environment. For those climatic areas where there will be more water due to climate change, making space will be more important. And at the coast, where significant numbers of people live, water is coming from four directions –the sky, rivers, sea and from below the ground.

Flooding has long been an issue ever since we started extending our urban areas into floodplains. Some communities have managed to persevere with regular flooding, but the height and frequency of floods is likely going to be worse for most existing flood areas. Moving settlements out of the way of harm will be very difficult, slow and time consuming.

As an example, retreat from flooding has been happening for many years along and near the Gulf

Albuquerque arroyo. *Dry most of the time, the system accepts short deluges of storm water.*

Coast (where Texas, Louisiana, Mississippi, Alabama, and Florida border the Gulf of Mexico). The Federal Emergency Management Agency has historically provided buyouts directly after flooding hits. State government can also lead buy-outs. The collective experiences is that buy-out processes are extremely slow, taking many years to complete after a significant event. While visiting Alberquerque, Vero Olivotto a PHD candidate at the New School, New York told me that the buy outs often result in less than the money required to find a suitable place to move to. She told me pre-storm valuations for buyouts were provided after destructive cyclones in New York State, which is good from the perspective of the homeowner initially. These offers are quickly eroded by climbing house prices when looking for a place to buy.

6.3 Heat impacts on human health – alleviated with trees

When I met with officials at City Hall in downtown Los Angeles, a pop-up message on the computer screen appeared saying "extreme heat warning". The planners, adaptation specialists and Marta Segura the new Chief Heat officer were clear in the purpose of their work - to cool the city down and prepare people for heat. They were eager to tell me about their projects and how adapting to climate change was happening now and needed to pick up pace. Turning down the heat in a city already experiencing extreme temperatures is challenging. Officials characterise the problem as a combination of Los Angeles' heat trapping valleys; too much concrete and asphalt; too few trees; and being too slow to act.

Heat is a leading cause of weather-related death internationally. It is a silent killer as the threat is often not taken seriously. People think that the problem can be easily rectified, and it can be if you have the resources to install and run air conditioning or can afford to easily escape to the beach. For the poor and vulnerable this is not an option. Instead, at a neighbourhood level, trees are likely the best tool to address heat issues. Shading and trans-evaporation by trees can have a significant impact. A medium sized tree can have the equivalent cooling of two air conditioner units. They also provide other co-benefits including increasing biodiversity, reducing land loss during storms and improving mental health. But trees are difficult to find space for or keep.

Tree cover on private land in Los Angeles is decreasing, mostly due to the redevelopment of sites for multiple unit intensification. Developers and landowners may have little tolerance for trees. It is difficult to redevelop around trees and many see new tree planning as a risk to underground infrastructure. However, unlike Auckland and Aotearoa, trees in Los Angeles are protected through planning rules so most trees not subject to redevelopment will remain. Marta Segura challenges the extent of the perceived impact of tree roots on infrastructure impact and is undertaking work to understand this issue better.

Street trees in Los Angeles, and Albuquerque, have suffered from years of little financial investment in their maintenance or watering when they are stressed by drought. LA has a tree programme where city residents can opt to care for a tree outside their house. But it is not easy to convince residents to take on this responsibility – for example, residents must agree to water the tree for the first few years of its life. In Albuquerque, volunteers have completed an assessment of the health of trees in the downtown area to understand what should stay, what should go and what should replace it. Involving the community in these decisions can help wider community buy-in.

Existing trees may no longer suit for the changing climate. Work on climate-ready tree guides are underway in some US states, including the Nature Conservancy New Mexico guide for Albuquerque[10]. The US Forest Service is working with University California Davis on a plan for California. Trees are slow to grow which means a lot of work in needed well in advance to 'beat the heat'.

6.4 Wildfires pose an increasing risk to human settlements

New Mexico experienced the largest and most destructive wildfire in the state's history between April and August 2022. I spoke with Manuel Montoya, an economics professor at the University of New Mexico, who grew up in the area affected by what is known as the Calf Canyon / Hermits Peak fires. He is now working to help people in his community to receive compensation from the Federal Government, after the Federal Government acknowledged responsibility for the wildfire. The fire began after two 'controlled' fires started by the US Forest Service got out of control. Montoya observed that it is very difficult to get access

10 Nature Conservancy New Mexico: https://www.nature.org/content/dam/tnc/nature/en/documents/Climate-Ready-Trees-Report-Nov2020.pdf

to the compensation, and no-one he has worked with has been paid out yet. Those in informal work or housing have a difficult job proving the extent of their loss. Many in the largely rural area rely on work such as firewood gathering and goat herding which is difficult to quantify and claim for in government processes. Houses have often been built to be relocatable, to avoid building permits and the costs associated with adhering to the county's strict adobe house construction code. The Federal Government only pays out a proportion of relocatable housing costs. The wildfire has also raised serious questions about established approaches to managing forests. For example, the Federal Government was working previously to stop goat herding on public lands, but the goat herders are arguing that their herds were performing a public service by reducing the fuel loads in the forest.

Work is underway to rehabilitate the areas affected by wildfire, particularly the meadow environments which provide habitat for a diverse array of species. Work is also focused on preventing wildfire in the first place and helping people safeguard their homes and communities in New Mexico. But rather that fearing or working against fire, Indigenous communities are asking for a new approach to accept fire. Culturally prescribed burns are a way that Indigenous communities have been working to reduce fire risk for centuries, but doing so in a safe way that prevents them getting out of control.

The recent wildfire in Lahaina, Maui in Hawai'i caught the state and county administration off guard. Land use change from forest and cultivated gardens to dry grass land had exposed the community to wildfire risk. After a dry season, strong winds whipped up flames that also meant helicopters could not be used to control them. Ultimately over 100 people died, and a historic town was almost completely lost. I met with Kawika McKeague, a private practicing planner in Hawai'i who is helping the community to rebuild Lahaina, but in ways that are climate resilient, including space for locals to live where many outside Hawai'i also want to live and vacation.

Many new houses and growing settlements are in areas already at risk from wildfire. Actions being taken to reduce this exposure include encouraging or requiring buildings to be wildfire resilient by creating defensible spaces where vegetation is kept back from houses and other structures. Building codes are changing to prevent ember buildup in structures, as most houses damaged or destroyed by wildfire are not overcome by advancing flame, but by embers building up in places like wooden decks and roof cavities.

According to Caerleon Safford, Project Manager for the Sonoma-Fire Prevention Division, California, getting the message about wildfire risk across to people is very difficult. The first challenge is getting people to request the advice. The second challenge is telling them what to do about it. Safford told me that if there are 10 actions recommended, in many cases the landowner will stop wanting to listen after action three or four is explained. Reasons for this disengagement warrant ongoing behavioural research, but it is likely that focusing on risks and cost is a barrier rather than focusing on what is valued and what needs protecting.

Wildfire in New Mexico *(US Department of Interior)*

Photo: Acoma Pueblo (Photo by author)

07. CONCLUSION - LESSONS FOR AOTEAROA

Climate change adaptation in many respects is an extension of past and present actions to address existing hazards and rebalance the natural environment. The pace and scale of these efforts must be redoubled as the risks become more severe and as our environmental quality in urban areas continues to diminish.

Working with Māori knowledge and frameworks will be needed to understand the past to know what the future may hold. Many places in the United States are working with tribal groups or supporting their plans to ensure adaptation plans and measures are fit for purpose so the risks to tribal communities posed by climate change is reduced.

The impact of heat on vulnerable communities in urban areas in the southwest is a clear warning for Aotearoa to seriously reverse the trend of diminishing tree cover, on private land and in the streets. Moreover, new trees need planting now so they are mature enough to provide cooling effects in Aotearoa cities when they are greatly needed.

The impact of sea level rise and higher rainfall will mean higher groundwater regardless of sea defences and walls used. Many measures need to be used including future proofing our underground services to stay clear of water and saltwater intrusion. Making room for water is important because holding it back is financially costly and results in poor environmental outcomes.

We need to continue to avoid sea walls if we want to protect other parts of the coast and public beaches. We are already starting to see the pressure from private landowners to protect their homes at the expense of other places.

Preparing homes and settlements for wildfires is important. The risk of very high or extreme wildfire risk could increase by 70 per cent by 2040, and not just in place where wildfire has occurred historically. Recent fires at Lake Ohau and Port Hills have raised awareness of the risk and some action is taking place to address issues like wilding pine. Building code changes and other measures needed to protect the built environment from wildfire need implementing.

Protecting the most vulnerable people from climate change will be critical. Involving these communities in decision-making is needed to ensure their challenges are known and addressed in ways that will have a meaningful impact. Vulnerable and underserved communities are more likely to experience the worst impacts of climate change, and these communities must be prioritised when we work to adapt to climate change.

Recommendations for climate adaptation approaches

Other key matters to keep in-mind when addressing climate change:

1. Start acting now – because the window on some approaches is closing soon, like nature-based solutions. For example, building protective wetlands need to happen before sea level significant rise makes this impossible, but once established they can evolve with the rising sea.

2. Look for and listen to what the science is telling us could happen – hoping for the best

but preparing for the worst.

3. No adaptation without mitigation, absolutely avoid adaptation that contributes to climate change and support adaptation approaches which help to reverse greenhouse gas emissions.

4. Nature based solutions are key – fighting the changing environment with hard engineering solutions will be extremely costly, may not work, and requires significant embodied carbon, whereas natural or living approaches such as making space for water is more cost effective.

5. Make space for the knowledge of Indigenous communities to help understand the past and present state of the environment to understand the future.

6. Support local communities and Indigenous groups to implement their own plans – because people who live in place know the situation best and are more likely to make climate ready solutions happen and work. The scale of work ahead that needs to be shared with non-government organisations to ensure work can be completed sooner.

7. Involve communities in decision-making and recommendation-making bodies. Significant actions such as managed retreat need to happen with communities not to them. Climate change panels are better with both experts and community and Indigenous representatives, so adaptation considers the needs of all parts of society.

8. Emphasise the co-benefits of climate adaptation. Avoiding risk is more likely when other outcomes can be achieved. Positive outcomes of climate adaptation are more inspiring to people than fear-based risk reduction narratives. For example, trees reduce heat stress on people and save lives and reduce hospitalisations, but also make our cities more attractive and increase bird and other life.

08. NEXT STEPS

My time on the Harkness fellowship has been hugely rewarding and inspiring to continue sharing what I have learnt.

I am presenting to the following audiences to share my insights:

- Ministry of Housing and Urban Development staff
- Ministry for the Environment staff
- New Zealand Planning Institute Conference
- Auckland Policy Office cross agency staff

In collaboration with iD+Pi and others I am working to deliver the second Global Indigenous Planning Symposium, which will be held in Aotearoa New Zealand in 2026. The first symposium was in Winnipeg, Manitoba, Canada in 2013 which supported the book Reclaiming Indigenous Planning which is widely cited. The second meeting's goal is to gather former and current Indigenous planning scholars, researchers, professionals, leaders and students worldwide to share ideas for intergenerational learning and strategies to promote Indigenous Planning. We plan to produce a second book to document the lessons shared at the event.

From left: Awanui Clark, author, Michaela Shirley, Ted Jojola, Chelsey Begay. (Image by Kahstoserakwathe Paulette Moore)

Photo: Albuquerque from the air (Photo by author)

09. APPENDIX

A. WHO I MET WITH TO DISCUSS CLIMATE ADAPTATION IN THE USA

Name	*Role*	*Organisation*
Makena Coffman	Director	University of Hawai'i Mānoa Institute for Sustainability and Resilience, HI
Sharon Hausman	Climate adaptation planner and research scientist	South Central Climate Regional Centre, NM
Liz Koslov	Assistant Professor	University of California Los Angeles, CA
Edith De Guzman	Assistant Professor	University of California Los Angles, CA
Mark Ellis	Captain	Polynesian Voyaging Society, HI
Dotty Paddock, Ken Furakawa and Dr Miriam Chang	Community leaders	Ko'olauloa Community Resiliency Hub, HI
Marisol Meyer and Tybur Casuse-Driovinto	Co-leaders	Shared Futures, Albuquerque, NM
Jake Pallazi	Tribal liaison officer	South Central Climate Regional Centre, NM
Marta Segura	Chief Heat Officer	City of Los Angeles, CA
Manuel Montoya	Professor of Economics	University of New Mexico, NM
Kawika McKeague	Planner	G70 Consultants, HI
Cody Winchester	Planner	G70 Consultants, HI
Alexander Yee	Planner	Manager, City and County of Honolulu, HI
Caerleon Safford	Project Manager	Sonoma-Fire Prevention Division, CA
Michelle Miano	Director	Environment Department, NM
Vero Olivotto	PHD candidate	New School, New York, NY
Amy Howden-Chapman	Planner	City of New York, NY
Shelly Wade	Planner	Agnew Beck, AK
Nicholas Maricichi	Planner	City of Los Angeles, CA
Gabriella Juarez	Planner	City of Los Angeles, CA

Name	*Role*	*Organisation*
Fabiola Inzuza	Planner	City of Los Angeles, CA
Jenna Monterrosa	Planner	City of Los Angeles, CA
Marie Cobian	Planner	City of Los Angeles, CA
Elspeth Arul	Associate professor	School of Arch. and Planning, (SoAP), UNM,
Theodor Jojola	Distinguished Prof and director	iD+Pi, SoAP, NM
Chelsey Begay	Programme Manager	iD+Pi, SoAP, NM
Michaela Shirley	Manager	iD+Pi, SoAP, NM
Lani Tsinnajinnie	Professor	iD+Pi, SoAP, NM
Anthony Fettes	Associate professor	iD+Pi, SoAP, NM
Katya Crawford	Professor	SoAP, NM
Ramona Malczynski	PhD candidate	Geography UNM, NM
Atherton Phleger	Lawyer	Cota Holdings, NM
Joel Temple	Student	University of Hawai'I, HI
Sheri Bozic	Director of Planning	Jemez Pueblo, NM

B. HOW MY TIME WAS SPENT IN THE USA

Step	*Date*	*Time*	*Notable activities*
In NZ before departure	18 – 26 August	1 week	Gave presentation to Ministry for the Environment staff about upcoming fellowship
Los Angeles, California	26 – 31 August	5 days	Visited LA City Hall and UCLA
Albuquerque, New Mexico	1 – 19 September	2.5 weeks	Presented to iD+Pi Fall semester welcome back event
Anchorage, Alaska	19 – 24 September	5 days	American Planning Association (APA) Western Planning Chapter conference - gave presentation about planning system in NZ
Albuquerque, New Mexico	24 September – 28 November	9 weeks	Presented to UNM School of Architecture and Planning Fall Lecture Series about Indigenous Planning in Aotearoa NZ Attended APA New Mexico Chapter conference – gave presentation
Honolulu, Hawai'i	29 November – 9 December	1.5 weeks	Visited University of Hawai'i and the Polynesian Voyaging Society base
Return to Auckland	9 – 24 December	2 weeks	Prepared report

C. TRIBAL CLIMATE ADAPTATION PLANS

List compiled for University of New Mexico Indigenous Environmental Planning class, Sharon Hausam, PH.D

- **Climate Change Vulnerability Assessment and Adaptation Plan, 1854 Ceded Territory Including the Bois Forte, Fond du Lac, and Grand Portage Reservations. (2016)**

  https://www.1854treatyauthority.org/images/ClimateAdaptationPlan_Final-July_2016-optimized(1).pdf

- **Climate Change Strategic Plan, Confederated Salish and Kootenai Tribes of the Flathead Reservation. (September 2013) [CSKT]**

  https://csktribes.org/CSKTClimatePlan.pdf

- **CTUIR Climate Adaptation Plan, draft for Board of Trustees review (June 2022). [CTUIR]**

  https://ctuir.org/departments/natural-resources/climate-adaptation/ctuir-climate-adaptation-plan-revised-final/

- **Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu. Tribal AdaptationMenu Team. Odanah, WI: Great Lakes Indian Fish and Wildlife Commission. (2019) [TAM]**

  https://glifwc.org/ClimateChange/TribalAdaptationMenuV1.pdf

- **National Inuit Climate Change Strategy. (2019)**

  [Inuit] https://www.itk.ca/wp-content/uploads/2019/06/ITK_Climate-Change-Strategy_English.pdf

- **Jamestown S'Klallam Tribe Climate Vulnerability Assessment and Adaptation Plan. (August 2013) [Jamestown]**

  https://jamestowntribe.org/wp-content/uploads/2018/09/3JSK_Climate_Change_Adaptation_Report_Final_Aug_2013s.pdf

- **Karuk Climate Adaptation Plan. (March 2019) [Karuk]**

  https://karuktribeclimatechangeprojects.files.wordpress.com/2019/08/final-karuk-climate-adaptation-plan_july2019.pdf

- **Metlakatla Indian Community Climate Change Adaptation Plan. (2018) [Metlakatla]**

  https://www.cakex.org/sites/default/files/documents/MIC%20CCAP%20secondary%20proof.pdf

- **Climate Adaptation Plan for the Navajo Nation. (2018) [Navajo]**

  https://www.nndfw.org/docs/Climate%20Change%20Adaptation%20Plan.pdf

- **Climate Change Vulnerability Assessment, Pala Band of Mission Indians. (2019) [Pala]**

  http://ped.palatribe.com/wp-content/uploads/2019/07/Pala-Environmental-Department-Climate-Change-Vulnerability-Assessment-2019.pdf

- **Mitigwaki idash Nibi (Our Forests and Water): A Climate Adaptation Plan for the Red Lake Band of Chippewa Indians. (2014) [Red Lake]**

  https://forestadaptation.org/sites/default/files/demonstration-files/Red-Lake-Forest-Water-Climate-Adaptation-Plan-Final-2014.pdf

- **Climate Change Adaptation Plan for Akwesasne. (2013) [St. Regis]**

  https://dvc479a3doke3.cloudfront.net/_uploads/site_files/ClimateChange.pdf

- **Swinomish Climate Change Initiative: Climate Adaptation Action Plan. (2010) [Swinomish]**

  https://swinomish-nsn.gov/media/54202/swin_cr_2010_01_ccadaptationplan.pdf

- **Núchíú: Ute Mountain Ute Tribe Climate Action Plan. (2020) [Ute Mountain]**

  https://drive.google.com/file/d/1x-6JGyODknqDbv0Sw-UlhlFtsWolk7YV/vie