

Faculty of Design

#### <sup>2021</sup>O'ahu and the Effects of Climate Change

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#### Suggested citation:

Lai, Jessica, Ni, Susan, Tang, Chelsea and Seixas, Giancarlo (2021) O'ahu and the Effects of Climate Change. In: Proceedings of Relating Systems Thinking and Design (RSD10) 2021 Symposium, 2-6 Nov 2021, Delft, The Netherlands. Available at http://openresearch.ocadu.ca/id/eprint/3898/

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# O'ahu and the Effects of Climate Change

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### **PROJECT OVERVIEW**

Climate change is known as the shift in a region's average weather conditions over a ong period of time. While the Earth's climate has naturally fluctuated throughout its existence, modern climate change is unprecedented. Today, temperatures around the world are rising faster than they ever have before in human history. In the past 100 years alone, the Earth's average temperature has increased by 1°C with 2020 being the hottest year on record.

Climate change is already affecting people all around the world, and its impacts extend well beyond rising temperatures. Anything from water, to agriculture, to ecosystems, to human health can be affected by changes to regional climate. To understand the depth and complexity of this issue, our team created the following map to draw out the causes and implications of climate change on the island of Oahu, Hawaii.

For our map, we chose to use the flower motif not only to represent O'ahu's natural eauty but also to indicate how delicate the climate situation has become. We divided our map into five large categories each with both the causes and effects across social, environmental, economic, infrastructure, and transportation aspects and they are all embedded in the overall political bubble. We utilized the gradient in the back to indicate the scope of the problem since climate change is much more than a local issue. In addition, because climate change can sometimes be treated as a problem to push off until later, we highlighted the short term and long term effects to give viewers a better idea of what is at stake. Finally, for our ecology of interventions we were able to identify four different interventions through many lifferent lenses and leverage points. By connecting all the interventions, we also hope to demonstrate how they could work together to create a better vision for the future.

### **THE GREENHOUSE GAS EFFECT**

As mentioned above, modern climate change is not a natural shift in weather conditions. We live in the age of the Anthropocene, an age during which human activity has been the dominant influence on climate and the environment. Human activities release gases known as greenhouse gases (GHG) into the atmosphere. hese gases, such as carbon dioxide, water vapor, and methane, trap heat at the Earth's surface in the same way that a greenhouse acts to capture heat from sunlight. This phenomenon is known as the greenhouse effect and is the main cause of rising temperatures and climate change.

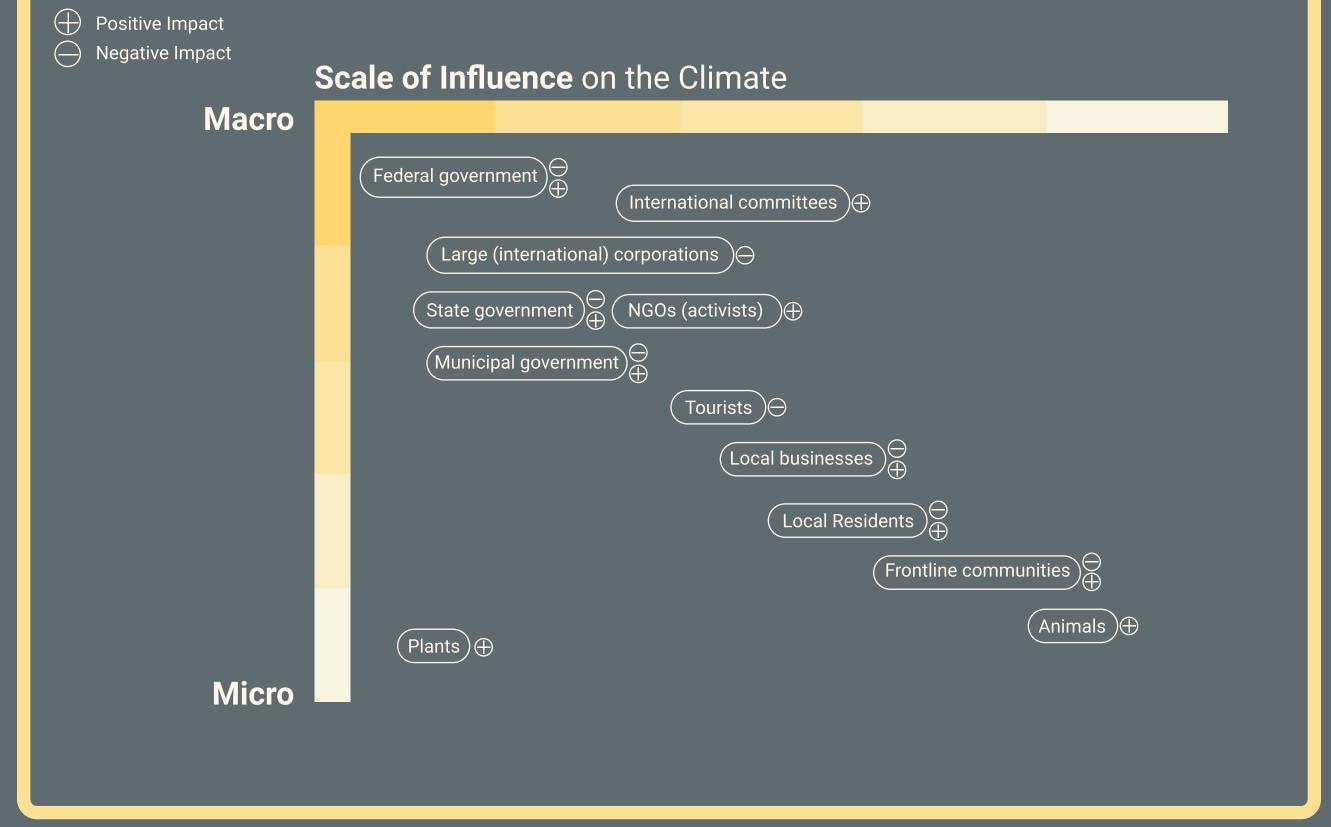
## **O'AHU GHG EMISSIONS INVENTORY 2019**

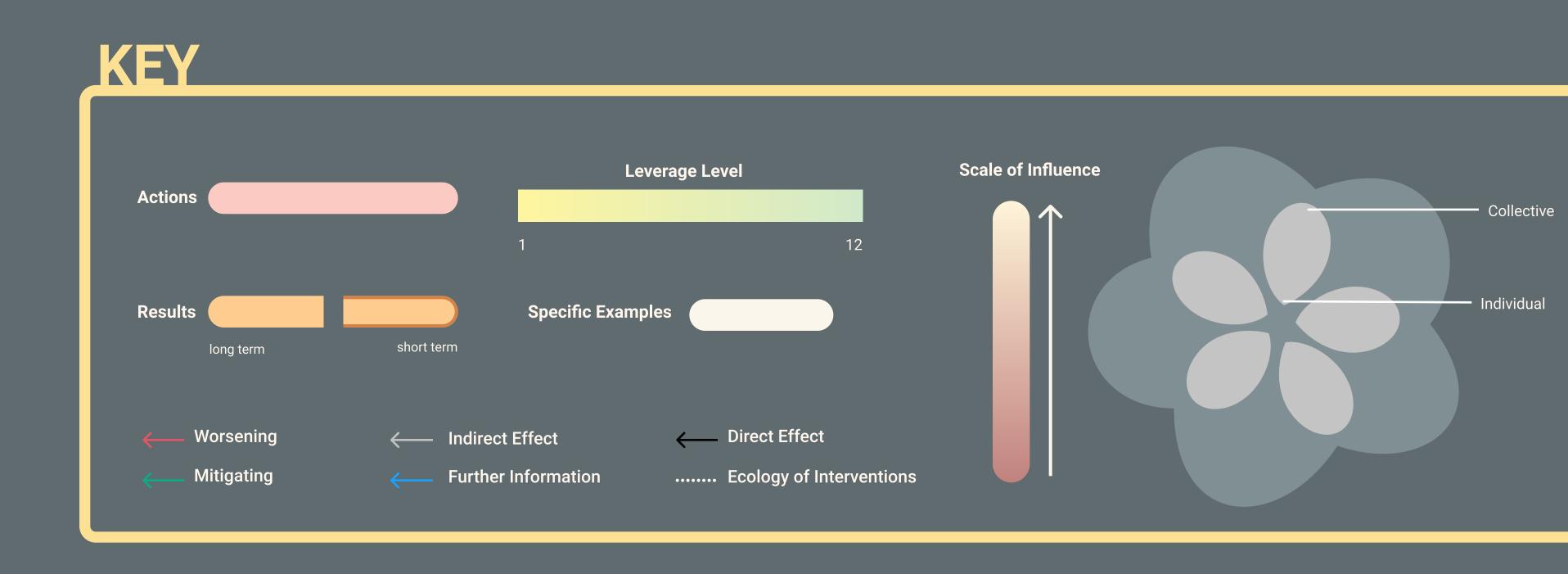
Transportation

Stationary Energy Industrial Processes and Product Use Waste Agriculture, Forestry, and Other Land Use

**6** \*Aviation 29%, On-Highway 17% 2% \*Industrial and Commercial 25%

**STAKEHOLDER DISTRIBUTION** 







#### Climate educational programs could make it easier for people to understand the imporance of why they •••• need to be mindful when they are making certain choices that might impact the environment. Combined with the encouraged use of green transportation, the people of O'ahu will develop a better understanding and awareness of the fight against climate change.

Investment in renewable energy

Growth of renewable energy capacity

Investment receives public

and government support

Less demand for fossil fuel

Hawaii'i State Energy Office

Determining data availability and

baselines to measure targets

Reduced mining

Reduced

manufacturing

Non-renewable Energy

Oil Coal

80% of total energy use.

Energy generation

**Renewable Energy** 

Geothermal energy

Updating Building Codes 🛛 🤶

Green Architecture

Rooftop solar

Ridge and soffit ventilation

Passive solar design

ack of educational

opportunities

Solar Wind

Problems within the

current social structure.

Freshwater

There is a real danger of

Raising awareness an

understanding for future generations

Annual Sustainability Report reflects on the progress achieved

Hard to engage citizens

who may not understand

Lack of

limate change.

Social Awareness

Lack of social initiatives environmental awareness

Poor understanding

Holes within current \_\_\_\_\_

Selecting specific measurable

indicators to track progress

towards those existing targets

of what is at stake

As an island community,

O'ahu has much at stake.

of raw

materials

Ex. wind farms noise

H-POWER (waste

energy plant)

Unintended consequences

"Not in my backyard"

phenomenon

endangered species

The Ola

Integrated Solid Waste Management Plan

Progressive Property Taxes

Emergency Food Supply and Storage Strategy

Department of

Education

Enforcing policies

Raised awareness could lead to the

increase of climate activists who

Federal Emergency

Management Agency

Community Emergency

Response Team (CERT) training

would contribute to the climate cause.

Guaranteed Security Program to

Support Local Home Ownership

Resilience Action 8

Energy Efficiency Portfolio Standard

The City and County

of Honolulu

OOP -Inequality suffered by disadvantaged groups within a society

Increased cost of living political power by the rich and powerful Less access to Less access to public resources private resources Increased exposure, susceptibility, and less ability to cope with changes for the disadvantaged groups Inequality aggravates environmental degradation.

Capture of social and

U

et and income and thus they are

more exposed and susceptible to climate hazards and are less capable

of coping and recovering through their own efforts.

Similarly, the voices of these

vulnerable populations are often ignored or unheard and hence leaving

them no way to reach out for help

**Educational Nature Programs** everage Level: The Paradigm Used to Design the System Information Flow Structures The current understanding of the climate change issue is still vague and incomplete, as it is often hard for people to admit the existence of bias in

heir worldview.

**Implementation Plan** t takes a collective effort, from individual to the international community nitiate these changes that would ultimately change people's thinkin dels at a high leverage point. One way to start this transition of n night be for the government to implement educational programs with the aim of installing new ideas or correcting the old ones. The goal of these programs should be to engage the younger generation in interacting with the natural environment outside of classrooms. For the island of Oahu, the government should work with both scientists and designers to start designing free and accessible educational programs <mark>r children starting from kindergarten to high school</mark>. These programs should be especially important for large cities where there is a large overall opulation. In Honolulu, for example, the government could work with esearchers at the University of Hawai'i at Mānoa to develop the wireframe for these projects. In time, these programs should help people to better connect, understand, and analyze the environment.

Design andIntroduce these newRegular governmentimplement aprograms to schoolsinspections and well-rounded plan and public institutions updates of these programs Potential Barriers The lack of funding and resources from the government to regulate the program would result in an unequal distribution of resources in an imbalanced social system.Leads to an increase in taxes thus the government should work toward providing equal opportunities for all to participate in these programs.

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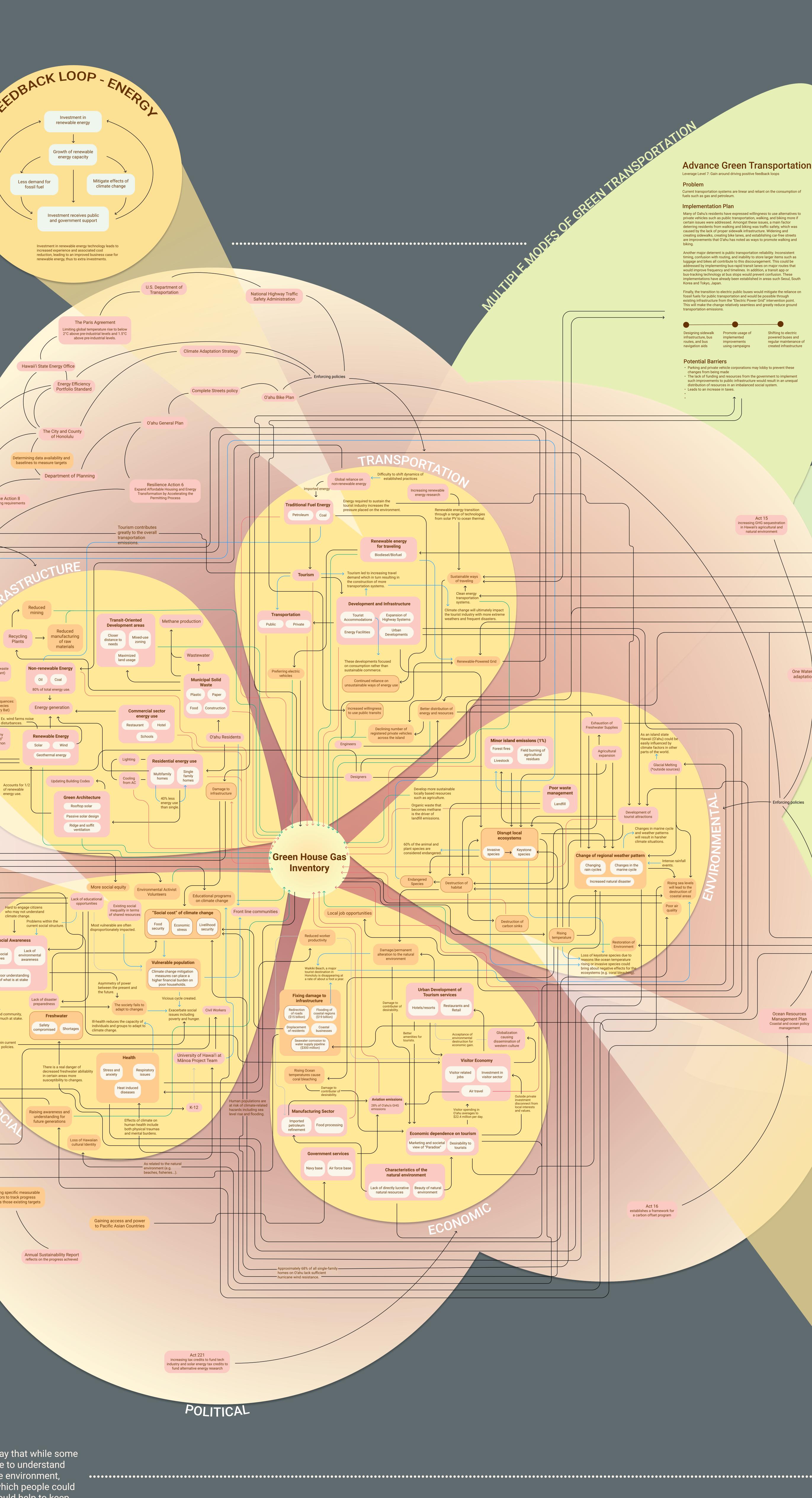
Residential Hurricane

Retrofit Program

State Department

of Health

These interventions are connected in a way that while some might serve the function of helping people to understand how their decisions and actions affect the environment, others demonstrate real, tangible steps which people could take and actually see how their actions could help to keep the environment healthy and sustainable for the future.



These two interventions could be viewed as being different stages on a three-horizon ••••• graph. The addition of electric grids for ••••••• electric cars could bring short term benefits and serve as the transition before green transportation could be fully incorporated.

# ECTRIC POWER GRID

#### **Electric Power Grid** everage Level: Balancing Feedback Loops

Transportation is the largest contributed to overall GHG Gas emissions, w supported by the developed auto and gas services provided for fossil fueled vehicles. Preference in accessibility encourages local residents to purchase fossil fueled vehicles instead of electric vehicles (EVS). mplementation Plan Developing an affordable renewal-powered grid for more EV charging will support the larger scale EV transition in the long term. Current charging station are only available in urban areas, and only the wealthy are able to set up private arging stations. By streamlining the permitting process, the cost of narging equipment will decrease to help gain accessibility for lower incom residents. As for the public charging stations, extending the power grid to rural and suburban areas, such as highway service areas will allow more equitab access to clean energy.

→ Streamlining the Building charging Extending the grid to rural areas such as and public facilities State high ways **Potential Barriers** Pushing EVs while the electric grid runs primarily on fossil fuels will have limited impact on near-term GHG emissions.
Increase in electricity usage in Hawaii heavily depends on the

increase in petroleum.

One Water climate

adaptation policy

management

Increased number of trees in urban areas will encourage individuals to bike and use public transportation more. These trees provide shade and protection from the weather for bikers or people waiting for buses.

### **Tree Planting Programs** Leverage Level: Balancing Feedback Loops Delays Relative to Change Rates

Implementation Plan

across the city that would also help with the mitigation of climate change To achieve this goal, the island's government need to make its residents firm believe in the social, psychological, and economic benefits of forestry and wh hey are worth preserving. Conferences and other green-awareness related t help to bring together leading advocates for urban forests all a d nation which could help to engage the public. Along with ot

esign thinking when planning the landscape, constructing the plan, and execut the goals. Once the initial goal has been reached, designers could also contribute in the long term process of aftercare and maintenance of the trees by drawing up models and plans for the future.

Mapping and assessing Development of structured plans Organizing and encouraging city streets and park trees through the combination of design local volunteers to part take in across O'ahu to determine thinking and scientific analysis these programs by explaing the a plan of action

Potential Barriers perception that trees widely cause or contribute to building damage Inadequate aftercare and maintenance of trees leading to high rates of tree

Investment in tourism due to high demand Rise of urban development in previously vacant land Carbon sinks are an Changes in land use is important part of predicted to cause the balancing carbon island of O'ahu to dioxide levels. These become a net carbon areas absorb more source by 2061 Carbon sink areas carbon than they damaged or destroyed release.

Unsuitability for certain Decreased GHG plant species, causing Absorption shift in foliage Rising temperatures causes changing moisture levels

reduced funding has been reduced due to competing priorities (tree planting not viewed as being important enough)

Research predicts that O'ahu will become more arid due to climate change.

objectives and advantages

ts like landscape engineers, designers could utilize design sl

Disappearance of trees across the island of O'ahu not only contribute to worsened climate situations but also problems associated with soil erosion and land O'ahu's Office of Climate Change, Sustainability, and Resiliency has a plan of planting 100, 000 trees by 2025 but it would take a collective effort to achieve this goal. The vision of this program should be to protect, plant, and manage trees to create a diverse, resilient, and beautiful urban forest on public and private lands