

Hawaii 2060: Visioning Hawaii's Adaptation to Climate Change

A Final Report of the Alternative Futures Exercise at the 2011 Planning Meeting with the Hawai'i Ocean Resources Management Plan Partners



Prepared by Heather Frey, Scott Yim and Rex Troumbley

A project of the Hawaii Office of Planning, Coastal Zone Management Program, pursuant to National Oceanic and Atmospheric Administration (NOAA) Award No. NA09NOS4190120, funded in part by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Ocean Service, NOAA, U.S. Dept. of Commerce. The views expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA or any of its sub-agencies.



Executive Summary

On August 22-23, 2011 a work session was conducted at the Marriot Waikiki Beach Hotel sponsored by the Hawaii State Office of Planning, Hawaii Ocean Resources Management Plan (ORMP) with the goal of creating climate change policies for the State of Hawaii. The work session was facilitated by The Hawaii Research Center for Futures Studies and Donna Ching, PhD. This report summarizes the work session proceedings, participant responses and policy recommendations based upon those responses.

The work session began with an address by Jim Dator. The participants were then divided into groups and placed into one of four futures scenarios of Hawaii in the year 2060. The scenarios were presented numerically, but not by theme as they are below. The scenarios were created according to futures methodologies: environmental scans and interviews with experts in fields related to climate change. In each scenario participants discussed six questions, the responses to which were then used to generate a summary of general trends, drivers and outliers. The four scenarios are:

- **Continued Growth:** heavy focus on the persistence of a growth-oriented, technologically progressive, multinational, corporation-guided, ultra-rich population that controls most of Hawaii's politics and economy.
- **Disciplined:** heavy focus on conservation and resource management. Society guided by a single decision maker using Confucian ideals. Active social control, hybrid manual and fuel-based energy generation, severely limited access to non-locally produced resources.
- **Collapse:** driven by resource and food shortages, coupled with an increase in environmental disasters. Hawaii is more isolated from the mainland, increased emphasis on community-based governance, a return to traditional ways of doing things.
- **Transform:** a fundamental shift in society and technology, purposeful acceleration of climate change, heavy utilization of genetic and cybernetic adaptation strategies. Utilization of the ocean as a new urban environment, both below and above the water.

The questions presented to participants during the work session were designed to address the areas of statewide concern regarding climate change in the State of Hawaii, which are necessary for improving the quality of life for Hawaii's present and future population. Participant responses were compiled and analyzed for points of agreement common to all four scenarios. These points of agreement are presented as policy recommendations, which are the culminating product of this report.

Table of Contents

Disclaimer	i
Executive Summary	ii
List of Participants	4
Opening Remarks by Jim Dator.....	7
Introduction to the Scenarios	16
Continued Growth	17
Discipline	20
Collapse	23
Transform	27
Introduction to the Questions.....	31
Individual Scenario Participant Responses	
Continued Growth	33
Discipline	36
Collapse	40
Transform	44
Evaluation of the Responses	49
Response-Based Policy Recommendations	53
General Trends and Conclusions	54
Appendix	
References to the Scenarios.....	58
Notes from Expert Interviews	66

List of Agencies and Participants

Center for Island Climate Adaptation & Policy

Director: Maxine Burkett

Program Assistant: Zena Grecni

City and County of Honolulu, Department of Planning & Permitting

Deputy Director: Jiro Sumada

Policy Planning Branch Chief: Randy Hara

Commission on Water Resource Management

State Drought Coordinator: Neal Fujii

County of Hawaii, Planning Department

Director: Bobby Jean Leithhead Todd

Long Range Planning Manager: April Surprenant

Planner: Bethany Morrison

County of Kauai, Planning Department

Deputy Director: Dee Crowell

Planner: Dale Cua

County of Maui, Department of Planning

Deputy Director: Michele McLean

Planner: Jim Buika

Department of Agriculture, Aquaculture Development Program

Manager: Todd Low

Department of Health, Environmental Health Administration

Deputy Director: Gary L. Gill

Department of Health, Environmental Planning Office

Public Participation Coordinator: Maile Sakamoto

Department of Health, Health Resources Division

Information Specialist: Judy Kern

Department of Health, Polluted Runoff Control Program

Planner: Brian Hunter

Department of Land & Natural Resources

Deputy Director: William M. Tam

Department of Transportation, Harbors Division
Transportation Planner: Sandra Rossetter

Department of Transportation, Statewide Transportation Planning Office
Project Manager: David Shimogawa

East-West Center
Senior Fellow, Research Program: Melissa Fenucane

Environmental Council
Climate Change Representative: Scott Glenn

Hawaii Chamber of Commerce
President & CEO: Jim Tolleffson

Hawaiian Islands Humpback Whale National Marine Sanctuary
Superintendent: Malia Chow

Honolulu Board of Water Supply
Program Administrator, Water Resources: Barry Usagawa

Island Insurance
Assistant VP, Compliance & Government Affairs: Jim Dixon

Ka'ala Farm
Co-Founder and Program Director: Eric Enos

Kako'o' Oiwi
Executive Director: Kanekoa Shultz

Marine and Coastal Zone Advocacy Council
Chair: Robin Kaye
Vice Chair: Jim Coon

NOAA Office of National Marine Sanctuaries, Pacific Islands Region
Director: Allen Tom

NOAA Office of Ocean & Coastal Resource Management
Pacific and Islands Region Team Lead: Bill O'Beirne
Coastal Management Specialist : Steve Frano

NOAA Pacific Services Center
Physical Scientist: Adam Stein
Coastal Planner: Doug Harper
Acting Director: Kristina Kekuewa

Oahu Metropolitan Planning Organization
Executive Director: Brian Gibson
Planning Program Coordinator: Randolph Sykes

Office of Hawaiian Affairs
Public Policy Advocate: Jeffery Kent

Office of Planning
Director: Jesse K. Souki

Office of Planning, Hawaii Coastal Zone Management (CZM) Program
Hawaii CZM Program Manager: Leo Asuncion
Planning and Policy Advocate: Marnie Meyer
Planner: Melissa Iwamoto

Office of Senator Clarence Nishihara
Senator Clarence Nishihara

Office of Senator Mike Gabbard
Committee Clerk for Senate Committee on Energy and Environment: Carlton Saito

Pacific Climate Information System
Regional Director: John Marra

Pacific Islands Climate Change Cooperative
Coordinator: Deanna Spooner

Public Utilities Commission
Chief Researcher: Josh Strickler

State Civil Defense:
Pre-Disaster Hazard Mitigation Planner: Dawn Johnson

The Nature Conservancy, Hawaii:
Director of External Affairs: Mark Fox

U.S. Army Corps of Engineers, Honolulu District
Project Manager/Environmental Coordinator: Athline Clark
Biologist/Project Manager: Cindy Barger

University of Hawaii, School of Ocean & Earth Science & Technology
Dean: Brian Taylor
Associate Dean for Academic Affairs & Professor: Chip Fletcher

University of Hawaii, Sea Grant College Program
Director: Gordon Grau
Associate Director: Darren Lerner

Waikiki Improvement Association
President: Rick Egged

Youth representative
Intern, Honua Consulting: Jamaica Osorio

Workshop Support:

CH2M HILL
Facilitator/Recorder: Lisa Kettley
Facilitator/Recorder: Paul Luerson

Hawaiian Islands Humpback Whale National Marine Sanctuary
Facilitator/Recorder: Fiona Langenberger
Facilitator/Recorder: Joe Paulin
Facilitator/Recorder: Paul Wong

Leeway Enterprise
Facilitator/Recorder: Miki Lee

Office of Planning
Facilitator/Recorder: Ruby Edwards

Office of Planning, Coastal Zone Management Program
Facilitator/Recorder: Ann Ogata-Deal

University of Hawaii, College of Tropical Agriculture & Human Resources
Lead Facilitator: Donna R.Ching

University of Hawaii, Hawaii Research Center for Futures Studies
Lead Facilitator: James Dator
Facilitator/Recorder: Heather Frey
Facilitator/Recorder: Aubrey Yee
Facilitator/Recorder: SeongWon Park
Facilitator/Recorder: Scott Yim
Facilitator/Recorder: Bumchul Shin
Facilitator/Recorder: John Sweeney
Facilitator/Recorder: Rex Troumbley

Opening Remarks by Jim Dator

The following text is a transcript of the opening statement given by Jim Dator as an introduction to the work session to all participants on 22 August 2011.

The purpose of our two-day workshop is to help create laws, plans, policies, and actions that will turn a novel set of emerging trends and events into positive opportunities for everyone in Hawaii. The trends and events are the knowns and unknowns associated with the terms, "Global Climate Change" (sometimes also called "Global Warming" though that can be misleading) and "Sea Level Rise." Those terms themselves portend a whole series of other changes in the Earth's biosphere and sociospheres and in the resources of nature upon which human and all life on Earth depends.

This is serious business and it will be a challenge for us to do what needs to be done in two short days. However, we have tried to assemble the best minds and spirits in Hawaii to do the job. I hope we have chosen well. A lot of the future of Hawaii is in your hands and minds and actions. Please do the best you can!

At the same time, we hope you will find the activities that we have planned for you to be interesting, useful, and fun in and of themselves; that you will come to think about the futures of Hawaii in general, and not only in relation to climate change, and your role in shaping Hawaii's futures, in different and more powerful ways.

For most of today, we will ask you to "experience" and evaluate several alternative futures for Hawaii by 2060. As you will see, none of the alternatives is like Hawaii of 2011, but much of each future has its seeds in the present and past, and each will grow and not grow in part by actions we take or fail to take at the end of the workshop tomorrow. I will say more about the details of today's activities, and of tomorrow's, at the end of my talk today.

According to the terminology of contemporary geology, the Earth has gone through many lengthy periods of substantial change, dynamic stability, substantial change, dynamic stability..., called, according to their relative lengths, "Eras", "Periods" or "Epochs". Some of you are far more intimately familiar with them than I am. All of you probably have some vague ideas if only from movies and TV shows. They are related to the origin of the universe--"it all began with big

bang"--the origin of the solar system, of Earth and our Moon (or two moons that became the Moon), the eventual origin of life, perhaps more than once, followed by a series of extinctions or near extinctions, and flourishings, and extinctions, and ice ages (maybe even when Earth was a Giant Snowball), until only an eye blink ago when primates and then a special branch of primates eventually self-designated, *homo sapiens*, and then more extravagantly self-named "*homo sapiens, sapiens*"--namely us: The current Crowns of Creation and Rulers of the Universe.

The Epoch during which humans evolved is called the Holocene and is but a tiny sliver at the end of linear depictions of all of Earth's Epochs, Periods, and Eras. Nonetheless, even though humans are extremely recent arrivals in the overall cosmological, geological, and biological evolutionary processes, some scientists are now saying that the Earth and all its inhabitants are moving from the *Holocene* Epoch into the ***Anthropocene*** Epoch.

And that is truly something new under the sun.

Those who say we are entering the "anthropocene epoch" wish to show that humans have now become a major geological force. Though we only recently evolved into sentient beings ourselves, we have in the last forty thousand years or so, and especially in the last 8000 years, and 300 years, and 100 years, influenced every geological and biological process on Earth that once operated "naturally" (that is to say, "without human influence"-- of course humans are part of "nature" and so we are to that extent acting "naturally" whatever we do. It cannot be otherwise).

All living things influence their environment. All evolution is symbiotic--a mutual interrelationship between an organism and its environment. But humans have become something quite unprecedented on this Earth. As someone put it, "there is no place on Earth where the hand of man has not set foot!" We find human influence, more or less significant, everywhere in the biosphere. Moreover, human influence is increasing everywhere, every day.

This is not something new for humans--not something that only industrial humans, or "western man" has done recently. To the contrary, wherever early humans have moved out of Africa and across the globe, the local flora and fauna have all let out the cry: "Here come the

humans! There goes the neighborhood". The evidence is clear that humans have long had a major role in shaping the planet, exterminating species, and modifying existing ones.

The only thing that is different about recent human activity--the last 8,000 and then 200 or so years--is the scope of our abilities to modify "nature"; our biospheric reach across time as well as across space. Humans do things that not only effect life everywhere on the planet now, but also last for thousands of years into the future. It was difficult for us to reach so far into the future and across the planet before the scientific-technological revolution of 200-300 years ago. And now, with our universities and research labs making new scientific discoveries and pouring out new technologies and processes every day, humans are changing the world far faster than ever before.

So we are in a new geological epoch, the Anthropocene.

But there is more to it than that. Humans are changing the world faster than we are understanding it. While what our scientists know about the world is extraordinarily impressive, and while new discoveries are announced every day, there is still much we do not know. Indeed, there may be much we do not even know about. We don't know we don't know because we don't know it. We are discovering our ignorance and errors as fast as we are gaining new understanding, and yet we go on changing the world.

That is the key.

Perhaps it would have been better if we had first understood the processes of nature and then changed them (if we decided they needed changing, or had to be changed in order to achieve some other goal). But we did not do that. And now it is too late to do anything except take responsibility for what we have done and are continuing to do. As Walter Truett Anderson said some time ago, it is like telling a teenager that she should wait and not go through puberty until she is older and wiser and can understand the changes she is going through. No doubt that is true, but it is not very helpful. We absolutely cannot or will not voluntarily stop learning and acting. So we must learn how "to govern evolution" even while we shape it more and more directly.

The issues surrounding climate change also present humans with unique ethical challenges as well. Traditionally, all ethics had been based on some version of The Golden Rule: "Do to others as you want them to do to you." Or "don't do to others what you don't want them to do to you." This principle is also called "reciprocity." For most of human history, humans lived in small, face-to-face societies where people could "do" to you if you did something they did not like. That is not the world we live in today. Now we can do things to people on the other side of the world and not care about it at all since they can't do back to us--until they suddenly do get back at us, as they did on September 11, 2001, and still have our complete attention ten years later as a consequence.

What about future generations? We can do unprecedented things to them but they cannot do anything to us at all. Is that fair? Is that ethical? Do we give a damn since they can't get back at us?

Climate change presents us with what has been called "a perfect moral storm" because what we are doing is so unfair to future generations. We say we cherish "family values." We purport to care for our children and grandchildren and for future generations. Now is the time to show them how much we care, or how little.

Which brings us to our task today and tomorrow. We have to start making policies, or deciding we don't have to make policies, to deal with one of the greatest uncertainties with potentially the greatest consequences that humans have ever faced, presumably because of human interaction with once-"natural" processes.

What we know about this process called "global climate change" is pretty impressive. What we don't know for sure is pretty scary: for some people that is immobilizing; for others it is a reason for temporizing, or denying, what is known.

On top of all this, no one can know the future for sure, although most of us often act as though we do. Most typically, we think about "the future" very narrowly. We focus on ourselves (and/or our company, or church, or community) and what lies ahead for us. Typically, we assume that while we will change, the rest of the world will hold still. Or, more precisely, that

while the world around us may change, it will change in ways so much like the present that we can ignore them and just focus on ourselves and our changes.

Unless we are careful, we might devise policies for adapting to global change that fail because we failed to assess broader social and environmental changes and continuities. Once upon a time, that was a very successful way to face the future. In fact, for most of human experience on this planet, the social and environmental world around us did not change, or else for the most part changed in highly dependable and often cyclical ways, like the seasons. It was folly to worry about anything but ourselves and our immediate futures.

Humans lived in societies where the future was "flat" for tens of thousands of years. We are psychologically, and probably biologically, adapted to such a relatively unchanging world. But that is not the world we live in now.

Beginning with the processes we call "civilization"--with the emergence of writing, agriculture, and life in cities and sedentary communities--until the social and environmental transformations caused by the plague, natural climate change, the Enlightenment, the Reformation, the printing press and ultimately the scientific-technological revolution several hundred years ago, and then more recently with the energy, electronic and political/economic transformations--including the perpetual revolutions caused by scientific/technological/military R&D--of the last 100 years or so, we now live in conditions of perpetual and fundamentally unpredictable social and environmental change.

Some people love it. Others hate it. Most ignore it and accept the present, whatever it is, as given and eternal with little thought or foresight: *que sera, sera*.

Fair enough, you might say. So, what are the "broader social and environment changes and continuities" we need to consider?

To answer that question, I need to say a bit about what futures studies is and what it is not.

Futures studies as an *academic* and as a *consulting* activity is based on the identification and analysis of *images* of the futures; *theories* of social stability and change; *methods* of social forecasting and design; the monitoring of continuing *trends* (often termed "driving forces") and

the identification of *emerging issues* which might alter those trends or create new ones. Futures studies is related to but different from planning and policy-making, just as planning and policy-making are related to but different from day-to-day administration. Just as day-to-day administration should be guided by prior planning and policies, so also should planning and policies be guided by prior futures foresight activities. Policy-making and planning without prior futures foresight is at best worthless and most likely harmful.

Some of the fundamental principles of futures studies are these:

Futurists cannot *predict* THE future. No one can. A prediction is intended to be a true state, an accurate statement, about the futures. Once we lived in communities where prediction was possible. Not now.

Futurists can and do *forecast* alternative futures. A forecast is intended to be a logical statement, a useful statement, about the futures. Futures thus are plural, alternative, diverse, possible. In a (French) word, "futuribles". Thus we speak of possible "alternative futures" and not "THE future" as though it were a pre-existing entity "out there" waiting to be predicted.

Most importantly, futures studies helps you *invent* preferred futures. Envisioned and invented futures are not "utopias"--they are not impossibly perfect places. Preferred futures are "eutopias"--the best possible real world you can imagine given the challenges and opportunities coming towards us, like giant tsunami, from the futures.

Finally, to be effective, the process of forecasting alternative futures and envisioning and moving towards preferred futures must be done continuously. To be effective, this futuring process needs to be incorporated in all organizations somehow. It needs to be some unit's duty to always look ahead and not be responsible for planning or daily activities.

Any statement about the futures must be based on some theory of social stability and change. There are many such theories available, and futurists must constantly be striving to test and improve the theory that guides their work. We recognize that society is shaped by biology (including human biology), the environment (both "natural" and "built"), by culture (and especially language), by technology, and by human will and actions.

We live in a world where new technologies are invented, developed, produced and diffused daily. Thus we focus on technology as the major agent of social change in our world. The diffusion of current technologies to places where they have not been used before, and the creation and diffusion of new technologies everywhere changes behavior, which changes beliefs, which changes societies as cohorts for whom these technologies are "natural" replace those cohorts whose behavior and beliefs were shaped by older technologies.

This theory is best captured in the statement by the Canadian philosopher of media, Marshall McLuhan: "We shape our tools and thereafter our tools shape us."

Though technology may be the "prime mover", it then influences other social and environmental factors that become drivers of social stability and change in and of themselves. For example, population, energy, the economy, the environment, culture, and governance. Each of these are shaped by technology, but are also shapers of other behavior and values, thus contributing to social stability and change.

Over the years, we have learned that all of the billions of images of the future that exist in the minds and actions of humans can be lumped into four "generic" images of the futures that serve as motivations for human individual and group behavior. The four generic images of the futures are Continued Growth, Collapse, Discipline, and Transformation. Whenever we are asked, "so what is the future," we reply, "there are four alternative futures."

Grow is the official view of the future everywhere. Since the 19th century, every institution in every nation has been increasingly oriented towards growth, development, progress via technologically inspired economic growth. Every course in every school at every level everywhere is oriented towards making and keeping the economy growing "forward"; or recovering growth if it is stagnant.

But more and more people now are worried about social *collapse*. The reasons are manifold and changing from day to day--economic collapse, environmental collapse, moral collapse; attack by terrorists or asteroids.... Recently, however, especially in the U.S. and Europe, the fear of economic and environmental collapse is rivaling *Grow* as a dominant image of the futures, as more and more subsystems seem to be collapsing or in danger of it.

So, we must prevent collapse, and turn from unsustainable growth, more and more people are saying, and *discipline* ourselves around some set of values, from God, nature, our culture, ourselves. We cannot continue to grow and we do not want to collapse. We must discipline ourselves to survive and thrive, they say.

No, some futurists, such as Ray Kurzweil retort. Because of the accelerating rate of technological change, we are heading towards the Singularity--a point of unity of many processes thought independent of one another. That will transform Earth and humans into a profoundly new and more powerful mode of living guided by artificial intelligences, transhumans, and life in space.

All ideas about the future are specific examples of one of these four images, we believe.

With that as a background, I now need to explain what we are asking you to do for the rest of the morning and part of the afternoon.

The graduate students and staff of the Hawaii Research Center for Futures Studies have devised four alternative futures for Hawaii. They are possible specific examples (among many other possible examples) of the generic four alternative futures I just outlined to you. These are not intended to be preferred futures. Nor are they "best case scenarios" or "worst case scenarios". Each has its "good parts" and its "bad parts"

We will ask you to do your best to succeed in each future just as you do your best to succeed in the present. No future is more or less likely than any other. Each is a specific example of how the four generic futures that always lie ahead might work out for Hawaii.

Moreover, we did not "make up" these specific futures in the sense of simply using our imagination. Each is as "empirically based" as any image of the futures can be. Each is based on plausible statements by people who, in a democratic society such as ours, have ideas and express them forcefully so as to influence actions now and hence influence the future. There surely will be parts of each future you will agree with or find likely, and parts you will disagree with or find implausible. Just as you do in the present.

It is not our intention to convince you any of them is true or false. The criteria for evaluating alternative futures are not their truth or falsity, since no one can predict the future accurately. They are intended to be useful: to get you thinking about the futures in ways that might be broader, deeper, or at least different and useful, than you may be thinking of them now.

You will spend the rest of this morning and part of the afternoon in two of the four futures we have prepared for you. You will be placed into a room with "artifacts" from the relevant future, along with a "guide from the future". You will read a brief narrative about your future, and then your guide will ask you to answer some questions about it. The questions are designed to get you thinking how you and Hawaii might respond positively and successfully to climate change if the future were to be as embodied in the future you are in. After you have done that, you will then be placed into a totally different future, and asked to respond positively to it as well.

Then, after your current ideas about "the future" have been properly tested, Donna Ching will take you through a visioning exercise so that we can then begin to develop a policy that will enable Hawaii to adapt to climate change now, guided by a vision of a broader preferred future.

I will end by reminding you of Dator's Second Law of the Futures. The Law is based on the premise that we are living in a world of very rapid, technologically induced social and environmental change. In such a world, the past is not a very good guide to futures that are full of many novelties caused by new technologies and the new behaviors and values they produce.

Dator's Second Law of the Futures says, "Any useful idea about the futures should appear to be ridiculous." Remember that law as you experience the futures, and engage in the envisioning process. This is as "true" a law as is possible in the social sciences. IF most of the future is novel, THEN many things you may hear about it will be new to you, and strike you as ridiculous.

Useful "ridiculous statements" must be based on "emerging issues" which actually exist, though most people are unaware of them. It is the duty of a futurist to point out the emerging issue that is the basis of the startling statement, and present a plausible scenario for its emergence and development.

Thus, not all ridiculous statements are useful. Many, being unfounded in evidence, are simply ridiculous. But if you rush to judgment and dismiss new ideas as ridiculous, you almost certainly will miss what is important for you to know about the futures. Your every day commonsense world--the things you take most for granted--is full of things that, when they were first conceived and invented, were declared to be ridiculous by solemn, serious, and respectable folks, like you.

Try to avoid falling into the trap of "crackpot realism"--believing that what is "now" has forever been and will forever be as it is now. The main point of our activities today is to enable you to think more usefully about helping Hawaii adapt to climate change on the basis of challenges and opportunities from the futures, and not on the basis of the past or present as you might otherwise be tempted to do otherwise.

Now, let's get ridiculous and start making sense.

Introduction to the Scenarios

The scenarios used during the work session were generated using the **Four Futures** method developed by Jim Dator on the basis of a continuing analysis of images of the future in a wide variety of sources. Details of the method can be found in *Journal of Futures Studies*, November 2009, 14(2): 1 - 18. The Four Futures method organizes scenarios into the four most commonly held generic types of images of the futures. They are:

- Continued Growth
- Discipline
- Collapse
- Transform

Each of the four futures uses a different theoretical, methodological and informational base. The four generic types are then made specific as appropriate. Our information for the futures used in this workshop was gathered over the course of summer, 2011, through interview sessions with public and private sector experts supplemented with information gathered through environmental scanning by HRCFS staff. A summary of expert interview participants can be found in the *List of Participants* section of this document, while links to other resources are organized by scenario in the *Appendix*.

The essential premise of each of the four images of the future is:

Continued Growth:

The purpose of government, education, and all aspects of life in the present and recent past and future is to build and maintain a vibrant economy, by developing the people, institutions and technologies to keep the economy growing and changing, forever.

Discipline:

Some people feel that precious places, processes and values are threatened or destroyed by continuous economic growth. They wish to preserve or restore these places, processes or values that they feel are far more essential to humans than is the acquisition of endlessly new things and/or the kind of labor and use of time that is required to produce and acquire them. They believe that continued economic growth is unsustainable, asserting that the economy and society must instead be focused on certain values and institutions that can ensure survival and a fair distribution of society's resources, goods, and services.

Collapse:

Collapse may be caused in one or a combination of ways – economic, environmental, resource, moral, ideological, catastrophic disasters, etc. It is based on the widely held fear that our globalized world is fragile, over-extended, and heavily interconnected. Collapse, in the sense that the word is used here is not meant to imply total destruction or extinction of humanity, but rather an event or set of events resulting in a lower stage of development than the world at present.

Transform:

This scenario focuses on the transformative power of technology – especially electronics, robotics, artificial intelligence, genetic engineering, nanotechnology, new materials, and space research. Its central feature is the emergence of a “dream society” as the successor to the “information society.” It anticipates and welcomes the transformation of all life, including humanity from its present form into a new “posthuman” form on an entirely artificial Earth, and throughout the solar system.

Continued Growth

ahOlaCORP

CONFIDENTIAL DOC - LEVEL 7

Pacific Region

Shareholders Update

02060/08/22

Life on Oahu's gold coast has never been better, even, and perhaps especially, in the wake of climate change. As expected, sea level rise and coastal erosion have been minor obstacles, and our perspective has always been that the many trials and tribulations brought about by climate change are opportunities for continued growth and market capitalization. In fact, we have recently started to license home reclamation insurance for those who lost everything in the deluge following Hurricane Keanu in 2057, and for those who continue to reside in low-lying areas, we have lowered coverages on our non-Act of God disaster policies, although steep premiums obviously keep our liability to a minimum. As deconstruction continues on the Greater Honolulu Sea Wall, we feel confident that we can increase profits across numerous sectors while financially mitigating the ongoing 1 foot rise in sea level, and as projections signal greater encroachment, perhaps up to and beyond a 1-meter rise, by the end of this century, we remain confident that cost-effective and profitable solutions, including our patented Fl-hOme-tilla technology, which is currently being marketed on Kauai, will be brought to the market.

With the standoff in the South China Sea escalating, our support of U.S. and Allied Asian military operations portends a significant increase in our warfare robotics division, whose h2-drOnes have been an integral part of fending off "drills" by North Chinese warships and piracy in the region and closer to our island home. We're also excited to announce a partnership with the Pacific Intelligence Command to install a new AI Intelligence Analytics Network (IAN) specializing in security forecasting and games-based defense strategy, and we are hopeful that our alliance with the military will bring the ongoing cyber attacks from religious extremists against our technology infrastructure to a swift end.

Now that we have purchased the controlling interest in the University of Hawaii system, we are working to tailor the institution's pedagogy and curriculum to suit the military's growing needs, which drives the local economy. We're planning on announcing this partnership with a new "billboard" next to the Chinatown corridor exit off the H1 a few weeks before registration opens. As the only locally owned accredited institution of higher learning on island, we have a veritable monopoly on local talent, as many families cannot afford the taxes and the service requirements for education on the mainland. We know that the families who live on island want to work and play here, and we feel extremely satisfied with the educational opportunities we can provide to the top 0.05% of the state's growing population, who according to our most recent data claim upwards of 90% of the island's wealth. We have not, however, forgotten about the other 1.8 million island residents, and our virtual vocational training platforms have seen record enrollment! Our inclusive housing plans have skyrocketed as real estate prices on the islands continue to rise, but we want to give back to the community, so we've doubled our efforts on the Upper Makakilo Domicile-Deficient Relocation Initiative (UMDDRI), which should house upwards of 30,000 residents in need.

As our island climate begins to dry and with the last of Oahu's original agricultural land now under development, we can finally implement our grand strategy for the island's food system: GM-hOme. We are confident that localized and small-scale production of GMO produce, which ensures that island customers can only grow our seeds, will provide an affordable and sustainable alternative for lower-income families (99.5% of the population) who cannot bear the burden of the trans-Pacific tariff on produce, which has now reached 67%. As negotiations with Googleplex Industries, who owns exclusive rights to the trans-Pacific Oceanic Waterway, recently came to a close, we are confident that this initiative will bring them back to the bargaining table. We had also previously agreed to re-negotiate the barrel tax rates to the inter-island refinery on Molokai and from the Pacific drilling and mining rig off the Northwest Hawaiian Islands, but the tariff setback has stalled all negotiations. We are committed to building an energy-independent Pacific, and as drilling in ANWR comes to a close, we are confident that the U.S. will look to our islands to bring what is left of the world's crude oil to the market safely and sustainably.

As concerns over freshwater access have driven millions from their homes across Africa and parts of the Americas, we are working with the military and the state to subsidize a large-scale reverse osmosis desalination plant for Oahu's leeward coast to ensure and stabilize Hawaii's strategic significance within the region. Our long-range plan includes reclaiming the site of the former Aulani resort, which was unable to survive the moderate tsunamis that struck during the mid-2040s, and we are looking solely to locals for a workforce to salvage and ultimately rebuild the site. As we continue to negotiate the purchase of the island's remaining usable beaches, we are excited about the opportunity to reinvigorate island tourism, and we are glad to have the assistance of the military and state agencies in clearing away the illegal tenements along Waianae and Waimanalo in order to begin construction on our 150-story beachfront timeshare and flex-residence properties in the coming months. We see these properties as key in providing opportunities for investment, both locally and internationally, in the islands. In thanks for your continued patronage and attendance at today's presentation, we are giving everyone the chance to be the first to experience our "Dive the Maldives" tours at a significant discount!

Discipline Scenario

Mastering the Art of Survival

Followers under Master T, welcome to the annual meeting 2060 at the T schoolhouse. As you know, since Master T was appointed as one of the Master Citizens in 2050 by the Hawaiian government, the Master has taught us how to achieve ethical and aesthetic excellence in one's everyday life. I am Seongwon, a facilitator of the meeting today – August 22, 2060 – so, I am going to report to Master T what we discuss after our meeting is over.

Followers, we are here to discuss how to make our community better. Yesterday, I asked Master T, “What single thing would improve the quality of our life?” The Master replied, “Tighten your belts and save, and produce more than you consume.” Even though we believe that we moved from a Consumer Society, where one's very livelihood depended on increasing consumption, Master T doesn't seem to be sure that we went “cold turkey” from the Consumer Society.

Let me remind you of the years of hardship that we went through because some of us still remain in the Consumer Society. The collapse of the global neo-liberal economic system, cheap energy depletion, and the ecological crises of the first half of the 21st century led to mass starvation and huge migrations around the world. Hawaii was not spared from this fate. These challenges were felt even more across the islands, especially as tourism, and the input of food and energy, was reduced to a mere trickle. And then, for a while, severe flooding inundated Oahu. In a single night, there were torrential downpours that dropped over 20 inches in just an hour's time. It was a complete nightmare! Lots of people died, and survivors suffered from a lack of water, food, medicine, and electricity. Because of these unexpected events being duplicated around the globe, the world population went down a third to five billion: the Hawaii population was down a half to 600,000. As you well know, all beachfront property became fully submerged due to sea level rise. These tragedies were mainly because of human-induced climate change.

The problems facing humanity were very serious, complex, and transnational. No one country could solve them. Thus, a new political governance entity emerged in 2049, called the G-20. This new United-Nations-esque organization was transformed from the former G-8

summits in order to solve transnational energy, environment, and food challenges. The G-20 tightly regulated financial systems, which resulted in raising interest rates and taxes. The government of Hawaii is now able through price incentives, rationing, and other methods, to strongly influence its people's economic behavior. All citizens were issued a *Resource Access Card* while corporations doing business in the islands have added ecological debt to their balance sheets. The more a corporation pushes the environment beyond its ability to renew itself, the greater the corporation gets into ecological debt. This provides a clear and tangible incentive for resource conservation. Few people complain about our strong governmental leadership, recognizing that individual and social survival and thriving depends on it.

We call these efforts the strategies of a Conserver Society. These strategies are sensitive to the limits of growth and are designed to change people's behavior whether or not they change their values. While the strategies certainly are desirable to thrifty people who conserve resources, these overarching strategies assume that people want to have a growing economy but in different ways than they previously practiced. By being more efficient and less wasteful, modest growth could be maintained with less energy and other resources, thus doing more with less.

For example, we use antimatter-powered public buses instead of private cars. We still use airplanes but only for business. We drink water that has been run through gray-water filtration, which is called silver nanowire filtration. We turn all food waste into energy. As is not uncommon elsewhere in Asia, most people in Hawaii eat insects. They are very nutritious and easy to raise without harming the environment. We have a large family that understands the need to share anything, linking together to create their home.

How did academia respond to the Conserver Society? In order to find an optimal solution to the energy and food crises, the G-20 created a network of transnational research universities, called "Global Green Universities." The University of Hawaii at Manoa (UHM) became one of the G-20 universities, as UHM has strong research abilities in the fields of Ocean, Land, and Space. UHM hired the best global scientists, engineers, designers, and economists, and students are granted internships where they can work on various projects to make our islands strong. In order to keep things working smoothly, alcohol consumption is strictly limited for students, and the drinking of organic green tea encouraged.

In this morning's session with other mentors, Master T imparted some timely wisdom, "Renew yourself completely each day, do it again, forever again." He has a truly disciplined mind, and we are very fortunate to have him as our guide on the pathway towards conserving life on our precious islands. We do not break down what we have, nor transform what we have; rather, we continuously renew what we have in order to live in harmony with all that exists.

Followers, these efforts that we made are good, but not enough for sustainable growth. Let's put forth every ounce of our energies in order to internalize values of the Conserver Society where life thoughtfully continues moving forward. Who can be the first to speak for a better community? Master T will be pleased to hear from you.

Collapse

ONE Hawaii: Collective Life in the New Beginning

Addressed to the group:

I'd like to extend a great and warm welcome to everyone. We are so grateful for those who have traveled both near and far, leaving behind family and your responsibilities to attend this gathering. We know how hard the journey is for some and want to especially acknowledge our neighbor island brothers and sisters who spent much time and effort to come here to Oahu and share their wisdom.

It has been a long road that we have traveled together and that brings us here today. Every five years since 2045 we gather, this year in the rich mountain farmlands of Mokuleia, to share, learn, plan and grow as a larger community, harvesting the wisdom of our brothers and sisters from around the islands. As is our custom, we begin with remembering, as we know the lessons of the past can be our important ally in collective visioning of a greater future.

Please join hands for our opening chant:

Unity in our diversity

Collective in our communities

Respect for the natural systems and inherent wisdom of all life

The Great Shift began in the early 21st century when easy prosperity still blessed our island chain. Food and medicine were plentiful, exchange with the outside world was a daily experience and most members of our island society lived in relative peace and harmony. Although there had been many harbingers before, this all began to change in late 2019. A worldwide economic depression had begun some years earlier brought on by collective greed and living beyond our ecological means. While war, suffering, poverty and environmental degradation had become rampant in some areas of the world, Hawaii still enjoyed a relatively good economy and natural environment. But homelessness was on the rise and the effects of climate change were already beginning to emerge with our beaches eroding and weather patterns changing.

Hurricane Ho'olilo devastated Oahu in 2015, claiming many lives and effectively bringing the economy of Honolulu to a standstill. We realized that while we had created many emergency plans, we had not created any long-term recovery plan for our islands and the people suffered greatly as a result. At that time, we imported over 80% of our food from outside of our islands and kept no more than a week's supply on hand at any moment. We had always thought aid would be immediate from the outside, but the logistics of transporting sufficient food and medical aid to the islands' over 1 1/2 million residents proved to be extremely difficult in reality. We were caught unprepared. Almost immediately, the people suffered starvation, looting and crime. While a sense of normalcy eventually returned, the damage to our city and infrastructure was great, and the memories of violence and chaos were too much for many residents. Some with shallow roots in Hawaii decided to leave the islands, and our economy, which was almost completely dependent on tourism, languished.

At the same time, in spite of the global recession, severe oil price shocks began in 2018 with the price of oil reaching over \$200 a barrel. The world leaders finally realized that the realities of peak oil had arrived. We had not prepared enough renewable energy resources and technologies to meet the needs of Hawaii's residents. Imports of goods, food and energy quickly became expensive beyond the reach of the average citizen and the economic downturn worldwide deepened to an unending depression. It was not long before many more of those with the means to do so and without deep family roots moved away. From a population of 1.6 million, our islands soon only held some 400,000 residents. We hear of the times when the U.S. Military held large plots of land on the islands, but this all changed when the global disasters struck. After the last military base vacated in 2028, we were left with only a small local coast guard to maintain any semblance of order. It was not enough to keep island-wide peace for long.

When the mega-tsunami hit in 2032, triggered by a huge earthquake in the Aleutian island chain north of Hawaii, residents were unprepared. The warning system was down due to energy shortages and many, many lives were lost. This final disaster sent our islands into a tailspin of food shortages, starvation, rampant crime and suffering. Sea level rise exceeded many of the experts' predictions and we are now living with an ocean that is over 3 feet higher than it was in the 21st century, and we see signs that it is still rising. I know some of you have come

today to tell stories of the sea level rise and its effect on your community. We are anxious to learn how you are dealing with this challenge. Our storms today are much stronger, flooding has become common and our communities have learned to operate in an almost constant struggle for survival.

Some of our elders who are still alive today remember well these dark times and we have learned much from them. As the remaining residents of our islands began to emerge from the shock of such drastic changes, they collectively realized that to survive as a society we would need to work together. To end the violence and chaos that had descended on our islands and to begin rebuilding a new way of life we would need to become One Hawaii. The Pono Peace talks began in 2042 leading to the OHCL Council - One Hawaii Community Leadership - we know today. The U.S. Government had always cared about us, but there was only so much they could do from so far away. Now, like every other country, we hear news that the U.S. itself is in disarray, devolving into many local, self-governing communities, concerned with their own survival. We invited our representatives from Washington to attend this council but they did not respond once again, so we can only assume that the journey was too arduous to make. We long ago learned that it is up to us to create the world we want to live in.

This week we will look at some of the programs going on around the islands. Our members from Kauai are here to talk about the impacts of the local food security initiatives they have started--the *One House, Many Families* sustainability initiative which I hear is enjoying great success in combating regional food shortages.

Here in Mokuleia we have been very successful with our daily, weekly and monthly share-market initiatives. Every family in the region brings their expertise to the markets to teach new skills, trade food and goods, and share ideas and knowledge. We think it is a great model, but you may have something similar already happening where you live. If so, we want to hear about it. I know that all of you have come to tell of the unique ways that your community is meeting its own challenges. We are excited to hear of your successes as well as your stumbling blocks.

We will also address some recent health concerns, particularly the outbreak of mosquito-borne diseases like malaria and dengue that I hear have plagued all our islands and the increase of leptospirosis in the fresh water streams near our communities. This source of water is a vital addition to the rainwater harvests and it is imperative that we find a solution to the waterborne illness that has become more prevalent. Our measurements show that the rains have been continuing their historic decrease each year and this poses a big challenge for our future. We'd like to hear from others what they have seen of rains on the other islands. There are some here in the Mokuleia Mountains who believe they have devised a system for tapping the underwater aquifers again. We will be sharing that knowledge with you this week.

Ours is a Hawaii where all members of a community work together to grow the food they need, harvest water, create energy, educate each other and engage in artistic endeavors that feed our minds and souls. Today, in this sacred place, in the abundant mountains of Mokuleia, we gather to share, to learn and to develop new ideas for the futures. We know that the air, water and land are our blessings to be treasured and protected, and that we will only survive as One Hawaii. I welcome each and every one of you and hope to learn about your community's unique challenges and successes so that we may face the futures, ready and prepared for whatever changes will come our way.

Transform

Setting: “Blue Hawai’i” 2060 Stakeholder’s meeting

The 2060 Blue Hawai’i Stakeholder meeting in kell now begins. Here are landers from Hawai’i dirt and also mainlanders here by projection. Here also are the Gene Masters, speakers of the language of God, GeoEngineers, readers of dirt and sea, with other scientists from other sacred kell. I will speak common sound so that all may understand and begin by recalling how Hawai’i has come to be as it is known today. As all know, life in Hawai’i has been much different since the U.N. Forum on Climate Change, prompted by the realization that humans have influence on parts of Earth’s ecosystem (the Anthropocene Movement), reached a general consensus that humans should take a more active role in shaping the evolution and embrace humankind’s role as a major geologic force. For decades, our grandsires worked to reverse or slow the effects of climate change, but by the time of the Forum, opinion had shifted from a “back to nature” mentality to one of “intelligent evolution”. Rather than viewing the Earth as a series of landmasses isolated by water, our grandsires of the First Anthropocene advocated a reorientation that insisted that bodies of water were isolated by landmasses. As the melting of the polar ice caps provided Russia with convenient lanes of water transport and access to resources, so too did Hawaiians begin to think of a Hawaiian (“HIquatic”) Continent rather than our home as the isolated Hawaiian Islands.

As Hawaii’s poor or recently dirt-less residents began living on ships speckled around each island, our grandsires began to build more permanent and artificial islands of dirt. As these “floating favelas” gradually became occupied by more of those who worked and lived in water, the separation between floating Honolulu (for example) is indistinguishable from Old Honolulu, except that many more chose to live in water than on dirt. After the technological Singularity of the 2040s, in which human intelligence merged with non-biological intelligence to revolutionize genetics, robotics and nanotechnologies, many humans chose to abandon biologic systems for technologic forms. We in Hawai’i have largely chosen to remain biologic, though some here have incorporated machines into their living flesh. Mainlanders and other Children of the Singularity now come to Hawai’i as genetic tourists, seeking escape from the cold and metal cities on dirt.

Hawaii's long history of ocean farming, dating back to pre-contact periods of overpopulation, helped our grandsires avoid some of the food shortages experienced by dirtied humankind. As a leader of ocean farming in the Anthropocene Era, early advances in genetic manipulation allowed for a wide variety of hardy, climate-adaptive plants and animals to be engineered for human consumption. A decreasing preference for anything "natural" or "unintelligently evolved", combined with increasingly scarce access to potable water encouraged development of pharmaceutical and organ replacement technologies which encourage water-retention and purification within the human body. Better kidneys and the ingestion of dialysis nanites now allow us to live with less water than our water-fat grandsires could have endured. Later, as more Hawaiians began to work and live underwater, modifications to the human genes allowed for minimal consumption of oxygen. Some of our youngest children are now able to breathe underwater and also drink the water of the oceans, thanks to the Gene Masters. As the estrogenic chemicals of our grandsires continued to dilute in our waters, the males' inability to produce sperm has made sexual reproduction difficult. Only ten years ago did the first human children asexually bud from their parents' bodies and the gender of male became vestigial to the human species. For those here in kell who wish to be considered biologic males, I remind you to drink your testeroil interval.

As fossil fuel energy production became more expensive and difficult to import, as well as the susceptibility of electronics to water, we of the HIquatic Continent have developed bioelectrical energy generation and storage. The warmth of the Earth, the light of the Sun, and the pull of the Moon provide all that our bodies and cities need. Hawaii's educational systems have become intensely focused on aquaculture and the invention of biotechnologies through an understanding of the Language of God and the climate engineering of GeoEngineers. Libraries, once filled with books preserving knowledge, have also become storehouses for genetic samples.

We have seen an increase in political conflict between the dirtied Hawaiians and those living in the ocean. Definitions of "human" vary between mainlanders, augmented with their artificial intelligences and electronic prosthetics, and the Hawaiian preference for genetic manipulation and biologics has caused some strife. The planned sinking of the Hilina Slump on the dirt of the Big Island, so that we might prevent a mega-tsunami should it fall uncontrolled

into the ocean, has not been met unopposed. Many of you here today undoubtedly remember moving from dirt communities to your ocean homes. Some few of you may only rarely find yourselves on Hawaiian dirt now that so much of our production and work lives are now surrounded by water. The climate engineering projects of the GeoEngineers are continuing, but as the first generation of totally Blue Hawaiian children (who are likely never to set foot on dirt) are being born, some with gills and some without, we have asked you to this stakeholder meeting in order to consider whether our climate engineering projects will continue to meet Hawaii's needs. You are here representing the different communities of the Hawaiian Continent and many of you are experts in aquaculture, GeoEngineering, the Language of God, education, policy and health. Bring those expertises to bear in today's meeting of kell and remember that you speak for many who cannot be here.

Transform Historical Timeline

2060 – First generation of children born in/on water which will likely never set foot on dirt that has not been artificially constructed, if they do so at all; first children born with the ability to drink sea water and breathe underwater; estrogen in the water has nearly eliminated the male gender; GeoEngineers prepare to sink the Hilina Slump on the Big Island in order to prevent a mega-tsunami.

2050 – Lack of potable water and clean air inspire the use of drugs, artificial organs, genetic modification and selective breeding with the goal of creating plants and animals which require less H₂O and O₂; dialysis medications developed to augment kidney function during the processing of urine during dehydration; first “bud babies” are born from an asexual reproduction process.

2040 – Genetically modified organisms and aquaculture transform the Hawaiian Islands into the “HIquatic Continent”, a central hub of production and commerce; more Hawaiians live on floating cities above and below the ocean surface; rising estrogen in water makes reproduction difficult for males; Singularity occurs, Hawaii's floating cities become refuge for those resisting the merge of human and machine intelligence and form.

2030 – U.N. Forum on Climate Change, inspired by the Anthropocene Movement, declares that it is impossible to reverse climate change and that active shaping of climate change should define environmental policy. The advice of genetic engineers is sought by policy makers who dub them “Gene Masters”.

2020 – First floating cities appear around and in between the islands, mainly occupied by those displaced by sea- level rise and the poor; the extinction of Hawaiian species prompts the University of Hawai’i to create Genetic Libraries to house samples of all species.

2011 – Recognition of climate change as a serious force prompts Hawai’i to initiate strategic planning and policy for the futures of Hawai’i.

Introduction to the Questions

The conference participants were provided with two sets of questions prior to the start of each visioning session. Facilitators then used the first set as prompts for discussion during the scenario sessions, while the second set was designed as a questionnaire to be filled out at the end of each session.

The first set of questions was designed to help prompt discussion as to what overall priorities of statewide concern regarding climate change in the State of Hawaii are needed in order to improve the quality of life for Hawaii's present and future populations. They serve as a way to explore the challenges and opportunities presented by each scenario, which in turn helps to identify themes and elements that are preferable and not preferable, which elements, if any, are common to all four scenarios, and which are relevant only under particular circumstances.

The Questions

The questions presented to the participants were:

- 1) Compared to the beginning of the 21st century, what are the major *advantages* we have for addressing climate change in this future?
- 2) Compared to the beginning of the 21st century, what are the major *challenges* we have for addressing climate change in this future?
- 3) Who will be the major actors creating and carrying out these policies in this future? (e.g., nations, corporations, scientific and educational institutions, individuals, religious groups, terrorists, etc.)
- 4) In this future, how does climate change affect the nature of relationships among stakeholders?
- 5) Who in this future society would reap the most benefits and who would face the most challenges?

The second set of questions deals with the personal views of participants by asking them to rate each scenario they encountered in terms of likely or unlikely, and preferable or not preferable while also allowing participants to problematize current social practices and policies. Space was also provided at the end of the questionnaire for participants to leave anonymous comments, concerns or personal thoughts. This questionnaire was collected at the end of each session. A sample of the questionnaire is presented here:

- 1) How certain are we that the future described in your scenario will occur—is it more

likely or less likely?

a. If this future is likely, what could we have done in the early 21st century to prepare for this future?

b. If this future is not likely in your opinion, what makes this scenario less likely?

2) How preferable is the future described in your scenario? That is, how close is it to your own preferred future?

Individual Scenario Participant Responses

Continued Growth

Compared to the beginning of the 21st century, what are the major advantages we have for addressing climate change in this future?

Trying to embrace, not change, Climate Change

Some places benefit from Climate Change and can capitalize on it

Hawaii is elevated a higher level compared to the Maldives, Tuvalu, and other islands

Hawaii is isolated, we can ignore what others are doing

Use the military to protect Hawaiian territory

Corporate support allowed us to use technology

The ocean is privatized, which allows us to conduct profitable activities

We have controlled and advanced fish stocks

We can keep disease rates higher, which impacts our pharmaceutical sector

Became home to all the world's declining species, because we own all biospheres in Hawaii

Compared to the beginning of the 21st century, what are the major challenges we have for addressing climate change in this future?

Isolation can be both bad and good

Need to control 90% of the population

Uncontrolled border patrol

Still use of 19th century, centralized, infrastructure

Difficulty obtaining water, energy, and sewage

Continual need to continue making profit

Need to engage 90-95% of population

Hawaii low on the totem pole if there is an ecosystem collapse

Large prison population in state

Social disruption with a worrisome crime rate keeps people away
Mobility difficult between areas
Additional opportunities to capitalize on energy options
Integration of all players and pieces
Profit to be made in additional land development within conservation areas

Who will be the major actors creating and carrying out these policies in this future? (e.g., nations, corporations, scientific and educational institutions, individuals, religious groups, terrorists, etc.)

Corporations have taken the lead and have concentrated political power in their hands
Uncontrollable segments of the population
Local, regional groups or initiatives
Terrorist segments and the potential for them to grow if not controlled
Continued exploitation of sexes
Youth get into school systems in order to “infiltrate” and disrupt other sectors
Relationship among stakeholders continue to change

How does this change the nature of relationships among stakeholders in this future?

Need to ensure diversity (genetically if necessary)
Intense competition among all stakeholders
Increased relationship between the military and the general public
The environment is important based on the monetary value
Corporations increase and decrease their importance based on how each issue helps or hurts their bottom line
Increased partnerships among universities, educators and the State
Whoever owns the technology controls the relationship

Those who can vote, those who have money, and those who have weapons create the dimensions of the relationships with those who do not

News media does a good job of manipulating the public, using the messages of the elite

With decentralized communication everybody counts as an outside stakeholder

Corporations because of requirements to act responsibly and ethically; accountability is tracked via corporate charters

Who in this future society would reap the most benefits and who would face the most challenges?

No need for the other 90-95% of Hawaii's population

90-95% of the population (the poor) add to problems and we own everything

No incentives if there will be no profit

Those with the highest level of education benefit

The creators and maintainers of technology benefit

The biggest beneficiaries are those with money

Discipline

Compared to the beginning of the 21st century, what are the major advantages we have addressing climate change in this future.

Due to the strict life cycle regulations there is a much smaller population which could be an advantage when distributing resources and establishing a state of control

This scenario looks closely at conserving resources which gives a better understanding of future supply and demand

Being that this is a disciplined society, it is easier to enforce the rule of law

Less green house gases are emitted, due to tighter regulations, can influence global climate change

Smaller carbon footprint

People are more receptive to government agency

Equal health distribution can be seen as better overall healthcare

No longer a consumer-based society

Sustainable level of living for 600,000 people

Taro, fishponds and algae are everyday resources for use in the general society

More spiritually aware society

Renewable energy pump/hydro

Less concentrated urban infrastructure

Coastlines have less development due to submerged areas

More focus on the group then the individual

Strong, united governing body in G-20

No cars and an increase in bicycles; glorified tricycles

Compacted development and stringent building regulations

We continue to have fresh water because water is not corporate, it is a public right

The University of Hawaii has taken on international role, which gives Hawaii leverage in the international market

The University of Hawaii has also embraced innovation, which gives incentive to able minds and bodies to be creative and environmentally responsible

Renewable and dependable sources of energy, anti matter

Climate change is a known issue and steps are taken to prevent any more environmental digression

Using resources in a reusable fashion is typical and common, not unique and rare

Hawaii is isolated from the rest of the world. No tourist so the economy has changed

Different society and economy than in the past. Much more stable.

The environmental, economical, and social costs are factored into the decision making process of individuals and government.

One of the largest advantages we have today is that we are energy sufficient through geothermal, hydro, wind energy, which are all produced here in Hawaii

Compared to the beginning of the 21st century, what are the major challenges we have addressing climate change in this future.

There is no doubt in regards to the changing natural environment since we have greater scientific certainty of the impact of climate change on our world

We are much more dependent upon ourselves due to isolation which makes the need to import resources even more critical

Human labor costs are much higher in our efforts to maintain sustainability

People have given up civil liberties in exchange for a sustainable lifestyle

Less federal disaster aid

Immunity from spreading diseases

State has lost tourism, which leads to a drastic change in the economic stability of the State.

Less capital to invest in green technologies

Greater competition for agricultural land due to loss of coastal lands

Ocean acidification has reduced certain fish as a protein resource

Might have to relocate people on one island to another due to impacts of volcanoes and erosion

Civil unrest due to some in society working for the good of others and themselves

The absence of military presence makes our society more vulnerable to outside threats

Lost air and boat transportation. Rebuilding in the same capacity as before was unsustainable and impractical

Uncertainty of the viability of coral reefs and natural forests to provide previous benefits of natural eco-systems has caused us to scale back in consumption of those areas.

Influx of people coming to Hawaii from other Pacific Islands that have been submerged. This has caused an even greater strain on our resources

Required to evaluate how susceptible a community that lives on the water, is to the impacts of climate change

Who will be the major actors creating and carry out these policies in this future? (e.g., nations, corporations, scientific and educational institutions, individuals, religious groups, terrorists, etc.)

Military

Educational systems

Islands around the world with similar characteristics to Hawaii

Master T and his citizens

Organized religion needed to help people adjust to this new reality. Need master citizens to help people adjust and comply.

Anarchist-type groups

Corporate World involved in feeding and transporting communities

Power and water utilities depending how they rise or collapse

New level of citizen engagement in government

Large corporations are not influential actors

How does this change the nature of relationships among stakeholders in this future?

Greater interdependency among each stakeholder

Many parts but one body

Barter systems become more depended upon

Different commerce systems

Thinking is long-term (generational) not in four-year election cycles

Stigma associated with those who caused problems

Different government agencies need to work together better

Assessment of what areas or people produce more or better (i.e. fish, taro)

Ahupuaa is found to be better for wind energy then agriculture

Greater collaboration for establishing what is good for the community

How does the government deal with dissenters or who don't agree?

For whom in this society would this create the most benefits and for whom would this create the most challenges?

People that own arable land have an advantage if private property rights are maintained

Whoever controls the resources (i.e. bureaucrats) has the greatest advantage

Scientific and social innovators

Green Tea and other natural herbal substance growers

Communities that demonstrate collaboration and sustainability will have the most benefit

Individual would have the greatest challenge in a collaborative society

Individuals with skill sets that serve the essential needs of the community, will do well

Collapse

Compared to the beginning of the 21st century, what are the major advantages we have addressing climate change in this future.

Wealth of Hawaiian knowledge before the technology-rich culture of the 21st century, from ancestors, lessons learned when technology got in way of protecting land

Greater sense of urgency; collapse of economy allows for a more sustainable economy

West Hawaii (Big Island) has to be more creative when addressing needs, working together, clustered communities with people sharing skills and making trades. Catchment systems were failing which led to the creation of underground catchment systems

Forced to learn the wisdom of less consumption

Tighter social network. Not as bad off as mainland

There is a lot of diversity in terrain for growing food and finding alternative places to live in a small area like Hawaii

Less dependent on fossil fuels

More flexible and interdependent society

Better able to adapt to our changing environment and attach less of a permanent relationship with physical belongings

There is a better understanding of environment and how it changes throughout the year

A greater cultural understanding of austerity from earlier generations of immigrants and how they came to make Hawaii their home

Sense of joy, artistry, music that is central to well being, singing becomes a way to come together

Compared to the beginning of the 21st century, what are the major challenges we have addressing climate change in this future.

West Maui has problems with potable water

Lack of fossil fuels

Cannot tap aquifers or pump wells because there is not a lot of power

West Hawaii's size is both a benefit and a problem. The main problem is the

difficulty communicating among communities

Degrading infrastructure is challenging the safety and health of the community

Do not have new technologies or many renewable resources to improve life

Communication is slow and done by notes and runners

Computers powered only by the sun, which limits their ability to tap information from other islands or the mainland

Many elders with knowledge were lost to disease

Because of new changes happening and the loss of knowledge, we cannot deal with the new changes as they come

Disease and child mortality percentages have been increasing

Women are subjected to different expectations in this society

Limited by what you can do with your own hands

Isolation and lack of communication reduces ability to deal with stresses and challenges

Tsunami wiped out access to books, arts, literature

Naturopathic knowledge on the big island could be used as a resource for other islands.

People have continued to over harvest eucalyptus forests to get insect repellent

Not able to combat invasive species to preserve endemic or native species for medicinal purposes

Need to create paradigm that is enduring and that is resistant to external influences if we re-engage with the outside world

Who will be the major actors creating and carry out these policies in this future? (e.g., nations, corporations, scientific and educational institutions, individuals, religious groups, terrorists, etc.)

West Hawaii – re-established guilds: masters, artisans, craftsmen, teaching is in clusters

Other pacific islanders who are already skilled in self sufficiency became leaders in terms of knowledge transferred, but they are in some ways still marginalized

There is some mistrust on West Hawaii but cooperation still exists

There is some degree of separation among generations, but all are involved in the community

It has proved more efficient when everyone is organized in smaller groups

Molokai retains a rural lifestyle, living relatively simple lifestyle, passed down through the generations

West Hawaii has become a “University of the Pacific”

How does this change the nature of relationships among stakeholders in this future?

Lanai is composed of small communities which operate with consensus based decision making

Keiki learns from the land

Value of Kupuna

Growing restlessness among all groups

Cooperatives with elders as repository of information

More trust between groups because we have to work together

More community based and less concerned with hierarchical guidelines

Leaders move around between communities to share knowledge and information

Recognize the contributions of all ages

Thinking ahead to future generations

Interisland exchange to learn about the changes and differences within communities. Changing the way we see the outer islands and ourselves

Urban Oahu suffered the most decline

West Hawaii – share leadership, but don’t appreciate others coming to take our resources

Maui – community meetings, democratic leadership based on cooperation

Increased reliance on religious leaders as people turn back to faith

Concern that the old times have taken on a mythical quality, promises of “returning to the old ways” become a political tool

For whom in this society would this create the most benefits and for whom would this create the most challenges?

Resource holders gain

Those who lack access to resources/power are the most challenged

Those areas with water have more control and power

The poor, less skilled and women are challenged

Lanai feels vulnerable because they are small, as population declines they become more vulnerable to outside control/acquisition

On Oahu former military lands useless; arms held by those in power, control of water determines who is in control, difficult for people to start up their own plots due to lack of water

In the early days, West Hawaii was under martial law, and as communication with the mainland became less frequent we became less powerful

People with food benefit

Those with disease suffer because of lack of medical care

Molokai consulted with people from Kalaupapa to understand and learn how to deal with disease

Transform

Compared to the beginning of the 21st century, what are the major advantages we have for addressing climate change in this future?

Less land anyway, so more water is useful

AI does not need water or food, and so they have multiplied

Cybernetic implants allow people to live in this environment

AI can help with climate change projects

Hawaii is expanding as the mainland is suffering from resource shortages

Focusing on adaptation means we anticipate rather than only respond

Artificial Intelligence community supports change more than humans

Hawaii ahead of mainland (has adapted to ocean life)

Easier migration and move between land/ocean boundaries

Able to predict climate change and better anticipate needed changes

Lanai is center of power (ocean-centric) rather than Washington D.C.

Hawaii is center of power, with lots of natural resources

Communication technology betters connections between Hawaii-Mainland

Many visitors to Hawaii bringing lots of ideas to Hawaii

Less reliant on portable water, land, and male-female sexual reproduction

Acceptance of climate change means Hawaii is good at adaptation

Less need to modify watersheds

Can create resources we need to survive

Robots which produce no carbon except during manufacturing

Slowing of the aging process for humans

Overpopulation on land less of a problem

Drive to increase population lessened, population growth rates stabilize

Science and engineering experts given political power

Less need for organized religion, fear replaced by technology

Direct access to Ocean Thermal Energy Conversion and wave energy
More confidence in science and technology
We successfully survived the end of petroleum health concerns; waste, water quality
Less judgment about physical differences
More self-reliance and self-sufficiency for Hawaii

Compared to the beginning of the 21st century, what are the major challenges we have for addressing climate change in this future?

Population is growing too fast in some places where resources seem abundant
AIs now compete for resources too
Adapting technology to extracting resources on land to under water
Still finite natural resources which can be diminished
Adapting human species fast enough to keep up with climate change
AIs can improve upon human flaws, perhaps superior to humans
Strife associated with different classes of humans, AIs and cyborgs
Lack of acceptance, possible violent underground movement
No sustainable solution to human-created trash and waste problems
No way to recycle AI construction material, possibly toxic
Lack of commonality between those living on land and those in water
Wasting ocean energy on land and those resistant to living in water
Lack of equality in those generating/using resources
Reliance on ocean may leave us vulnerable to new threats
No genetic recombination, decreases our ability to adapt naturally
Land use policy requires a new system of ownership
Dangerous reliance on technology and the loss of former culture
'Caretakers' having too much power regarding personal health
Continually increasing need for greater food production

Less certainty on what will constitute quality of life
Creation of caste or class systems developed based on cybernetic technology
Larger geographical area to control
Continued climate change may encourage new forms of extreme weather
Floating cities may want independence from land-based cities
Uniformity of cities may discourage diversity
Wars over resources and energy are likely to occur
Decreasing appreciation for arts and humanities
Difficulty in preserving Hawaiian culture
Less democratic form of government
Earlier generations asked the wrong questions about climate change
Increasing complexity of life and lifestyles may cause social ills

Who will be the major actors creating and carrying out these policies in this future? (e.g., nations, corporations, scientific and educational institutions, individuals, religious groups, terrorists, etc.)

AI's are able to adapt better than humans
Humans with artificial implants form a middle class, or transitional group
Increasing conflict between human, AI and cyborg classes
Education: too much information, loss of knowledge which cannot be electronically encoded
Political-economy: only a few corporations in control of resources and waste disposal
Religion: AI's have none and most see religion as a distraction
Tourism: not promoting mass tourism, catering only to the super wealthy
AI's are taking over (unintended consequence)
Large demand for people on land looking to visit and live in Hawaii
Power concentrated in producers of new technology and underwater vehicles

Growing competition between Hawaii and other Pacific Islands trying to attract visitors

Native Hawaiians are not a major player, their population is diminishing

Early adopters of new technology have an advantage over slow adopters

Resurgence of militant, religious, and terrorist groups

In this future, how does climate change affect the nature of relationships among stakeholders?

Relationships are less social and more individual-based

Climate Change is enforced with conflict over who decides what to control

Humans depend on knowledge from genetic engineers, reliant upon them

Reliance upon AIs have made some humans dependent upon them for thinking

More acceptance to change in younger generations

Tension between land and water dwellers, with relations improving in younger generations

Some dependence of humans on AI, which makes some uncomfortable

Resistance of land dwellers to move into water, land dwellers using lots of resources

Who in this future society would reap the most benefits and who would face the most challenges?

Who benefits?

Corporations benefit as they are capable of hoarding resources

Those humans who have adapted to living underwater

Education a social tool for controlling attitudes and perspectives

Knowledgeable in technology and early adopters

Current landowners and lease holders benefit as land costs increase

Aqua dwellers as they rely upon an abundance of water-based resources

Who is Challenged?

Those who have not adapted to water, which is a majority of humans

Those who have no technological adaptations are not able to live on scarce resources

Human genes are resources to be managed

Mutants, failed experiments, and non-human species

Evaluation of the Responses

This section will present general themes as discussed during the work sessions in relation to the seven drivers around which the scenarios were designed:

- Population
- Environment
- Economy
- Technology
- Energy
- Culture
- Governance

None of the groups discussed all seven of the drivers, but all made direct reference to some of them. A general survey of the groups' thoughts on each driver yielded little consensus, but did suggest that there are parameters within which they expect them to fluctuate, as well as particular elements relating to each of them that are preferable over others.

Population

Groups that did directly discuss population invariably suggested that fewer people on the islands would be an advantage. Where population growth was mentioned (Transform scenario), it was seen as a negative pressure on the resources and economy of the islands, and also as a potential source of conflict between locals and non-locals. The elderly were a commonly mentioned sector of the population, and were viewed as vulnerable due to resource and energy fluctuations because of dependence on medical facilities and access to medications, valuable because they possess a wealth of knowledge, and also as a living model to emulate due to their previous experience with harsh economic downturns and lack of access to resources. One disciplined group went so far as to specify a good carrying capacity for Hawaii at 600,000 people.

Environment

Self-sufficiency for Hawaii, both in terms of food and energy dominated discussion of this driver. Conservation of land was also an important theme, but was much less prevalent. Expanding the built environment into the ocean was generally viewed as acceptable, but some

felt that in doing so we would pollute the ocean environment as well. Some groups viewed the geographical isolation of Hawaii as an advantage; they felt it would allow the State government more freedom to allocate scarce resources and to better utilize land for the purpose of self-sufficiency, rather than profit.

Economy

Some groups suggested that it is possible people will be just as happy to live with fewer material goods, but that investment in technology, particularly in the energy sector will be the key to adapting to sea level rise. In one disciplined scenario, a downturn in the tourist sector of Hawaii's economy was associated with a lack of capital for investment in green technologies. In another, participants suggested that a society based on resource discipline could not be a consumer society at all. Collapse scenario participants suggested a community-based barter system as a possible response to decrease in the influx of goods from the mainland, and that Hawaii could be more selective about what we import. In all six scenarios, participants agreed that the cost of maintaining our current way of life will continue to increase.

Technology

Renewable energy technologies such as ocean thermal energy conversion, geothermal, solar and wind were seen as the most important kinds of technology to invest in. Participants in the transform scenarios generally agreed that expanding our environment into the ocean is a viable idea, but it was routinely mentioned that genetically or mechanically adapting ourselves to the environment was disturbing, though there was also agreement that such adaptations would be advantageous. It was suggested that such adaptations, if they were ever to be carried out, would be done out of necessity, and not preference. Other groups suggested repurposing old technologies as an adaptive strategy, highlighting that even if the environment of Hawaii collapses, technology does not simply disappear. In all cases, access to technology in general was associated with the ability to transport it from the mainland or elsewhere. There was wide recognition that the vast majority of the technologies that are essential to Hawaii cannot be built in Hawaii. Several groups suggested that where possible, technologies whose production and maintenance can be sustained locally in fields such as agriculture, water catchment, naturopathic

medicine, aquaculture and energy should be widely implemented. Traditional Hawaiian technologies were suggested as a possible model.

Energy

Across all groups, there was a consensus that renewable energies are the most viable route to energy self-sufficiency. Dependence on any single source of energy was framed as a negative. Alternative sources of energy that have not yet been invented, such as the anti-matter energy in the disciplined scenario were generally viewed with skepticism as to whether they would be viable in the next fifty years, and none of the groups chose to consider implementing nuclear technology. Several collapse groups suggested that a transition to manually powered forms of personal transportation would not be unpleasant and that a “Venice”-type approach to adaptation might even add to the atmosphere of paradise traditionally associated with Hawaii.

Culture

There was wide agreement on the need to form stronger communities, with only one disciplined scenario suggesting that culture would focus more on the individual. One collapse group suggested that small groups would prove more efficient. Many groups agreed that the family unit, both traditional and extended, will become stronger and more important, and that religion and spirituality will also play a larger role across a wide range of scenarios. Corporations were widely viewed as the actors which benefitted the most, representing the most powerful type of group. “Common” people were most often framed as having the least power, and there was widespread agreement that those who owned land or controlled resources would benefit at the behest of 90-95% of the population. This percentage range was mentioned across several of the scenarios. Interdependence was identified as an important value, one that would be reinforced by factors such as a decrease in population size, scarcity of resources, and an economic or environmental collapse. However, it was also identified as a potential source of conflict and a possible source of social inequity. One group went so far as to state that conflict is a part of human nature, suggesting that it could be addressed but never eliminated. The elderly were mentioned more often than children, with a single reference to the word “keiki” appearing in one

collapse scenario's notes. Most often, children were referred to using the more general term "future generations."

Governance

Increased isolation could be an advantage in terms of increasing the capacity of State governance, but most groups felt this could only come at the expense of access to resources, which would justify a greater degree of government control. However, many participants felt that going as far as the disciplined scenario would lead to a totalitarian form of governance. One disciplined group went as far as to characterize the scenario as "1984" in reference to George Orwell's novel of the same name. That particular group also felt that limiting access to resources through rationing would remove the incentive for people to work hard. Across the groups, corporations were widely viewed as having more potential for increased power in the future than government. Growth and increased social control were also generally associated with higher levels of security, particularly with regard to corporations. There was greater general support for forms of governance which include more people, though it was also widely assumed that changes in governance are a fundamental source of social inequalities. Scenarios with a small number of powerful actors were generally viewed as less preferable and those with more democratic traits as more preferable.

Response-Based Policy Recommendations

The following policy recommendations are derived from participant responses collected during the futures work session exercise. They do not represent the views of the authors or scenario facilitators. The response-based policy recommendations are:

- Think about policy in two phases: one set of policies geared toward tourists/short-term visitors, and another geared toward long-term residents
- Oahu is the best testing ground for policies because it will be most affected by climate change
- Stop development of critical infrastructure (airports, emergency facilities, oil storage facilities, government buildings, etc.) in the inundation zone, and where possible relocate to outside inundation zone
- Consider policies geared towards reducing population pressure on Hawaii's resources, including:
 - Policies on immigration and maximum residency caps
 - Restrictions on the number of tourists allowed into the state at any one point in time
 - Limit the number of people that can live on and visit each island
- Encourage lifestyle choices which will lessen the dependence on imported medications
- Encourage expanding the built environment into the ocean with an eye toward minimal modification of the natural environment
- Encourage research of sustainable technologies that can be designed, produced and maintained locally
- Encourage development of alternative forms of energy and transportation
- Decrease dependence on the importation of goods, services and human resources
- Consider alternative forms of long-distance, high-capacity transport to and from the mainland and international destinations
- Diversify and decentralize energy sources
- Create an official agency whose sole task is to anticipate and create policies that advocate for and protect the welfare of future generations as a silent minority group

General Trends and Conclusions

Several key themes not directly related to the drivers or the scenarios themselves have been identified:

- A general malaise regarding faith that adaptive action will be taken in time to prevent disaster
- Climate change is seen as a negative that can be mitigated, but is not something that most people embraced, though there was wide agreement that it is inevitable
- *How* we adapt to sea level rise is important
- Oahu was widely viewed as the area most likely to suffer from the negative effects of sea level rise and would suffer the effects first and worst
- The general work group orientation tended to believe that the future would be worse than the present
- The collapse scenario was viewed as likely, while the others drew mixed responses

There was unanimous agreement between groups that current forms of governance are reactive rather than anticipatory, and as a result issues are often not addressed until they become big problems. Those efforts that are currently being undertaken were viewed as lacking in coordination and communication among groups working towards similar ends.

Climate change was framed in all groups as inevitable even in scenarios where technology, conservation or other mitigation strategies were widely deployed. The view of most participants tended to be one of collapse as being the most likely scenario. Though collapse itself was framed in a negative light during group discussions, and the idea of a continuation of the way we live now (in a consumer-based society) was preferable.

While there was little general consensus as to specific approaches in adapting to sea level rise, there was also a definite range of responses within which participants preferred to work. Outside of these bounds, people began to reject elements of the scenarios, in some cases rejecting the entire scenario based on severe dislike of particular elements. Both the continued growth and transform scenarios experienced one walkout each because of this. These examples show how set the participants are in their perceptions of the future and their resistance to change.

Because Oahu is the most urban and populated of all the islands, participants expected that if access to resources or consumer goods were affected by sea level rise, Oahu would be hit first

and hardest. In scenarios where widespread emigration out of the state occurred, Oahu's population shrank by the largest percentage. Outer islands that are currently more rural were viewed as more self-sufficient and also held the most potential for future conversion to renewable energies, because the land would not need to be repurposed as it would be on Oahu.

Overall, most groups tended to believe that the world of the future will be worse than the present. This idea was not always explicitly connected to sea level rise, but seemed to be rooted more in the belief that the problems affecting Hawaii are increasing in number and also accelerating their pace so that they become much more difficult to deal with over time. Social inequities were widely expected to increase, while social justice was commonly viewed as difficult to define, much less achieve.

While the majority of groups lacked a consensus as to the likelihood and preferability of their scenarios, collapse groups agreed unanimously that collapse was likely but not preferable. However, most groups also generally agreed that scaling back on consumption of material things might be a social good, suggesting that the transition to a collapse-type scenario might not be as painful as some might think.

Future Work Session Observations and Suggestions

The general work session results provided a variety of information that can be usefully deployed when planning for policy change over the next fifty years. Presentation of scenarios did prove effective at helping participants maintain a long term, plural view of the futures for the duration of the work session. Assigning participants specific roles was effective in prompting engagement both with the issues specific to each scenario, as well as the other participants. For example, the transform scenarios assigned a participant to represent the AI community and collapse participants were randomly assigned to represent different islands.

Participants found the scripted introductions given prior to entering each scenario room useful, but many noted that it was much more difficult to shift time horizons after leaving the scenario rooms. Future work sessions should emphasize transitioning both into *and* also out of the scenario rooms. Future work sessions could be enhanced by exposing participants to all four scenarios and a minimum of one full day should be allocated for this portion of the futures work.

A general introduction was provided to the entire group before entering the scenario rooms, but future work sessions should also include a formally structured debrief with the entire group after exposure to all four scenarios.

Future work sessions would benefit from producing a group generated scenario which represents preferred elements and addresses challenges identified in the four scenario sessions. Such a scenario is representative of a thorough futuring process and can help to clarify policy issues. A group debrief would provide an opportunity for participants to discuss their responses to the scenarios in terms of preferability and likelihood. Finally, future work sessions should result in the creation of a preferred future which outlines general policies geared towards the achievement of that preferred future.

Appendix

References to the Scenarios

Continued Growth Scenario References

Baehr, B. (n.d.). Bacteria levels “very high,” Leeward beaches still closed. Retrieved from <http://www.hawaiinewsnow.com/story/13858009/bacteria-levels-very-high-leeward-beaches-still-closed?redirected=true>

China says navy drills not linked to sea disputes. (n.d.). . Retrieved from http://www.channelnewsasia.com/stories/afp_asiapacific/view/1138100/1/.html

Chung, H. (n.d.). A Fresh Solution for Desalination. Retrieved from <http://www.xtreme.hawaii.edu/research-projects/desalination/>

Climate Change in the Pacific Region. (n.d.). . Retrieved from <http://www.fws.gov/pacific/Climatechange/changepi.html#Effects>

Cole, W. (n.d.). University of Hawaii UARC deal reached. Retrieved from <http://the.honoluluadvertiser.com/article/2007/Sep/18/ln/hawaii709180330.html>

Consillio, K. (n.d.). Matson boosts fuel surcharge 4 percentage points to record 47.5%. Retrieved from <http://www.staradvertiser.com/news/breaking/121674514.html>

Demetriou, D., & Mason, R. (n.d.). Rare earth minerals find in Pacific could spark Japan-Hawaii stand-off. Retrieved from <http://www.telegraph.co.uk/finance/commodities/8616623/Rare-earth-minerals-find-in-Pacific-could-spark-Japan-Hawaii-stand-off.html>

Eagar, H. (n.d.). Sea wall: Soft “way to go.” Retrieved from <http://www.mauinews.com/page/content.detail/id/520317.html>

Ferran, L. (n.d.). CIA Counter-Terror Chief: Al Qaeda Will Go Cyber. Retrieved from <http://abcnews.go.com/Blotter/cia-counter-terror-chief-al-qaeda-cyber/story?id=14224256>

First Fully-Armed Robots Patrolling in Iraq; First Shots Imminent. (n.d.). . Retrieved from <http://gizmodo.com/285394/first-fully+armed-robots-patrolling-in-iraq-first-shots-imminent>

Fletcher, C. (2009). Sea level by the end of the 21st century. *Shore & Beach*, 77(4), 4.

Fletcher, C. (n.d.). Adapting to Sea Level Rise and Coastal Erosion in Hawaii. Retrieved from <http://www.cakex.org/case-studies/2862>

From underwater, Maldives sends warning on climate change. (n.d.). . Retrieved from http://articles.cnn.com/2009-10-17/world/maldives.underwater.meeting_1_maldives-climate-change-sea-levels?_s=PM:WORLD

Gruenwald, J. (n.d.). Expert: Cyberattacks Might Be Tip of Iceberg. Retrieved from <http://www.nationaljournal.com/tech/expert-cyberattacks-might-be-tip-of-iceberg-20110803>

Hawaii experienced a 12.3% population growth from 2000 to 2010. (n.d.). . Retrieved from <http://quickfacts.census.gov/qfd/states/15000.html>

Hawaii Fact Sheet: HI agriculture income population food education employment unemployment federal funds farms top commodities exports counties financial indicators poverty farm income Rural Nonmetro Urban Metropolitan America USDA organic Census of Agriculture. (n.d.). . Retrieved from <http://www.ers.usda.gov/statefacts/HI.HTM>

Hawaii: Most millionaires per population. (n.d.). . Retrieved from <http://www.bizjournals.com/pacific/stories/2009/07/13/daily1.html>

Homeless Encampment Swells In Waianae. (n.d.). . Retrieved from

<http://www.kitv.com/news/22664552/detail.html>

Hoover, W. (n.d.). Homeless population on Oahu rises 28.2%. Retrieved from

<http://the.honoluluadvertiser.com/article/2007/Jun/17/In/FP706170365.html>

Katz, S. (n.d.). Does Service Learning Really Help? Retrieved from

<http://chronicle.com/blogs/brainstorm/does-service-learning-really-help/20461>

Launch of UN report warning of rising economic losses due to disasters and climate change in the

Pacific. (n.d.). . Retrieved from

<http://www.preventionweb.net/english/professional/news/v.php?id=21125>

Miller, K. (n.d.). North American Water Impacts Map. Retrieved from

http://www.isse.ucar.edu/water_climate/html_map.html

Murphy, K. (n.d.). Shell gets conditional approval for U.S. Arctic drilling plan. Retrieved from

<http://www.latimes.com/news/science/environment/la-na-shell-arctic-20110805,0,2841153.story?track=rss&dlvrit=142902>

New Census data update Hawaii's population profile. (n.d.). . Retrieved from [http://hano-](http://hano-hawaii.org/july-newsletter/news-for-nonprofits/new-census-data-update-hawaiis-population-profile/)

[hawaii.org/july-newsletter/news-for-nonprofits/new-census-data-update-hawaiis-population-profile/](http://hano-hawaii.org/july-newsletter/news-for-nonprofits/new-census-data-update-hawaiis-population-profile/)

Osher, W. (n.d.). Monsanto Hawai'i Gifts Prize Money to The Nature Conservancy. Retrieved from

<http://mauinow.com/2011/07/28/monsanto-hawai%E2%80%99s-gifts-prize-money-to-the-nature-conservancy/>

Page, L. (n.d.). CIA's DARPA working on human-brain-mimicking tech. Retrieved from

http://www.theregister.co.uk/2011/07/14/iarpa_brain_bbn_deal/

Sanburn, C. (n.d.). Shadows on the Beach. Retrieved from

<http://honoluluweekly.com/feature/2011/01/shadows-on-the-beach/>

Schearf, D. (n.d.). Report Finds Increase in Global Sea Piracy But Less Successful Attacks. Retrieved

from <http://www.voanews.com/english/news/africa/Global-Sea-Piracy-Rises-Attacks-Less-Successful-125558773.html>

Shimogawa, D. (n.d.). Homeless in Waimanalo see more people in the area. Retrieved from

<http://www.hawaiinewsnow.com/story/12753105/homeless-in-waimanalo-see-more-people-in-the-area>

Shire, D. (n.d.). Analyzing the Global Oil Supply: 2012 Is the Year for Peak Oil. Retrieved from

<http://seekingalpha.com/article/282523-analyzing-the-global-oil-supply-2012-is-the-year-for-peak-oil>

Swift, N. (n.d.). Across The World: The Privatization of Higher Education. Retrieved from

<http://chronicle.com/blogs/worldwise/across-the-world-the-privatization-of-higher-education/25189>

Tesoro Corp. "looking at alternatives" for Hawaii refinery. (n.d.). . Retrieved from

<http://www.staradvertiser.com/news/breaking/123408368.html>

Underwater Habitats - Trilobis 65 Floating Home. (n.d.). . Retrieved from [http://www.sub-](http://www.sub-find.com/trilobis65.htm)

[find.com/trilobis65.htm](http://www.sub-find.com/trilobis65.htm)

Univ. of Hawaii – U.S. Pacific Command Partnership. (n.d.). . Retrieved from

<http://bytemarks.org/univ-of-hawaii-u-s-pacific-command-partnership/>

When The Water Ends: Africa's Climate Conflicts by: Yale Environment 360. (n.d.). . Retrieved from

http://e360.yale.edu/feature/when_the_water_ends_africas_climate_conflicts/2331/

Wong, E. (n.d.). China Warns U.S. on South China Sea Disputes. Retrieved from

http://www.nytimes.com/2011/06/23/world/asia/23china.html?_r=2

Discipline Scenario References

Campuses 2060: Futures of Higher Education. An International Workshop on Futures of Campuses for Higher Education, November 13-14, 2009, School of Architecture, UHM

Dator, J. & Kramer, W. & Park, S. (2009). *Through a Brushwood Door: Should Korea Become a Conserver Society?* Hawaii Research Center for Futures Studies.

Dicke, M., & Van Huis, A. (n.d.). The Six-Legged Meat of the Future. Retrieved from

<http://online.wsj.com/article/SB10001424052748703293204576106072340020728.html>

Muir, H. (n.d.). Antiproton ring found around Earth. Retrieved from

<http://www.newscientist.com/article/mg21128245.500-antiproton-ring-found-around-earth.html>

Tucker, P. (2011). *Purification at the Nano Scale*, The Futurist. August 2011, 11-12.

The Effects of Climate Change on Hawaii's Ocean & Coastal Resources. Center for Island Climate Adaptation and Policy (ICAP), 2010, 6-10.

Ziegler, R. (2004). *Earthquest 2054: A Day In the Life of Hawaii*. Richard Ziegler.

Collapse Scenario References

- Chossudovsky, M. (n.d.). Economic Depression and the New World Order. Retrieved from <http://www.globalresearch.ca/articles/CHO201B.html>
- Duncan, R. (n.d.). The Great Depression and The New Depression. Retrieved from <http://dailyreckoning.com/the-great-depression-and-the-new-depression/>
- Future Climate Change - Future Sea Level Changes | Science | Climate Change | U.S. EPA. (n.d.). . Retrieved from <http://www.epa.gov/climatechange/science/futureslc.html>
- Hawaii's Beaches Eroding At An Alarming Rate. (n.d.). . Retrieved from <http://www.hawaii.stateassessment.info/2009/02/04/hawaiis-beaches-eroding/>
- Hurricanes in Hawaii-Part 2 of 3, Official Web Site for The City and County of Honolulu. (n.d.). . Retrieved from <http://www1.honolulu.gov/dem/hurric2.htm>
- Leptospirosis Symptoms, Vaccine, Treatment, Prevention, Diagnosis and Prognosis Information by MedicineNet.com. (n.d.). . Retrieved from <http://www.medicinenet.com/leptospirosis/article.htm>
- Martenson, C. (n.d.). Why Time Is Short Now That We're Past Peak Oil. Retrieved from <http://www.businessinsider.com/why-time-is-short-now-that-were-past-peak-oil-2011-5>
- Pacific Business Center - University of Hawaii: State of Hawaii (USA). (n.d.). . Retrieved from <http://pbcp.hawaii.com/state-of-hawaii-usa.asp>
- Peak Oil News and Message Boards. (n.d.). . Retrieved from <http://peakoil.com/>
- Rafique, M. (n.d.). Oil prices could go as high as \$200 per barrel. Retrieved from <http://arabnews.com/economy/article484164.ece>
- Reiter, P. (n.d.). Environmental Health Perspectives: Climate Change and Mosquito-Borne Disease. Retrieved from

<http://ehp03.niehs.nih.gov/article/fetchArticle.action?articleURI=info:doi/10.1289/ehp.01109s11>

[41](#)

Sea Level Rise Website. (n.d.). . Retrieved from <http://www.soest.hawaii.edu/coasts/sealevel/>

Snyder, M. (n.d.). What Is The Best Place To Live In The United States To Prepare For The Coming Economic Collapse? Retrieved from <http://inteldaily.com/2011/05/what-is-the-best-place-to-live-in-the-united-states-to-prepare-for-the-coming-economic-collapse/>

The Drowning of Hawaii. (n.d.). . Retrieved from <http://archives.starbulletin.com/2007/09/23/news/story01.html>

The Oil Drum | Discussions about Energy and Our Future. (n.d.). . Retrieved from <http://www.theoil drum.com/>

Tsunami Hazards. (n.d.). . Retrieved from <http://www.soest.hawaii.edu/coasts/nps/tsunamiHazards.php>

Woo, S. (n.d.). Heavy Reliance on Tourism Has Hawaii's Economy Hurting. Retrieved from <http://online.wsj.com/article/SB125047318664935729.html>

Transform Scenario References

12 Fantastic Floating Cities and Artificial Islands. (n.d.). . Retrieved from <http://webcoist.com/2009/04/27/12-fantastic-floating-cities-and-artificial-islands/>

Analysis of Legislative and Regulatory Chaos in the U.S.: Asexual Human Reproduction and Genetic Engineering. (n.d.). . Retrieved from http://www.lifeissues.net/writers/irv/irv_81chaosasexgen4.html

Chapa, J. (n.d.). LILYPAD: Floating City for Climate Change Refugees. Retrieved from <http://inhabitat.com/lilypad-floating-cities-in-the-age-of-global-warming/>

Future evolution of genetic engineering. (n.d.). . Retrieved from

<http://hfgfoodfuturist.com/tag/genetic-engineering/>

Genetic Engineering - The Future of Human Evolution. (n.d.). . Retrieved from

http://www.humansfuture.org/genetic_engineering_adaptability.php.htm

Pararas-Carayannis, G. (n.d.). Instability of Kilauea Volcano's Southern Flank - Evaluation of Mass
Edifice Failures, Flank Collapses and Potential Tsunami Generation. Retrieved from

<http://www.drgeorgepc.com/VolcanoHawaiiKilaueaInstab.html>

Parrish, A. (n.d.). Estrogen Levels in Water Alarm Scientists. Retrieved from

http://www.associatedcontent.com/article/2300573/estrogen_levels_in_water_alarm_scientists.html

Sachs, J. (n.d.). The Promise of the Blue Revolution (Extended version). Retrieved from

<http://www.scientificamerican.com/article.cfm?id=the-promise-of-the-blue-revolution-extended>

Sudia, F. (n.d.). Over the Horizon: Water Challenges / Better Kidneys? Retrieved from

<http://fwsudia.blogspot.com/2010/03/water-challenges-better-kidneys.html>

Weir, F. (n.d.). As ice caps melt, Russia stakes its claim to oil-rich Arctic. Retrieved from

<http://www.csmonitor.com/2007/0803/p25s01-wogi.html>

Notes from Expert Interviews

The initial phase of project design involved gathering data and information through a series of informational work sessions and interviews conducted during the spring and summer of 2011 at the State Office of Planning. The purpose of these work sessions was to gain insight as to what kinds of futures are currently being considered by experts in fields as diverse as public health, ecosystems, ocean acidification, infectious diseases, climate and rainfall, ahupua'a issues and more. Personnel participating in the work sessions or interviews included:

Leo Asuncion – Hawaii CZM Planning Program Manager

Marni Meyer – Planning and Policy Analyst, Hawaii CZM Program.

Cindy Barger - Watershed Program Manager, US Army Corps of Engineers

Deanna Spooner (Coordinator) and Jeff Burkett (Scientific Manager) - Pacific Islands Climate Change Cooperative (PICCC) - ecosystem experts

Bruce Wilcox - UH Manoa Infectious Diseases, South East Asia

Ed Texiera - Director State Civil Defense - disaster management

Karl Kim - UH Manoa, Department of Urban and Regional Planning - disaster management

Cheryl Anderson - SSRI, Social Issues

Steve Anthony - USGS, Groundwater

Melissa Finucane - Pacific RISA, Rainfall Issues & Water Resources

Makena Coffman - UH Manoa Department of Urban and Regional Planning, Greenhouse Gas/Climate change Policy and Economics

Dolan Eversole - UH Manoa Sea Grant Program, NOAA Coastal Storms Program Pacific Islands Regional Coordinator - coastal storms/sea level rise

Chip Fletcher - SOEST, Sea Level Rise

Dave Karl & Barb Bruno - CMORE CREDDH with NOAA, Ocean Acidification

Anthony Aalto - Sierra Club

The information gathered at these work sessions and interviews was intentionally broad in nature, and focused on discovering trends, developments and important information that may just now be emerging or becoming relevant. This information was then used as part of the information and data set upon which the drivers for the main work session were based.

- Global trend – 1-foot sea level rise by 2050
 - o Hawaii may lag behind: 1 foot increase by 2060
- Beach erosion will become a pressing issue, but will be ignored until it cannot be
 - o I.e.: you can't have a seawall until you have "hardship"
 - o Does hardship automatically allow for seawall construction? Sierra Club is working on this.
- Some of our coastal roads will be shut down for many hours per year
 - o Laniakea, Honoapiilani Highway, West Maui, East coast of Oahu. Both undermining and overtopping, during a typical ocean swell
 - o By 2060 we won't even need a storm. Many of these roads are the only way in and out for some communities.
 - o Up to 3-4 times a month for 3/4 of a day each
 - Sea level rise will slowly sneak into our lives.
- Sea level rise comes out of storm drain system.
 - o 2011: Now happens 2 times per year at the highest tides in Waikiki.
 - o Yacht harbor towards Diamond Head gets water.
 - o At Kakaako you can already hear manhole covers rattling when there is a big swell.
 - o By 2060 storm drainage system will be shut down two to three days, twice a month.
- Infrastructure problem: Sewage lines often run under the main roads. Kalaniana'ole, etc.
- Sea level will raise the groundwater table.
 - o Not all are convinced that this will cause infrastructure damage.
- Maintenance – we typically have a reactive rather than proactive response
 - o Water table sits at about mean sea level. If you raise a foot and then have high tide you will see more road degradation.
 - o Currently a lot of potholes near ocean are caused by this.
 - There is a significant economic burden for fixing and maintaining roads.
- There may be some areas where we can "climate proof" the road – build a 3-foot "bridge" that raises the road above the water table to mitigate this maintenance issue.
- Idea of putting timed gates – storm system – where the gates close during high tide.
 - o Similar to the New Orleans system.
- It is difficult to convince anyone to spend money on planning for problems that are not explicitly assigned to their departments (A maintenance issue)
- Ocean Acidification – ocean around Hawaii is acidifying.
 - o How that directly affects ecosystems is not really clear
 - o Different species may be more or less vulnerable
 - o We don't know yet how Coralline Algae (an important part of our ocean ecosystem) is affected.

- Ocean phytoplankton are also being damaged by sea temperature rise
 - o Ocean acidification and sea temperature rise are interrelated
- Sea level rise and coral reefs could change sedimentation issues and increase wave energy
 - o We know this has happened in geological history.
- Rainfall is a huge issue
 - o 15% decrease in rainfall in Hawaii since 1950
 - o Microclimates will affect the rainfall change in the future
 - o Trend is accelerating – possibly net 30% decrease by 2060
 - This may lead the way for desalination to be developed in the future.
- By 2060 our coastline will be largely seawalls and we will be dealing with water that will not drain away
 - o Possible solution – land trust that buys up beachfront areas.
- Average rate of beach erosion island-wide is a little less than a foot per year. 60 feet of erosion by 2060.
- Computer modeling showing increased hurricane activity
 - o Windward sides of the islands are not as vulnerable to Hurricanes b/c water is cold to the east, but as those waters warm and the wind regime changes, we may begin to see hurricanes approaching from the east - a new pattern.
- Sea Level rise makes tsunamis more damaging.
- What everyone is afraid of here is a tsunami generated from the Aleutian Islands
 - o These lose the least amount of energy as they travel, no shallow areas between here and there
 - o Worried that the stress buildup on the Pacific plate is being released everywhere but there (Chile, Tonga, Japan, etc.)
- We're currently having a lot of successes in green infrastructure and development, this could accelerate by 2060
- Wetlands will benefit from sea level rise for a period and then they will become salty.
- How sea level rise would affect ports
 - o More wave energy
 - o Worry about surging, high tides – water washing up on low docks
 - o We can engineer ports to accommodate this, but it may imperil the gasoline refineries due to surges or tsunamis
 - If our oil refineries are destroyed, no one is going to gas up to rescue us because they could not gas up to get home.
- 15% increase in vulnerability to hurricanes by 2060
 - o 30% by the end of the century
 - o Worst part of the island to be on when hurricane makes landfall is the right corner
- Airports may experience wave splash on the reef runway
 - o May only be usable at low tide when there is no swell
 - o We also may need a longer runway for the new larger planes
 - o We could add seawalls or raise the runway, but this would be really expensive.
- One of the biggest challenges to change is regulatory framework
 - o We are hitting a stagnation point on a lot of current projects

- It is difficult to manage economics and development needs vs. ecosystem and conservation needs.
- Waikiki beach – we are currently going to spend a few million re-nourishing the sand
 - The cycle of re-nourishing is going to accelerate with sea level rise
 - Drainage is an issue as well
 - Will Waikiki become degraded and will tourism look elsewhere?
- Kaanapali beach – there are areas where the beach has disappeared, so hotels block access to the ocean and build a “keiki” beach at the pool so people stay at the hotel and spend more money, etc.
- Taro growing is threatened – the ponds will become salty with sea level rise



Hawaii Reasearch Center
for Futures Studies

Department of Political Science

2424 Maile Way, Suite 632
Honolulu, HI 96822
www.futures.hawaii.edu