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U.S. House of Representatives Committee on Foreign Affairs
Subcommittee on Asia, the Pacific, and Global Environment

"Climate Change and Vulnerable Societies: A Post-Bali Overview"

February 27, 2008
Room 2200, Rayburn House Office Building

Introduction

Thank you, Chairman Faleomavaega, and members of the subcommittee, for the opportunity to testify on behalf of the Federated States of Micronesia, at your hearing on the international climate change negotiations, and on the path forward towards a post-2012 climate treaty.

I also would like to express the sincere condolences of our leaders and our people to the family, friends, and colleagues of Congressman Tom Lantos, who provided a model of what a political leader could and should be.

How long will Micronesia exist?

The topic of climate change is very much on the minds of our leaders and our people in Micronesia. Climate change is about our very existence—our existence as a country—a country with rich traditions that since time immemorial have helped unite our generous and peaceful people into a unique and successful society. We now must ask ourselves, "How long will our country, and our culture, continue to exist?"

All low-lying island and coastal countries are vulnerable.

Micronesia is not alone. We are representative of all vulnerable countries around the world, including those in the Alliance of Small Island States, and the many other low-lying coastal countries that face the growing risk of extinction from abrupt climate change and the sea-level rise that it will cause. (The unique vulnerability is recognized in the 1992 UN Framework Convention on Climate Change, to which the US is a Party.)

We need your help with adaptation measures that may delay some of the coming climate impacts to our island and coastal communities, including help protecting and enhancing the growth of our protective coral reefs (which also store significant amounts of carbon). But even more, we need your help mitigating climate change, something the US is in a unique position to lead, given your technological inventiveness and optimistic spirit. Immediate, "fast start," mitigation is the best adaptation strategy, and that is the focus of my remarks.

How close is the tipping point for abrupt climate change?

The abrupt climate change from the melting and disintegration of Arctic, Greenland, and Antarctic ice is "non-linear," and will occur when we pass a tipping point by putting too many greenhouse gas pollutants into the atmosphere. A non-linear tipping point is like the final step we take as we walk off a cliff. Once we take that step, we are not able to go back. It is irreversible.

The question is not *whether* abrupt climate change will occur, but *when* it will occur—if we continue business-as-usual. How close are we to the tipping point for abrupt climate change from the melting of the Arctic Ice? The melting and disintegration of the Greenland Ice Sheet? From the West Antarctic Ice Sheet? How much time do we have to continue to exist as a country?

One leading climate scientist at NASA, Dr. James Hansen, explains that the tipping point for abrupt climate change and catastrophic sea-level rise could be as close as ten years away. When we cross it, we will be irreversibly committed to up to 6 or more meters of sea-level rise in the coming decades, perhaps at the rate of 1/2 to 1 meter per decade.[1]

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[1] Dr. James Hansen, of the NASA Goddard Institute for Space Studies, argues that "[p]ositive climate feedbacks and global warming already 'in the pipeline' due to climate system inertia together yield the possibility of climate 'tipping points' … such that large additional climate change and climate impacts are possible with little additional human-made forcing. Such a system demands early warnings and forces the concerned scientist to abandon the comfort of waiting for incontrovertible confirmations." *Scientific reticence and sea level rise***,** Environ. Res. Lett. 2 (2007). Dr. Hansen raises specific concerns regarding melting ice sheets and rising sea levels:

> The current rate of sea level change is not without consequences. However, the primary issue is whether global warming will reach a level such that ice sheets begin to disintegrate in a rapid, non-linear fashion on West Antarctica, Greenland or both. Once well under way, such a collapse might be impossible to stop, because there are multiple positive feedbacks. In that event, a sea level rise of several metres at least would be expected. … The palaeoclimate record contains numerous examples of ice sheets yielding sea level rises of several metres per century when forcings were smaller than that of the business-as-usual scenario. For example, about 14,000 years ago, sea level rose approximately 20 metres in 400 years, or about 1 metre every 20 years.
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> There is growing evidence that the global warming already under way could bring a comparably rapid rise in sea level. … The findings in the Antarctic are the most disconcerting. Warming there has been limited in recent decades, in part due to the effects of ozone depletion. The fact that West Antarctica is losing mass at a significant rate suggests that the thinning ice shelves are already beginning to affect ice discharge rates.
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> So far, warming of the ocean surface around Antarctica has been small compared with the rest of the world, as models predict, but that limited warming is expected to increase. The detection of recent, increasing summer surface melt on West Antarctica raises the danger that feedbacks among these processes could lead to non-linear growth of ice discharge from Antarctica. …
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> Ocean warming and thus melting of ice shelves will continue even if CO2 levels are stabilised, because the ocean response time is long and the temperature at depth is far from equilibrium for current forcing. Ice sheets also have inertia and are far from equilibrium. There is also inertia in human systems: even if it is decided that changes must be made, it may take decades to replace infrastructure.

The US National Academy of Sciences report on abrupt climate change is entitled *Abrupt Climate Change: Inevitable Surprises*, and concludes that the "available evidence suggests that abrupt climate changes are not only possible, but likely in the future. …"[2] A report prepared for the US Department of Defense warns that abrupt climate change could lead to geopolitical de-stabilization and "skirmishes, battles, and even war."[3]

The record ice-melt in the Arctic and Greenland last year, and now in the Antarctic, gives a further sense of urgency to Dr. Hansen's warnings about the tipping point for abrupt climate change and sea-level rise. So does the recent scientific evidence that the oceans now appear to be absorbing less of our carbon-dioxide emissions, leaving more of this greenhouse gas in the atmosphere.

According to a new scientific report published this month in the *Proceedings of the National Academy of Sciences*, other climate surprises are coming fast.[4] The collapse of the Indian summer monsoon could be a year away, and the dieback of the carbon-dioxide absorbing Amazon rainforest could tip within 50 years.

We need to expand the definition of "dangerous levels" of anthropogenic climate emissions to include the tipping points for abrupt climate change.

The threat of abrupt, non-linear, and irreversible climate impacts must be one of the factors we use to determine what are "dangerous levels" of greenhouse gas emissions. This is a critical part

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> The threat of large sea level change is a principal element in my argument that the global community must aim to restrict any further global warming to less than 1 °C above the temperature in 2000. This implies a CO2 limit of about 450 parts per million or less. Such scenarios require almost immediate changes to get energy and greenhouse gas emissions onto a fundamentally different path. …
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> The broader picture strongly indicates that ice sheets will respond in a non-linear fashion to global warming – and are already beginning to do so. There is enough information now, in my opinion, to make it a near certainty that business-as-usual scenarios will lead to disastrous multi-metre sea level rise on the century time scale.

Climate Catastrophe, NEW SCIENTIST (28 July 2007).

[2] *See* Committee on Abrupt Climate Change, *Abrupt Climate Change: Inevitable Surprises*, National Academy Press, Washington, D.C., 2003 (the "available evidence suggests that abrupt climate changes are not only possible, but likely in the future, potentially with large impacts on ecosystems and societies").

[3] *See* Peter Schwartz & Doug Randall, *An Abrupt Climate Change Scenario and Its Implications for United States National Security* (2003) (warning that result of abrupt climate change without adequate preparation "could be a significant drop in the human carrying capacity of the Earth's environment", including shortages of food and fresh water, drought, and flooding, which could lead to geopolitical de-stabilization and "skirmishes, battles, and even war."), http://www.gbn.com/ArticleDisplayServlet.srv?aid=26231. *See also* Chris Abbott, Paul Rogers, and John Slobada, *Global Responses to Global Threats: Sustainable Security for the 21st Century,* Oxford Research Group, June 2006, http://www.oxfordresearchgroup.org.uk/publications/briefing_papers/globalthreats.php; and Durwood Zaelke, Oran Young, & Scott Stone, *After 'The Day After Tomorrow': What Will Society Learn from the Inevitability of Rapid Climate Change Events*, NATIONAL STRATEGY FORUM REVIEW, Fall 2006, http://www.nationalstrategy.com/Portals/0/FINAL.FALL.2006.NSFR.pdf.

[4] Timothy Lenton, Hermann Held, Elmar Kriegler, Jim Hall, Wolfgang Lucht, Stefan Rahmstorf, and Hans Joachim Schellnhuber, *Tipping elements in the Earth's climate system*, 105 PROC. OF THE NAT'L ACAD. OF SCI. 6 (Feb. 12, 2008).

of the threat we must avoid through aggressive policy responses. We can no longer consider only the linear effects from an eventual doubling of CO_2 concentrations and a two to three degree Celsius temperature rise.

We need "fast start" strategies to provide time for mid and long-term solutions.

With the UN negotiations on a new climate regime scheduled to last two years—until December 2009—, plus several additional years to ratify and implement that regime through national legal systems, there is a need for leadership on immediate "fast start" mitigation strategies to give us time to get mid- and long-term strategies working effectively. We also need "fast start" strategies for adaptation, as the impacts of climate change are already occurring and being felt in Micronesia and other low-lying countries. One critical strategy both for adaptation and for mitigation is to protect and enhance the growth of coral reefs, which both store significant amounts of carbon and which act as protective buffers against rising sea-levels and increasing storm surges.[5]

The ozone treaty can provide fast start mitigation.

The ozone treaty, known as the Montreal Protocol on Substances that Deplete the Ozone Layer, can be strengthened this year to provide immediate and significant climate mitigation.

This can be done by controlling the emissions of chemicals from discarded products and equipment, including refrigerators and air conditioners, which harm both the ozone layer and the climate system when they leak from landfills. The potential climate mitigation is significant: 7.4 billion tons of carbon-dioxide equivalent by 2015. This is more than the 5 billion tons of carbon-dioxide equivalent the Kyoto Protocol seeks to reduce in its initial commitment period from 2008-2012.

Micronesia will continue working with Argentina and the US to further strengthen the Montreal Protocol at its annual meeting later this year, as we did last year.

Continuing the climate success at the Montreal Protocol's 20th anniversary last year.

Last year, Micronesia was the first Party to the ozone treaty to submit a proposal to strengthen the treaty to explicitly address climate change, by accelerating the phase-out of HCFCs. A total of nine Parties, including Argentina and the US, as well as other island and low-lying Parties, submitted a record number of proposals to strengthen the ozone treaty last year.

The agreement reached by the 191 Parties at the 20th anniversary meeting in Montreal in September 2007 will result in climate mitigation of 15 billion tons of carbon-dioxide equivalent, significantly more than the Kyoto Protocol, and even more if the transition to better substitutes is managed carefully. This is the first time all countries of the world, including China, India, Indonesia, and the US, agreed to binding and enforceable climate mitigation obligations.

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[5] Pandolfi, *et al*., *Global Trajectories of the Long-Term Decline of Coral Reef Ecosystems*, SCIENCE, Vol. 301, no. 5635, pp 955-958 (15 August 2003); and Coral reef destruction: the causes of coral bleaching. http://www.libray.thinkquest.org.

Montreal Protocol is the world's best climate treaty—so far.

It is significant to understand that the ozone treaty, throughout its 20 years of operation, has become the best environmental treaty in the world, and—for the moment at least— the best climate treaty as well. It has reduced climate emissions by a net of 135 billion tons of carbon-dioxide equivalent between 1990 and 2010, and delayed climate change by up to 12 years, keeping us from many of the tipping points for abrupt climate change. (Recall that Kyoto is seeking a total of 5 billion tons of carbon-dioxide equivalent, at the rate of 1 billion tons per year from 2008-2012.)[6]

Overall, protecting the ozone layer is delaying climate change by 35-41 years when earlier voluntary efforts and national measures are considered along with the Montreal Protocol. These combined efforts to phase-out ozone-depleting substances have solved a piece of the climate problem that otherwise would have grown to nearly equal today's CO_2 contribution, while also starting the ozone layer on the path to recovery later this century.[7]

Other "fast start" strategies for strengthening climate mitigation under the Montreal Protocol.

There are other "fast start" strategies for strengthening the Montreal Protocol to do still more for climate mitigation, including:

- Further accelerating the phase-out of the remaining ozone-depleting and climate-warming substances;
- Tightening exemptions for essential and critical uses, as well as for chemical feedstocks and process agents;
- Strengthening efforts to combat illegal trade; and
- Regulating HFCs under the Montreal Protocol or under a Montreal Protocol-type regulatory regime so they can be phased-out, rather than traded as one of the six Kyoto basket gases. (HFCs are substitutes for CFCs and HCFC, with high global warming potential. But because they do not have any ozone depleting potential, they were originally left out of the Montreal Protocol and put into Kyoto.)

There are many lessons from the Montreal Protocol that can help us as we negotiate the next climate treaty. I will discuss several later in my testimony.

Other "fast start" strategies.

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[6] *See* Guus J. M. Velders, *et al*., *The Importance of the Montreal Protocol in Protecting Climate*, 104 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 4814 (2007); and Donald Kaniaru, Rajendra Shende, Scott Stone & Durwood Zaelke, *Frequently Asked Questions: Strengthening the Montreal Protocol by Accelerating the Phase-Out of HCFCs at the 20th Anniversary Meeting of the Parties*, in Donald Kaniaru, Ed., THE MONTREAL PROTOCOL: CELEBRATING 20 YEARS OF ENVIRONMENTAL PROGRESS – OZONE LAYER AND CLIMATE CHANGE (Cameron May 2007).

[7] *Id.*

Other "fast start" strategies include energy efficiency. The June 2007 *G8 Summit Declaration* states that "Improving energy efficiency worldwide is the fastest, the most sustainable and the cheapest way to reduce greenhouse gas emissions and enhance energy security … [and] could contribute to 80% of avoided greenhouse gases while substantially increasing security of supply."[8] Energy efficiency also has strong co-benefits, including lower operating costs, lower conventional air pollution, and increased energy security. These strong co-benefits can contribute to the sustainable development agendas of developing countries, and help us become more competitive globally, even as we become more sustainable.

Another "fast start" strategy is to reduce black carbon, or soot from industrial pollution. Dr. Hansen says black carbon air pollution may be the second most important contributor to climate change.[9] Black carbon contributes to climate change in two ways. It is an aerosol that traps heat. And when it is washed out of the atmosphere by rain and snow and is deposited on snow and ice, it changes their reflectivity, or albedo. When snow and ice become darker, they absorb more heat, and further accelerate global warming, contributing to the record ice melts we are now observing.

Black carbon also contributes to air pollution linked with up to a million deaths per year in China alone. Cleaning up black carbon will bring both immediate climate mitigation, and immediate health co-benefits, especially in the developing world. But black carbon does not appear to be on the world's climate agenda, and was not discussed at Bali.

Another "fast start", and low tech, strategy, is to improve the management of the world's forests. If we can balance tree planting with tree harvesting—that is, if we can manage our forests in a sustainable way—we can solve 20% of the climate change problem. Forests also are important for adaptation, and tree planting along the coast of FSM would provide an important buffer against tidal surges and would enhance food security.

One neglected aspect of forest management is bio-char, also know as *terra preta*, black soil that stores tremendous amounts of carbon.[10] Originally practiced by the Amazonian Indians, bio-char

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[8] *G8 Summit Declaration*, at ¶¶ 46 and 62 ("62. The global potential for saving energy is huge. According to the International Energy Agency, successfully implemented energy efficiency policies could contribute to 80% of avoided greenhouse gases while substantially increasing security of supply."); *see also* Stephen Pacala and Robert Socolow, Stablization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies, 305 Science 968 (13 August 2004) at 968-69 ("Improvements in efficiency and conservation probably offer the greatest potential to provide wedges [to reduce climate emissions].").

[9] Reducing emissions of black carbon may be "the most effective way we know to retard Arctic warming." Charles Zender, Testimony for the Hearing on Black Carbon and Climate Change, U.S. House Committee on Oversight and Government Reform 6 (18 October 2007). *See also* Mark Z. Jacobson, Testimony for the Hearing on Black Carbon and Climate Change, U.S. House Committee on Oversight and Government Reform 12 (18 October 2007); S. Menon, J. Hansen, L. Nazarenko, and Y. Luo, *Climate Effects of Black Carbon Aerosols in China and India*, 297 SCIENCE 2250-2253 (2002); J. Hansen and L. Nazarenko, *Soot Climate Forcing via Snow and Ice Albedos*, PROC. NATL. ACAD. SCI. U.S.A. 423–428 (2004); IPCC, Fourth Assessment Report, Work Group I Report "The Physical Science Basic", Chapter 2: Changes in Atmospheric Constituents and in Radiative Forcing 163 (2007) *available at* http://www.ipcc.ch/ipccreports/ar4-wg1.htm.

[10] In 2007, Sen. Ken Salazar (D. Col.) introduced the Harvest Energy Act of 2007 (S. 1884), which provides $50 million in competitive grants, equally distributed across fiscal years 2008-2012, to fund the development of bio-char production systems on multiple scales.

is produced by the low-tech process of burning organic matter in the presence of little or no oxygen. Bio-char, the major byproduct of this process, is then plowed into the soil, increasing soil productivity while storing the carbon from the organic matter for hundreds to thousands of years. A leading expert at Cornell University reports that if we replaced slash-and-burn agriculture with slash-and-char, we could reduce global carbon emissions by 12%.[11]

Enhanced growth of coral reefs also should be expanded, and, along with efforts to protect coral reefs, should be eligible for credits under the Clean Development Mechanism.[12]

For FSM in particular, our highest priority for a "fast start" strategy is achieving energy independence by replacing oil-burning generators with clean energy technologies. The Compact earmarks US grant support in the environmental sector grant for this purpose, and makes available to FSM US "projects, studies and conservation measures" for alternate energy development.[13] This should begin with the development of a National Action Plan for Adaptation, and FSM feels it would be appropriate to look to the US for financial and technical support for such a plan, due to our common goals of long-term security in the region.

There are many other "fast start" strategies, including some already underway, such as the US EPA's Methane-to-Markets strategy, and its strategy for addressing PFCs from aluminum smelting. Japan and the European Union also have many fast start strategies under way or under review.

All need to be accelerated, with further funding, more capacity building, more pilot projects, and other aggressive strategies for spreading the best practices to reduce climate emissions throughout the world, focusing on those with the fastest mitigation potential, and the strongest co-benefits for developing countries.

Other benefits of "fast start" strategies.

In addition to keeping us from passing the tipping point for abrupt climate change until we can develop and deploy the mid and long-term climate solutions, "fast start" strategies will help us gather concrete data regarding the technology, cost, and management skills associated with these strategies—information that we will need to have in order to deploy such strategies on a global scale. At the Bali talks, this kind of concrete data was generally missing, and the Parties too often were left with only rhetorical statements.

"Fast start" strategies also will let us build stronger working relations with partners around the world, including scientists, engineers, and managers in the private and public sector, as we work together side-by-side to solve concrete climate problems. This will help us build the trust and confidence we need to reach our more ambitious goals in the future, including the possibility that

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[11] Johannes Lehmann and John Gaunt, Marco Rondon, *Bio-char Sequestration in Terrestrial Ecosystems – A Review*, MITIGATION AND ADAPTATION STRATEGIES FOR GLOBAL CHANGE, 11: 403-427, at 1 (Springer 2006).

[12] Pandolfi, *et al*., *Global Trajectories of the Long-Term Decline of Coral Reef Ecosystems*, SCIENCE, Vol. 301, no. 5635, pp 955-958 (15 August 2003); and Coral reef destruction: the causes of coral bleaching. http://www.libray.thinkquest.org.

[13] U.S. Public Law 108-188, amended Compact , section 221(e).

we may have to move to carbon-negative strategies someday, *i.e.*, more than a 100% reduction in emissions—something we'd do well to study and experiment with now.

Other lessons from the Montreal Protocol ozone treaty.

As the most successful environmental treaty, and the most successful climate treaty—so far—the Montreal Protocol needs to be studied carefully so we can learn why it has been so successful in phasing out 96 chemicals in more than 240 industry sectors. We need to bring these lessons of success into the climate negotiations, as soon as possible.

Micronesia co-sponsored a seminar in Bali on the lessons of the Montreal Protocol for climate change, along with Argentina, Sweden, and the United States. A report on the key lessons appeared on February 15, 2008, in UNEP's *OzoNews,*[14] and can be summarized as follows:

First, the climate problem is not one big problem with one big solution. It is a series of discrete problems, with discrete solutions. It is important to disaggregate the climate problem by breaking it down into manageable pieces, so that governance measures—including Montreal Protocol-type regulatory measures—can be tailored to fit the specific source, sink, or sector. This will allow us to focus on the specific technology needed for the specific part of the problem, and to identify the specific countries that must reach an agreement in order to make the solutions work. Only a relatively small number of countries are needed to negotiate the best climate governance system for aluminum, for example, or for steel.

Second, the Montreal Protocol follows a "start and strengthen" approach, with a governance system that is dynamic and evolutionary, that learns by doing, and that can be quickly strengthened through a unique "adjustment" procedure that allows Parties to accelerate by consensus the control measures that apply to chemicals already regulated. Such treaty adjustments take effect in 6 months without ratification in capitals, with the option for Parties to affirmatively opt out. This approach will be important for climate governance as well, and could incorporate the "fast start" strategies recommended here, even as the broader climate treaty is being negotiated.

Third, the Montreal Protocol is a governance system that treats all Parties fairly and that fully implements the principle of common but differentiated responsibility, through a 10-year grace period for developing country phase-outs, a dedicated Multilateral Funding mechanism with a democratic decision-making procedure (i.e., equal representation from developing and developed country Parties, with a majority of each group required for decision), and a 3-year replenishment cycle to pay agreed incremental costs, which are calculated through an independent assessment by the Montreal Protocol's Technology and Economic Assessment Panel (TEAP). The principle is further supported by a spirit of cooperation and trust developed through 20 years of success. Future funding mechanisms to assist developing countries adapt to and mitigate climate change should be informed by and modeled after the Montreal Protocol's Multilateral Funding

[14] *See also* http://www.igsd.org/ (containing select PowerPoint presentations from Bali seminar on lessons of Montreal Protocol for climate negotiations).

mechanism.[15] Funding for national climate focal points should be provided, as is done by the Multilateral Fund, to ensure the rapid diffusion and absorption of technologies needed for mitigation and adaptation. The US and other donor countries also should have the option of providing a percentage of their funding bilaterally, as is done under the Montreal Protocol Multilateral Fund, with a portion of this funding dedicated to small island developing States, which are the most vulnerable developing countries.

Fourth, the Montreal Protocol Parties are kept up to date by the best available, real-time information, including unpublished information, on science, technology, and the economics of ozone-friendly technologies and their accessibility. This done through annual reports prepared by the TEAP, and their Technical Options Committees (TOCs). The success with this approach suggests the following lessons for climate negotiations:

- The IPCC takes four years to prepare its assessments, and should be supplemented with an annual process like the TEAP;
- Sectoral technical options committees (TOCs) should be set up for the most significant sources, sinks, and sectors;
- Reports of the TEAP and TOCs should be placed before the Parties without any editing from governments;
- Both regulatory measures, like Montreal's phase-outs, and market-based measures, like cap-and-trade, are needed to solve pieces of the climate problem, and these two types of governance approaches need to be coordinated to avoid perverse incentives (such as the perverse incentive under the Kyoto's Clean Development Mechanism which is encouraging expanding production of HCFCs to earn credits for destroying the HFC-23 by-product.); and
- The Montreal Protocol's successful approach to compliance is based on providing compliance assistance to help Parties achieve the mandatory targets and timetables of the ozone treaty, with trade sanctions as a backup for willful non-compliance. The full range of compliance approaches should be considered during the climate negotiations, including the possibility of sanctions for willful non-compliance, for example, fines or penalties that are dedicated to adaptation.

The need for a strong governance platform that can be scaled up quickly as "political will" grows.

"Political will" for climate governance comes from science showing us a preview of the future if we do not act responsibly today. It comes from educating the world's policymakers, and ultimately the citizens of the world, through our universities, think tanks, and non-governmental

[15] *See generally*, Stephen O. Andersen, K. Madhava Sarma, and Kristen N. Taddonio, TECHNOLOGY TRANSFER FOR THE OZONE LAYER: LESSONS FOR CLIMATE CHANGE (Earthscan 2007), and Donald Kaniaru, ed., THE MONTREAL PROTOCOL: CELEBRATING 20 YEARS OF ENVIRONMENTAL PROGRESS – OZONE LAYER AND CLIMATE CHANGE (Cameron May 2007); *see also A Tale of Two Cities: Lessons for Climate Negotiators*, by Romina Picolotti, Argentina's Minister of Environment, *MEA Bulletin*, Issue No. 37 (29 November 2007) (" A key role of modern environmental law is to harness and direct the power of optimism as well as fear, thus driving markets to a tipping point where they necessarily innovate and provide the environmentally superior solutions we need – essentially, a Moore's Law for climate solutions.).

organizations, and through the growing climate sophistication of the global media. It comes from engineers and venture capitalists who can envision future markets for clean energy and other climate friendly technologies and products, and who can show policymakers and citizens that solutions will come faster if policymakers build strong yet flexible governance structures.

Political will also comes, even for the skeptics, from the physical impacts themselves, as the climate system shows us its increasingly unstable and violent side. But by then it may be too late for many of the low-lying countries of the world, including Micronesia.

But political will also comes from leadership, and we are optimistic about climate leadership in the US, including from Congress, as this hearing shows. Strong leadership from the US is key to strong international commitments in the Bali treaty process under the UN. This leadership can come from the next US President, or it can come from the US Congress. We hope it comes from both.

US leadership can be the catalyst for a tipping point in climate governance, which in turn can produce a tipping point in technological innovation—the equivalent of Moore's Law for computer technology, [16]but in this case for clean energy and other climate friendly technologies.[17]

This is what we need, and this is what we know the US, more than any country in the world, is capable of providing, including leadership for the "fast start" strategies needed to avoid abrupt climate change.

Thank you.

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[16] Gordon Moore, the co-founder of Intel, predicted in 1965 that computer chip capacity would double ever two years; this is known as "Moore's Law." *See* http://www.intel.com/technology/mooreslaw/index.htm.

[17] *See generally*, Stephen O. Andersen, K. Madhava Sarma, and Kristen N. Taddonio, TECHNOLOGY TRANSFER FOR THE OZONE LAYER: LESSONS FOR CLIMATE CHANGE (Earthscan 2007), and Donald Kaniaru, ed., THE MONTREAL PROTOCOL: CELEBRATING 20 YEARS OF ENVIRONMENTAL PROGRESS – OZONE LAYER AND CLIMATE CHANGE (Cameron May 2007); *see also A Tale of Two Cities: Lessons for Climate Negotiators*, by Romina Picolotti, Argentina's Minister of Environment, *MEA Bulletin*, Issue No. 37 (29 November 2007) (" A key role of modern environmental law is to harness and direct the power of optimism as well as fear, thus driving markets to a tipping point where they necessarily innovate and provide the environmentally superior solutions we need – essentially, a Moore's Law for climate solutions.").