



## **Ecosystems and People of the Pacific Ocean -**

### **Threats and Opportunities for Action:**

#### **A Scientific Consensus Statement**

#### **Executive Summary:**

The people from around the Pacific Ocean, from the Arctic to Antarctic, from countries populous and sparse, are witnessing a decline of the Pacific Ocean's vast resources and in the ability of people to use those resources. Pollutants, nutrient and sediment run-off from land, overfishing, habitat destruction, and climate change emerge repeatedly as the major causes. Though this wide-spread similarity of threats across the Pacific Ocean is alarming, it also provides the opportunity to craft solutions that target pan-Pacific problems and therefore provide hope to hundreds of millions of people who rely on the Pacific Ocean and its ecosystems.

#### **The Pacific, Covering Half the Global Ocean**

The Pacific Ocean is the largest single geographic feature on our planet. It represents half the world's ocean area, occupies one-third of the earth's surface, and helps support hundreds of millions of people. The Pacific Ocean contains complex ecosystems and supports ocean-based economies that produce a wealth of resources for local and global benefit. The Pacific is also the engine room of Earth's climate and the storeroom of its ocean biodiversity. However, Pacific Ocean is not being managed sustainably. A host of interacting impacts threaten the future of the human communities around it, the future of life within the Pacific, and the future of our global climate.

#### **A Complex Ocean, a Common Crisis**

The Pacific Ocean supports much of the world's marine and terrestrial biodiversity. Threats to the Pacific's ecosystems and to communities that depend on its bounty continue to intensify as its resources are over-harvested, and sediments, nutrients and chemical pollution pour off the

land. Marine habitats ranging from shallow corals, mangroves and sea grasses to previously inaccessible deep sea beds show decaying health. Some species of large tuna, sharks and turtles have experienced significant declines, marking the progressive depletion of top predators and other large species in the Pacific Ocean. These reductions jeopardize economies, local livelihoods, and food security across the globe. Climate change exacerbates these threats and increases the vulnerability of coastal and ocean ecosystems and resources.

Scientists who study Pacific Ocean ecosystems have worked together to summarize the most important environmental threats to the Pacific Ocean and its people, and to identify opportunities for addressing many of these threats. This consensus statement:

1. Identifies and prioritizes key threats to the health and productivity of the Pacific Ocean - many accelerated by climate change – for which there is broad consensus in the scientific community.
2. Highlights the environmental and socioeconomic impacts of these threats.
3. Outlines a ‘road map’ that identifies available solutions for these broad categories of threats.

Although the threats are serious, it is not too late to take decisive action to prevent almost certain future catastrophes, and that will bolster a critical part of the life of our planet.

### **Threats Facing the Pacific Ocean:**

A review of environmental threats across the Pacific Ocean shows remarkable similarity between the major problems experienced in poor and rich countries alike, in densely settled areas and rural zones, in populous nations and on small islands. Across these diverse areas, three rank as the most pervasive and serious local threats: habitat destruction, pollution from sewage and land run-off, and over-fishing. In addition, climate change imperils all Pacific ecosystems, already creating pulses of warm water, hypoxic dead zones, and acidic conditions. These threats interact with one another to damage natural ecosystems, reduce biological and human economic diversity, destroy productivity, and make human use of the sea more difficult. Each is described briefly below.

Though this summary suggests that the Pacific Ocean faces ecological peril, it also reveals that countries very different in wealth, population, size, and culture face similar problems. The presence of these same dominant threats across the Pacific suggests that effective solutions to these problems will have major beneficial impacts for societies across the Pacific Ocean. These societies form a network of nations and communities connected by the vast Pacific Ocean, joined by their mutual reliance on the ocean, and united in their need and will to repair its damage.

**Pollution:** Organic pollutants from sewage, nutrient pollution from fertilizer run-off, plastic marine debris, toxic dumping and oil spills, urban run-off and dispersed pollutants combine to create one of the most critical classes of ocean threats. Sewage and farm run-off can create dead zones, algal blooms, and acidic areas. Across the Pacific organic pollution can fundamentally alter the basic ecosystem structure, create human health risks, and stresses economies. Plastics and other long-lived industrial products accumulate in vast areas in the North Pacific Gyre and on beaches and shorelines around the Pacific. They clog habitats and strangle seabirds, turtles, sea mammals, and fish, and, in certain areas, outnumber plankton. The rate of breakdown of some chemicals is so slow that they persist for decades. In the case of old fishing gear, nets and long lines continue to fish long after they are lost at sea. Toxic chemicals, oil and run-off debilitate coastal marine life, reduce birth rates, and create hormonal disruption.

**Habitat destruction:** Productive marine habitats are lost to destructive fishing practices, poor agricultural land use, inappropriate coastal development, and industrial wastewater. Destructive fishing, including coastal trawling, the use of dynamite or poisons, and indiscriminate netting, can destroy habitats and reduce fishery productivity. Land use practices that create erosion, or eat up mangroves and smother sea grass beds reduce coastal ecosystem health and impair local productivity. Poorly designed development projects for tourism, roads, housing, urban centres, and aquaculture needlessly destroy coastal habitats across the Pacific and limit livelihoods that depend on ecosystem productivity.

**Overfishing and exploitation:** Unsustainable resource use reduces fish stocks throughout the Pacific, limiting fish catches and often causing ecological shifts that further reduce biodiversity and productivity. Over-hunting of herbivores results in uncontrolled growth of algae and seaweeds, which can smother corals and other bottom-dwelling organisms. Fishing on the high seas for top predators such as sharks has made these creatures rare across the Pacific. International tuna fleets often fish unsustainably in waters controlled by small countries, strip stocks to low levels and move on. Bycatch further reduces fish stocks because large numbers of non-target species with low economic return are discarded as waste back into the ocean. Artisanal and recreational fishing suffer when local needs outstrip local supply, causing displacement of fishing activity, reduced income and insecure food supply. Habitat destruction exacerbates overfishing by reducing fishable area and productivity.

**Climate change:** Pacific countries have already seen strong effects of ocean warming, changes in ocean circulation and abrupt shifts in precipitation patterns. The bleaching and subsequent death of reef-building corals caused by warm water pulses have destroyed reef ecosystems, or required decades to recover. Shifts in ocean and atmospheric currents have created massive dead zones or changed migration patterns of whales and seabirds. Some ocean areas have already acidified to levels known in laboratory studies to cause harm to ocean life.

In addition, decreasing pH levels due to CO<sub>2</sub> acidosis are shifting the ecological balance of marine plankton and bottom dwelling species that form calcium skeletons. The rates of current environmental change far outpace anything seen in human history, and are likely to accelerate in the near future. These new conditions present serious challenges to the Pacific Ocean Community for the next decades or centuries. Many areas of the Pacific Ocean may become uninhabitable due to sea level rise, coastal inundation, shifting rainfall, collapse of fresh water supplies, or changes in the migration patterns of food species. These changes will increase the number of impoverished people and reduce the stability of many nation states.

**Multiple stressors multiply harm:** When marine life is subjected to multiple stressors, such as pollution, habitat destruction, over-fishing, and changing climate, populations of ecologically and economically important species can collapse. From coral reefs to kelp forests to cold water deep seas, an increase in harm and a decrease in growth and reproduction can wipe out once productive communities. In this sense, global climate change is coming at the worst possible time, when many communities around the Pacific – both human and ecological – are threatened by other powerful problems.

### **Solutions and options for a better future**

**Maintaining ecosystem health and sustainability should be as fundamental a goal as economic development.** While there are currently no solutions in place to solve all these problems across the Pacific Ocean, a set of sensible approaches to pervasive environmental problems can be deployed in a concerted way to limit and even reverse environmental harm, returning Pacific ecosystems and communities to greater health. Overall, solutions must significantly reduce pollution from human sewage, sediment and run-off from poor land use practices, flows of debris and toxic material into the sea from point and nonpoint sources, and unsustainable extraction of marine organisms. Major reductions (some up to 95% of current rates) are probably required in discharges of nutrients and sediments from land to sea.

**New technologies, innovative market mechanisms, and financial tools that promote adoption of sustainable practices can empower local communities, help maintain the cultural richness of the Pacific Ocean nations, and reduce the human footprint on the Pacific.** In many cases, the straightforward response to an environmental problem (such as pollution or habitat destruction) might be simply to prohibit the human activities that cause the pollution or habitat loss. But for large and complex problems such as those that span the whole Pacific, learning *how* to stop or alter the activities that give rise to these problems is the key to a set of enduring environmental solutions. Strategic changes that can lead to effective solutions include incorporation of ecological principles in economic decisions, use of financial and market instruments such as environmental bonds, legacy trusts, catch share programs, and

tax systems to create incentives for activities that promote rather than degrade ecosystem health, and environmental education across the age spectrum to build capacity for local populations in ecosystem and economic management.

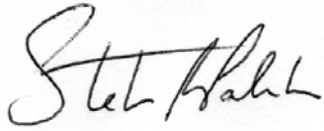
**Climate change mitigation is a global task, and yet a united Pacific can be instrumental in promoting frank global dialogue about establishing and achieving mitigation targets.**

The long term health of Pacific ecosystems and human communities across the ocean requires aggressive mitigation of global greenhouse gas emissions. Key to the solution is the observation that the Pacific contains some of the highest and lowest emitting countries.

**In addition to mitigation, each region within the Pacific must adopt sustainable adaptation strategies for ecosystems and human communities in the face of climate change.** Though these strategies will need to be locally tailored, they can draw on similar principles to solve common problems. For example sea level rise will impose different challenges for highly urbanized coastal communities than for rural areas, but both geographies can consider a common range of adaptation options to achieve some protection for vulnerable human settlements and ecosystems.

**Effective and enduring solutions require capacity-building within the Pacific Ocean Community and integrated problem solving.** The solution to the spatial and economic challenges in sustainable management of the Pacific Ocean lies in collaboration at many levels, including social, scientific, regulatory, institutional, and information technologies. To help promote sustainable change in how communities across the Pacific interact with their common ocean, we propose a new executive institution – one that joins banking, industrial, ecological, and educational expertise into a single collective enterprise that can help build capacity within and advise Pacific nations and evaluate overall progress. Combining financial, livelihood, conservation, and educational goals and functions into a collaborative institution would encourage managers and decision makers to examine and address issues across the larger whole, and cultivate the integrated ecological, economic and education understanding and problem solving that progress requires. Pacific Ocean countries need to coordinate their expertise, creating open access online information systems, for example, for education, research, and resource management. A Pan-Pacific Century Trust could provide economic resources and management knowledge for the entire Pacific community, and could deliver education and expertise in how to apply sustainability principles to economic development.

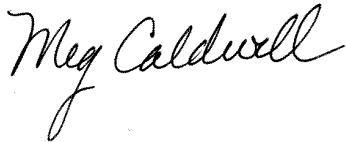
**We must act now.** The best science indicates that over the next century we can expect to see dramatic declines in the health of the Pacific Ocean, its ecosystems, and the people that rely on this shared resource, unless concerted and prompt action to address known threats is taken. Identifying common problems, uncovering their underlying causes, and addressing them now may allow the Pacific nations to enter the next century as world leaders in the creation of vibrant, intact and highly functioning economically and ecologically sustainable communities.



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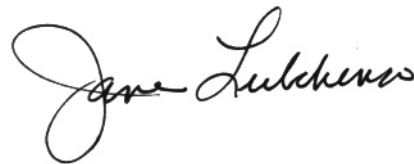
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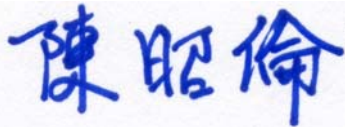
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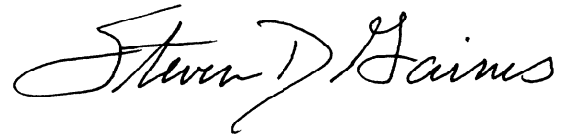
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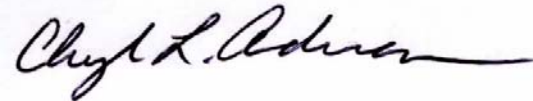
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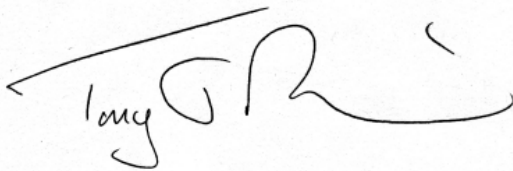
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