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Working toward a More Valuable Ocean: Concepts and Ideas from Thinkers and Doers

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INTRODUCTION

Lisa Emelia Svensson and Linwood Pendleton

Environmental policy is often considered an economic cost rather than an economic value. Although the costs of repairing the environment are often calculated and incorporated into decisions, the economic values of lost ecosystem services rarely are. By better defining the economic values of the services provided by ecosystems and integrating these values in the economy, we will be better equipped to sustainably use these ecosystems and, in turn, increase their capacity. In December 2013, the Swedish government and Duke University hosted a meeting for decision makers, “big thinkers,” and practitioners to discuss how innovative policy making and new business models can augment the value of natural capital in our seas and estuaries.

The forum at the House of Sweden revealed the degree to which businesses, governments, and multinational organizations are tackling the challenge of improving ocean health while improving human wellbeing and increasing returns to human enterprise. Businesses large and small are finding new ways to turn environmental challenges into opportunities for profit. Governments are starting to reflect the value of ecosystem services in financial statements and political considerations—Sweden will do so by 2018. Multi-lateral agencies, such as the World Bank, have embarked on new—some would say bold—initiatives to harness the power of business and the natural capital of ocean and coastal ecosystems.

These short essays highlight keynote remarks from the House of Sweden’s ocean forum. Together, they reflect public and private sector perspectives on the economic capacity of healthy ocean ecosystems.

Assistant Secretary of State Kerri-Ann Jones describes new initiatives from the U.S. Department of State that are intended to catalyze changes in approaches to sustainable fisheries, marine pollution, and ocean acidification.

Rear Admiral Jonathon White reminds us that even the U.S. Navy is not immune to changes in ocean health. He discusses how these changes affect naval planning and infrastructure. He also offers a forward-looking perspective on how the U.S. Navy’s role as an international first responder to natural disasters is evolving with changing ocean conditions.

The United States is not alone in its pursuit of innovative solutions to protect ocean ecosystems. Catarina Heder discusses public and private partnerships fostered by the Swedish Agency for Marine and Water Management. These partnerships nurture new businesses and industries that strive for an innovative green approach to the marine economy.

The World Bank has launched a new program to bridge the gaps among economic development, poverty reduction, business innovation, and healthy oceans. World Bank senior economist Pawan Patil discusses the program and the multi-billion dollar portfolio the Bank has designated for healthy ocean initiatives.

One business taking the lead in innovative ocean technologies is Swedish shipping giant Stena. Claes Berglund, Director of Public Affairs and Sustainability at Stena, highlights efforts in the shipping industry to clean up the way ocean fleets are powered.

Two long-time ocean advocates contribute personal perspectives on threats to ocean health. Mikael Karlsson sees new hope for combatting these threats in emerging governance in the European Union and the Baltic region. Tundi Agardy reflects on the move toward ocean management that seeks to directly address the economic and human values associated with ocean and coastal ecosystems. Agardy, like Karlsson, questions whether the push to *quantify these values* is distracting us from the obvious steps we can take now to *increase them*.

These short essays suggest the rich breadth of ideas for combining the powers of businesses, governments, and other entities to catalyze the natural wealth of oceans and estuaries.

OCEAN SUSTAINABILITY: U.S. PERSPECTIVES

Dr. Kerri-Ann Jones, Assistant Secretary, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State

Oceans are receiving increased attention in Washington these days. President Obama has placed ocean policy high on his agenda. He signed an Executive order in July 2010 that established a National Ocean Policy that defines the Administration's position on relevant ocean issues, including Coastal and Marine Spatial Planning, and established the National Ocean Council. All U.S. agencies are now following the National Ocean Policy's Implementation Plan that was issued in April of this year.

Oceans also are a major interest of Secretary of State John Kerry. The first major policy speech he gave when he arrived as Secretary was on marine protected areas, and soon thereafter he asked my bureau to plan a major oceans-related conference that would bring together key leaders and experts to discuss a series of oceans topics. We've entitled our conference, "Oceans under Threat: Charting a Sustainable Future."

The oceans and their resources are critical to the well-being of all of us. But the oceans are in trouble, and it is vital that we all recognize and face together the pressing and growing threats to the health and sustainability of the oceans. The United States, like many countries, has an intimate connection to the oceans. Our economy and our identity are firmly embedded in our ocean heritage and resources. As recognized in our National Ocean Policy, America's stewardship of the oceans is intimately linked to our national prosperity, the health and well-being of our people and of our environment, and our foreign policy.

The oceans and their resources are critical to the world community. Oceans cover almost three-quarters of our planet. They regulate our climate and our weather. Over one-third of the world's population lives in coastal areas, and more than one billion people worldwide rely on food from the ocean as their primary source of protein. Many jobs and economies around the world depend on the living marine resources in our oceans.

But the oceans are in trouble. A number of critical fish stocks have declined, some to the point of collapse. In many regions, corals are dying, leaving bare skeletons of reefs that can't support fish or protect coastlines. Run-off from land and harmful algal blooms have sapped the oxygen from water, creating marine dead zones around the world where fish and other marine life cannot thrive. Our oceans are becoming littered with debris, threatening marine life and in some places concentrating in massive "garbage patches." The oceans are absorbing carbon dioxide from the air, changing the very chemistry of the water and threatening the food webs of the oceans.

Still, there are ways to respond to many of these challenges that inspire us in the work we do every day to better manage the ocean. Through partnerships and collaboration among governments, the private sector, research institutions, and NGOs, through innovation, and with the political will and the right policies, we can address these challenges.

Examples of on-going efforts include the Port States Measures Agreement. This agreement has been signed by many nations, and once in force will help ensure that illegally harvested fish do not enter the stream of commerce. It will prevent the offloading of fish in ports around the world. Another example is

the UN's initiative for a World Ocean Assessment that will provide a valuable scientific baseline to inform ocean and coastal policy and future management decisions.

A key example, and one of great interest to Secretary Kerry, is the international effort to establish marine protected areas (MPAs), following on commitments all countries made at the World Summit on Sustainable Development Year as well as at the Rio+20 conference. The United States and New Zealand have co-sponsored a proposal to establish what would be the world's largest MPA, in Antarctica's Ross Sea. The Ross Sea is a unique ecosystem deserving of protection, in particular to allow for long-term scientific study. Our proposal is based on sound science and has been supported by Sweden and most other members of the Commission for the Conservation of Antarctic Marine Living Resources. Even after many years of sustained effort, the Commission has not agreed to establish this MPA in October, due to the opposition of a very small number of countries. We see a very positive sign for marine conservation that so many diverse countries, including those that fish in the region, are willing to establish this MPA, but unfortunately we are not there yet. The lack of success is frustrating, but it means we must redouble our efforts. We very much hope to resolve the remaining differences and to make progress on this proposal in the near term.

To address the current state of the oceans, much more needs to be done. High-level conferences, like the one we are planning, provide important opportunities to draw attention to the threats facing our oceans and to identify ways to address these challenges. We want to showcase best practices in marine conservation and encourage the participants to promote national and international action to improve the state of the oceans.

Key Oceans Themes: In developing the themes for the State Department's planned oceans conference, we reached out to NGOs and industry. We also worked with Members of Congress, where Senator Whitehouse co-chairs the U.S. Senate Oceans Caucus. Through these discussions and reflecting the Secretary's concerns, we are developing a focus on three broad and important issues, all of which connect to themes you will be exploring here today and tomorrow.

Sustainable fisheries—We know that the health and sustainability of marine fisheries are deteriorating. A significant percentage of key fish stocks are overfished and/or depleted. Illegal, unreported, and unregulated fishing plagues too many fisheries worldwide. Certain fishing practices also cause damage to the ocean itself, including excessive bycatch and destruction of vulnerable ecosystems and habitats. The international community has been striving to grapple with these challenges, with mixed results so far.

On a more positive note, new technologies and partnerships among governments, industries, and consumers offer prospects for improving the state of ocean ecosystems and key fisheries. We hope to showcase the best available science relating to marine fisheries and to highlight some ways to move toward a more sustainable future.

Marine pollution—The global marine environment faces threats of pollution from a variety of land, sea, and air-based sources. It is estimated that 80% of global marine pollution comes from land-based sources. Marine debris, which includes plastics, is one type of marine pollution, and is a global problem that threatens wildlife and presents health and safety concerns for humans. More than 250 different animal species—including seabirds, turtles, seals, sea lions, whales, and fish—have been documented as having ingested marine debris or suffered from entanglement in marine debris.

Nutrient pollution, caused by diverse sources including agriculture, sewage, and wastewater runoff, is a critical problem, because it over-fertilizes marine environments with high concentrations of nutrients, particularly nitrogen and phosphorous, which can produce “dead zones.” It is estimated that there are nearly 500 dead zones in the world’s oceans in which marine life cannot be sustained.

We intend to draw attention to these serious marine pollution issues while also highlighting best practices and innovative initiatives to combat this global concern.

Ocean acidification—Our third theme will be ocean acidification, one of the most pressing issues facing the world’s marine environments. It occurs as oceans absorb increasingly greater levels of atmospheric carbon dioxide. Ocean acidity has increased over 30% since the Industrial Revolution. Studies have shown that a more acidic environment has a dramatic effect on some calcifying species, including oysters, clams, sea urchins, shallow water corals, deep sea corals, and calcareous plankton. When these organisms are at risk, the entire food web may also be at risk.

The U.S. State Department’s Oceans Conference will offer an overview of the status of ocean acidification, highlight affected industries such as shellfish farming, and address new and emerging tools for monitoring this debilitating trend affecting many critical regions of our oceans. This conference represents an important opportunity for international stakeholders to consider further research and cooperative actions to understand and address the pressing acidification issue facing the world’s oceans.

It is only through innovation and collaboration that all stakeholders can address these challenges. With that in mind, I should also mention that we are exploring areas for public-private partnerships as possible ways forward related to some of these themes.

A VIEW FROM THE U.S. NAVY’S CHIEF OCEANOGRAPHER

RADM Jonathan White

The U.S. Navy relies on superior knowledge of the oceans and atmosphere around the world to maintain a war-fighting advantage against any potential adversary in any maritime environment. This knowledge, including the ability to accurately predict dynamic changes on short- and long-term timescales enables us to operate safely and plan effectively. The long-term physical alterations to the world’s oceans due to climate change represent significant risk to coastal infrastructure and oceanic ecosystems, and they will undoubtedly influence local, regional, and global economies.

This risk will drive our future Navy’s infrastructure planning and will likely induce security concerns in oceanic nations, including ones that are already considered as “high-risk for conflict” due to existent geopolitical and economic instability. The ability to accurately plan for the impacts of changing oceanographic conditions, to include sea-level and chemical composition, will enable the U.S. military (and our allies) to better prepare and respond to future threats and crises.

Our changing climate and global ocean can legitimately be characterized as a “Revolution in Human Affairs.” Such revolutions are not new, but are usually recognized only in retrospect. From Noah’s Ark to the Industrial Revolution to the Information Age, the human race has experienced numerous events or innovations that have revolutionized the course of history. Ongoing climate change portends just such a revolution, as the world that we know today will be quite different by the end of this century. The economic impacts of this change will be numerous:

- An Arctic Ocean that is open for extensive summer and fall periods for transit; resource exploitation, fishery expansion, tourism, etc.
- Coastline reconfiguration and resulting loss of infrastructure, displaced populations, changes to fish habitats (as well as other oceanic food sources)
- Increased catastrophic weather events, including more frequent and more dispersed droughts and floods.

- Damages to oceanic and estuary ecosystems by ocean acidification (caused largely by absorption of anthropogenic carbon) – representing extensive modifications to food sources.

The developed nations of our world have the opportunity to prepare for these changes, and to prevent or minimize the extent of geo-political and economic upheaval. We must realize that even with dramatic changes to industrial activity to mitigate the ongoing climate changes, the changes that will occur over the next century are largely unstoppable as the momentum of processes in place is too great to reverse for many decades. Thus we must adapt and evolve as a global society. As Charles Darwin is often paraphrased: “It is not the strongest of the species that survives, nor the most intelligent, it is the one that is the most adaptable to change.”¹

The road to success can be characterized by five “Ps”—Partnership, Prediction, Publicity, Preparedness, and Prevention.

Partnership: Whether along traditional organizations such as the United Nations, G8, G20, etc., or through the establishment of global and regional “coalitions of the willing,” individuals must commit to work together across international, intergovernmental, and public-private boundaries in all facets of this matter. Outside of wartime, this has never been done effectively. Leadership is the most important, and likely the most difficult part of these partnerships to determine.

Prediction: The partners must generate the most accurate and highest resolution (spatially and temporally) predictions on specifically what changes to our oceans are anticipated and where, and all must agree to use these predictions for planning.

Publicity: Effective marketing is key to bringing the world together; publicity is the only means by which effective partnerships will be generated in advance of crises.

Preparedness: Partners must cooperatively invest scarce resources to ensure the highest risk nations and regions are prepared for anticipated changes to the greatest extent feasible. This should include the establishment of legitimate metrics for humanitarian assistance efforts toward this end.

Prevention: The above steps, which are incredibly complex and difficult, can enable us to move from a disaster response mindset to a disaster prevention mindset – the key measure of success in the long run, and perhaps survival.

The U.S. Navy, as a partner and leader in the global ocean community, should be considered as a major partner in these efforts. Our considerable investment in research and operational prediction of ocean conditions is unparalleled. As a Global Force for Good, we stand ready and willing to participate.

ENVIRONMENTAL CHALLENGES IN OCEANS AND WATERS DEMAND INNOVATIONS

Catarina Hedar, Swedish Agency for Marine and Water Management

Coastal regions are tremendously important for Europe’s economy—and for Sweden’s economy. Approximately 40% of the EU’s population lives within 50 km of the sea. Almost 40% of EU gross domestic product (GDP) is generated in these maritime regions, and a staggering 75% of the volume of the EU’s foreign trade is conducted by sea. However, this important role played by our coasts has come at

¹ L. Megginson. “Lessons from Europe for American Business,” *Southwestern Social Science Quarterly* (1963) 44(1): 3–13, at p. 4, noted by Nick Matzke.

a cost to the environment, as a European Environmental Agency report, *Balancing the Future of Europe's Coasts*, makes clear.

We all know that the ecological health of the Baltic Sea is in a critical state due to eutrophication, hazardous substances, and overfishing, but the region is well positioned to find solutions.

The objective of the Swedish Agency for Marine and Water Management, SwAM, is to turn problems into opportunities, and to look at the sea as a sustainable resource. To achieve results and reach goals in our environmental efforts, it is essential that innovation and collaboration across borders occur. The agency's mandate is broad and diverse, one of its core tasks is to regulate fishing and develop guidelines for how marine environments and streams may be used, for example in the case of wind and water power. We also play an important role in the continuous development of blue growth, and within the field of social and environmental economics, concentrating on the sea, waters, and coast.

One possibility for obtaining a balance between human impact and maintaining or improving marine and aquatic environments is for environmental technology solutions to be developed and applied to specific uses.

One of our reports—*Create a Better Water Environment While Making Money: Is That Possible?*—asks if creating a better water environment is both profitable and possible. For the report, SwAM conducted a series of interviews in which that question was posed. And the answer is: yes, it's profitable and possible. More than half of the companies interviewed for the report said that they would be more profitable if we, the governmental agencies, demanded higher environmental standards and stronger regulations. By doing so, we could possibly help open a market for sustainability.

Two companies that represent the shift toward profitable environmentalism include Waves4power and Tech Market. Waves4power creates energy from the waves. Tech Market focuses on phosphorus recovery and the removal of hazardous substances from bottom sediments.

There are also other interesting concepts, for example, oxygenation of the dead seabed. There is a large area in the Baltic Sea, the size of Denmark, which is dead. Boxwin is a project constructing a prototype to deal with this problem. The concept involves a floating wind turbine that drives a pump that brings oxygen-rich surface water to the lower layers of water to hopefully bring new life into the seabed again.

Another problem that has yet to be solved is the overfishing in the Baltic Sea. Solutions for this include selective fishing gear that distinguishes species and size of fish.

Harvesting algae for biofuel or even as food is a concept encouraged by SwAM. Tests for algae production are taking place in the south of Sweden.

We also need alternative solutions to current anti-fouling paints. Imagine a solution where you can get an alert via text message when the barnacles begin to accumulate on a vessel's hull, making it time to scrub the boat. You could take care of your boat in an environmentally friendly manner and reduce the use of antifouling paints.

Another interesting concept supported by SwAM is the Clean Shipping Index (CSI), a business-to-business tool for cargo owners to select clean ships and quality ship operators. Transport buyers use it to calculate and minimize their environmental footprint. Ship owners present the environmental profile of their fleets to a network of large customers who then consider the profiles in procurement situations. The aim is a market demand for clean ships. CSI is driven by a non-profit organization.

Pilot studies are important to innovation. We have to get new systems in place and have them tested on-site. There is good research out there that's yet to be tested, and we need to create the appropriate prerequisites to see it through.

The role of an agency like SwAM is to help the invisible hand move the market in the right direction. SwAM supports innovation to accelerate the transition to a sustainable society.

Although the environment in the Baltic Sea is under intense pressure, the conditions to tackle the challenges are better here than in many other places.

INNOVATION FOR SUSTAINABLE SHIPPING

Claes Berglund, Director of Public Affairs and Sustainability, Stena AB

All through history and the development of mankind, shipping has played a central role. It is one of the oldest businesses in the world. Meanwhile, the oceans unite people and enable trade—it is a fantastic resource.

Shipping is an important enabler of world trade and thereby the increased distribution of wealth. Shipping has employees from all over the world and is truly a global business that most of us are proud to be a part of. It is also the safest and the most environmentally friendly mode of transport.

Stena is a diversified family-owned business based in Sweden. Today, Stena is involved in offshore drilling, property, finance, technical and environmental services, and shipping. Innovation, care, and performance are our key values and are part of our success.

The shipping industry operates some 80,000 ships. The International Maritime Organization (IMO) is the governing body over this industry. States and the industry itself work side by side to improve shipping as a whole, especially when it comes to safety and environment. The soon-to-arrive Ballast Water Convention, which identified a problem with invasive species and was addressed by the IMO, is a good example of this drive. It is also worth noting that the shipping industry is the only industry with a global regulation for carbon dioxide emissions. It regulates what type of ships we are allowed to build and requires that all ships have an energy efficiency plan.

The rise in oil prices has made investments in energy efficiency a paramount activity. Fuel saving is thus on the top of the agenda of every shipping company today. The focus here is on technical improvements such as hull shape, propeller blades, and on operational changes including slow steaming and improved information on fuel consumption on the bridge. The result of these efforts is substantial. Our studies show that the carbon dioxide emissions from shipping in the North Sea have been reduced by approximately 25% since 2008. This has been accomplished solely through competition within the shipping sector and by industry response to customer needs.

As an industry, we face a new energy challenge. It's time to look for a new fuel again. Today most ships run on heavy fuel oil—a residual substance at refineries as compared to the different fine distillates that supply cars and aircrafts. Tighter regulations for cars and lorries have resulted in even dirtier fuel for ships. Although being the most environmentally friendly mode of transport, maritime shipping cannot and should not be excluded when it comes to environmental improvements.

Natural gas is a comparably clean fuel. It is also quite cheap. The problem is that it is very hard to transport, unless you are close to a pipeline. This problem can be solved in two ways. First, by lowering the temperature to -163 degrees, which makes the gas a liquid and 600 times smaller in volume. It's called

LNG (liquid natural gas) and is often used to transport natural gas where it can later be turned into gasified natural gas. Natural gas from LNG is increasingly used as a fuel for ships.

The second alternative is to convert natural gas to methanol at the source. Then it becomes a normal flammable liquid. It is possible to produce methanol from many different sources, for example, forest products or waste. It is even possible to make methanol from carbon dioxide and water.

We are looking very closely at these different options, but it's still too early to say whether LNG or methanol will be the choice for shipping.

Shipping is developing with society—and it will continue to contribute to a sustainable world.

THE POWER OF PARTNERSHIP IN IMPROVING OCEAN HEALTH

Dr. Pawan G. Patil, Senior Economist, World Bank Group

Nowhere is the link between poverty and the environment more obvious than in the ocean. The ocean plays a vital role as the planet's life support system. It holds about 97% of our water, it absorbs heat and carbon dioxide, it generates oxygen, and it shapes our weather patterns.

However, the ocean is not a life-support system in the abstract sense. It feeds over a billion people and supports hundreds of millions with jobs and livelihoods. Many of these people are located in some of the poorest coastal and island nations. Over half of the world's economy is produced within 100 kilometers of the ocean.

This is exactly why the World Bank has engaged in the ocean agenda for many years now. If we care about ending extreme poverty by 2030, we cannot ignore the ocean. The ocean is fundamental to the economic well-being and future food security of a huge number of our client countries.

The work we do on natural capital accounting shows the value of a healthy ocean to a country's economic prosperity. Countries tell us they want our help to put in place the laws and institutions needed to better manage their ocean resources for sustainable economic growth. In a changing climate that is already displacing thousands, endangering millions, and threatening the development gains that have been so hard won, this is increasingly important.

To give the ocean a fighting chance of withstanding climate change, we have to tackle the other issues threatening its health in the meantime—and that means overfishing, destructive and illegal fishing, marine pollution, and the destruction of marine habitats like coral reefs, sea grasses, mangroves, and salt marshes. The good news is that solutions exist for all these challenges. We can act to rebuild fish stocks, protect critical natural habitats, and reduce pollution levels. In fact, an integrated approach to all these threats is the best thing we can do for the health of the ocean while we transition away from carbon-based economies.

At the World Bank Group, our portfolio of support to fisheries and ocean habitat conservation now runs to over \$1 billion, and we are providing another \$5 billion to support pollution reduction and water resource management in coastal areas. We have heard, however, that while a good start, this is not enough.

Through this work, however, we learned that change can happen and when it does, people benefit. There are many examples. We know that our work alone isn't enough. No one organization or country can do what's needed to turn around ocean health on its own. That's why we see partnership as so important.

When the global community comes together to focus on real solutions, the opportunities that emerge are tremendous.

The Global Partnership for Oceans (GPO) is a new way for us to focus on the action needed. The Global Partnership for Oceans, which the World Bank has been stewarding for the past 18 months, is an important platform for the global community to focus on ocean action. The Bank is grateful to over 140 public, private, and civil society partners for their enthusiasm, passion, and expertise, which have been vital to the GPO's evolution.

The partnership seeks to bring public, private, and civil society financial flows together in a way that creates the triple win that we all seek: poverty reduction plus profitable investments in the ocean space for sustainable growth plus conservation for protection of ecosystem services. Rather than simply having all the players "at the table"—we're starting to see a different sort of dynamic emerging through the GPO—one in which the partners own and drive the agenda. Countries needing expertise and financing to achieve declared targets—like Aichi Target 11, poverty alleviation, and inclusive green growth are in the driver's seat of this process.

But no one size fits all: actions and solutions have to be tailored to the local context and adapted based on careful monitoring and lessons. We know this will be hard—any partnership focusing on such a large part of the planet and involving so many countries and groups will be. But after one year of designing this together with many stakeholders, we're really excited about the GPO moving forward.

Together, we can build the momentum and results to solve the global challenge of the oceans and seize the opportunity for countries and the global economy. In partnership, we can unleash the wealth of the ocean in pursuit of a world without poverty underpinned by healthy oceans and the goods and services they provide. We are proud to work as one of many in partnership and believe this is the only way we can turn the tide on ocean health.

MARINE ECOSYSTEM SERVICES BENEFIT US IN SURPRISING WAYS

Tundi Agardy, SoundSeas

Focusing on marine and coastal ecosystem services has great potential for improving the way we approach marine management, steering our use of the sea's resources and space toward sustainability. Why? Simply put, we humans are willing to invest in the protection of nature only when we see it benefits us. New research that identifies and assesses ecosystem services, and estimates their economic value, can focus attention on safeguarding the ecosystems that support, sustain, and enrich us all. Marine ecosystem services provide direct benefits, many of which are only now being recognized. Properly considering the role marine ecosystem services play in human well-being provides us with an approach to management that could lead to vastly improved outcomes.

The loss of ecosystem services is not an esoteric concern shared only by academics and environmentalists. The loss of ecosystem services threatens us all, whether we live on the coasts or inland, whether we are engaged in business or employed by government. Risks are heightened when services are lost: it's not just that fisheries collapse, shoreline destabilization, and exposure to natural hazards, but also risks to traditional livelihoods, to physical health, and to emotional well-being. And given the role of oceans in maintaining planetary balances, in weather, climate, and nutrient cycling, we risk disrupting our entire life support system when we carelessly degrade our oceans.

An ecosystem services approach assists us in scoping the problems facing our oceans and developing strategies to address them (planning), and in policy development, legislation enactment, and implementation of rules and regulations (management). One of the most important facets of this approach is that it is holistic: one cannot identify ecosystem services of value without describing the linkages that connect various elements of nature (species within ecosystems, one ecosystem to the next), and the linkages between natural systems and human well-being. Understanding these linkages is the foundation for ecosystem-based management, improving efficiency, and reducing vulnerabilities to surprises and unintended consequences.

The focus on ecosystem functions of value to humans can also generate the flow of new funds for conservation and management, which are badly needed. Conducting targeted research to support planning, convening parties to negotiate international agreements, monitoring marine areas, enforcing laws, and conducting day-to-day management of marine areas all require significant human and financial resources. Those who directly benefit from effective management— and continued ecosystem services delivery—should view protection of ecosystems as worthwhile business investments, with high rates of return. Demonstrations of new revenue streams generated by private sector investment are cropping up worldwide, but we urgently need to replicate them and bring them to scale.

Paradoxically, recent interest in quantifying ecosystem services can lead us away from making investments that will improve planning and management for these benefits. Rather than generating useful information for rapid uptake by planners and decision makers, some in the scientific community push for a full understanding of ecosystems, ecological processes, social and ecological resilience, and economic valuation of services. This is complicated stuff, sometimes controversial, and always time-consuming. We simply don't have the luxury of time to generate full understanding before we act. Yet we know enough about most of these systems to quickly identify what ecosystem services they provide and how. We know which human activities cause negative impacts that need to be reduced. And we know enough to practice triage: rapidly identifying which coastal and marine (and inland) areas need immediate protection in order to safeguard ecosystems and the delivery of services.

All of this information can be synthesized, and much of it can be mapped. This becomes the basis for spatial planning and for zoning plans that accommodate use but also protect what needs protecting. An ocean zoning plan that is built from solid scientific understanding of how ecosystems function and contribute to the well-being of people and that shows how we can alleviate the pressures that threaten that well-being is the best hope we have for protecting our oceans and our planet.

SUSTAINABLE MARINE GOVERNANCE: LESSONS FROM THE BALTIC SEA REGION

Dr. Mikael Karlsson, President Swedish Society for Nature Conservation (SSNC) and European Environment Bureau (EEB)

Some decades ago in Estonia, I witnessed enormous mining landscapes and huge open waste ponds with tons of radioactive sediments close to the Baltic Sea. Not far away though, national parks and wooden meadows showed a flourishing biodiversity. There was hope amid havoc.

This situation was not unique for post Soviet States. In between beautiful coastal areas, industries all around the Baltic Sea emitted enormous volumes of pollutants. Together with high nutrient loads from agriculture and municipalities, this has made the Baltic Sea probably the most polluted marine area in the world. Adding overfishing, continuous oil spills, high ecosystem sensitivity, limited water exchange with the North Sea and steadily changing politics illustrates the challenges at hand.

Nevertheless, preventive measures were taken quite early, in some nation states and under the 1974 Helsinki Convention for the protection of the Baltic Sea. By then, only Denmark and West Germany were EC members, and the Soviet Union dominated the eastern shores. In spite of the cold war though, HELCOM adopted hundreds of recommendations, including those on several hazardous substances. The effect over time has been lowered levels of toxic substances, such as PCB. Today I see white-tailed eagles quite often, which I couldn't when I grew up. Traditional command and control works.

After the Wall came down, Finland and Sweden joined the EU, which thereby focused more on the Baltic Sea. The Helsinki Convention was revised and strengthened. Multi-level governance flourished, with firms, municipalities, NGOs, and universities collaborating to an unprecedented extent. Ten years later, the Eastern enlargement of the EU made Russia the only Baltic country outside the union. Again, changes followed and EU policies for chemicals, nutrients, and so on were applied more broadly. Opportunities grew for new structures and policies, such as collaborative forums, and directives on marine strategy and spatial planning. HELCOM adopted the 2007 Baltic Sea Action Plan, and the EU developed the Strategy for the Baltic Sea Region. Recently, we have also seen a promising reform of EU fisheries policy, and a clear failure to do the same in the agricultural area.

Based on this review, we can identify and learn from themes and trends for policies.

Structurally, the EU has become increasingly important, but the EU has also promoted regionalization of marine governance. The latter might be seen to cause tensions with Europeanization, but studies show the trends to be mutually supportive.

Looking at policies, we can see a trend from pollution control to risk governance: individual policies have been matched by sector integration, a polluter perspective has been complemented by the ecosystem approach to management, and the dominance of nation states has transformed into a multi-level system, with both local and international, horizontal and vertical governance structures, where policies are uploaded and downloaded. All this risk governance is causing a kind of policy thicket, but so far the many cooks have not spoiled the broth.

This is not to say that the most adequate governance structures are in place, not at all. I think fewer, better coordinated and more comprehensive policies are needed, and I would imagine that EU gradually will replace HELCOM as the focal point.

Even more important than structures is policy content. Here, government, including the EU unit, still counts most in the governance landscape of networks, institutions, and actors. Therefore, public policies will be most important also in the future.

But why are there still huge gaps between objectives and measures?

One hypothesis is that we know too little about the oceans; that we don't see, consider, or account for marine natural capital; and that we have innovation bottlenecks and technological challenges.

Of course, we need more knowledge and data, better models, and natural capital accounting as well as new technologies and tools for stimulating innovation. But I think there are deeper challenges.

We need to ask if science is a key governance bottleneck. In many cases it isn't. A clear example is the huge gap between the science-based recommendations on fish quotas from the International Council for the Exploration of the Seas and the non-science-based decisions made by regulators, grossly exceeding advice and maximum sustainable yields. We also know how to cope with uncertainty. In just the same way as we don't eat unknown mushrooms, we apply precaution, a principle included in the EU treaty and the Helsinki Convention. PCB was banned based on the precautionary principle some two decades before there was full scientific proof of the damage so apparent today in the Baltic Sea, a measure that has saved

many white-tailed eagles, seals, and otters, not to mention huge remediation costs. We also know how to apply precaution when setting fish quotas.

Moreover, we know how to transform environmental capital and pollution costs into monetary values, but asking for full valuation of marine ecosystem services would take ages.

Given these comments, I argue that even more important than describing in various ways what is being destroyed, we need to question the false arguments that environmental policies jeopardize competitiveness, innovation, and employment. Theory and empirical findings rather say the opposite.

So what is the recipe for sustainable governance then? Firstly, we all need to place marine issues higher on the agenda. Secondly, we should emphasise traditional environmental principles. Besides precautionary legislation, the polluter pays principle implies phasing out harmful environmental subsidies, which counteract all other efforts. If the money goes in the wrong direction, so does development. Instead, environmental investments in blue and green capital are needed. Furthermore, pricing can be done with or without a detailed cost-benefit analysis at hand. Taxes on greenhouse gas emissions have been shown to be very beneficial for preventing further ocean acidification. Similar price signals are needed for nutrients and hazardous substances. Thirdly, participation is often crucial, both in policy development processes and in implementation, for instance in fisheries and coastal planning. Public decisions, as such, should be made by those who are elected.

Underneath these measures, more systemic change seems needed—of institutions and values, for example. I am optimistically thinking that we can change even such root causes. I will tell you why.

As a kid, I saw the ocean as robust and enormous. When I grew up, I realized that was not true. Today we find hazardous substances and plastic debris, but smaller and smaller fish stocks, also in the deep sea. But today we also know that neither society is resilient. That makes us vulnerable, but it also enables change, and we have seen a lot of positive change around the Baltic Sea, including in North-East Estonia. This is far from enough, but more than enough to inspire enhanced ambitions.

VIDEO LINKS TO REMARKS

To view videos of our authors presenting their remarks, visit <http://openchannels.org/videos/economics-oceans-conference>. To view remarks of a specific speaker, use the following links:

- **Kerri-Ann Jones**
<http://vimeo.com/channels/oceanecon/81291872>
- **Catarina Hedar** (At minutes: 4:00-10:00)
<http://vimeo.com/channels/oceanecon/81281745>
- **Pawan Patil**
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- **Tundi Agardy** (At minutes 9:00-17:00)
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