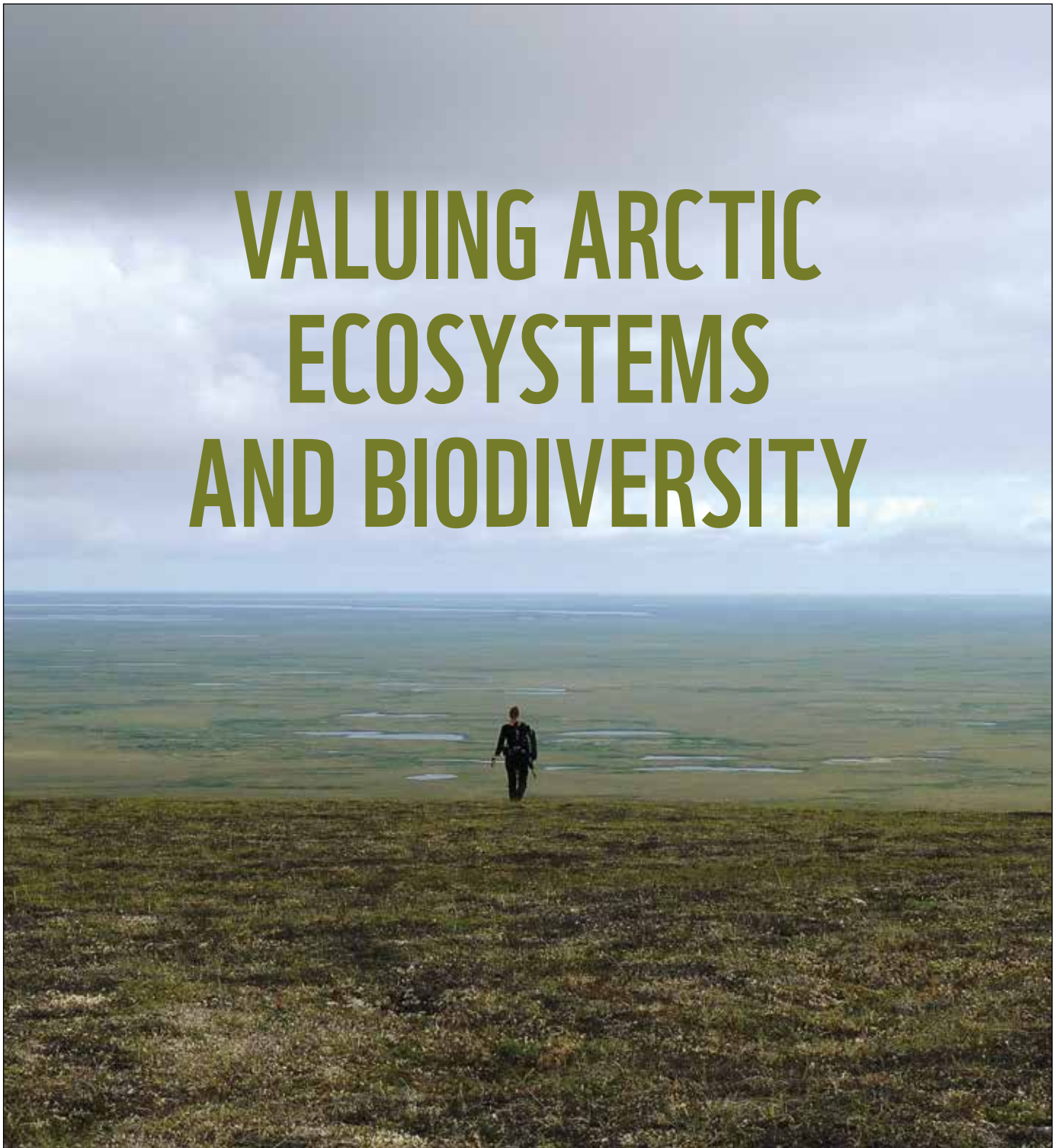


THE CIRCLE

When you take away our fish	14
Does a price tag on nature add to its value?	16
Managing resources, managing tensions	25

VALUING ARCTIC ECOSYSTEMS AND BIODIVERSITY



THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY

Contents

EDITORIAL Melting Values 3

IN BRIEF 4

TOMAS DECLERCQ Valuing the Arctic in economic decision making 6

MARIANNE KETTUNEN Taking responsibility, identifying dependencies, seizing opportunities 10

ILJA LEO LANG Tourism and ecosystem services 12

PIAMA OLEYER When you take away our fish you take away more than just our food 14

ESTHER WOLFS Putting a price tag on nature – does it add value? 17

FINN KATERÅS Norway on track to capture benefits and values of ecosystem services 19

BRAULIO F. DE SOUZA DIAS Essential systems under threat 21

MARK MARISSINK Mainstreaming biodiversity values 22

STACEY SOLIE Managing resources; managing tensions 25

THE PICTURE 28

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ABOVE: Peat bog and lakes,
Western Siberia. The Arctic wet-
lands play an important role in
World's climate regulation.

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Melting Values

COVERING ALMOST 15 million square km of the planet's surface, the Arctic is, despite its size and relative remoteness, one of Earth's most endangered ecosystems. It continues to be both disproportionately affected by, and has a disproportionate effect on climate change. Increasing global temperatures shrink the Arctic ice cap, triggering a reduction in *albedo* – i.e., fraction of solar radiation reflected back into space. Without its polar reflector to cool itself, Earth continues to get warmer; amplifying future losses to Arctic ice and exacerbating climate change. It is estimated that since 1979, the volume of summer Arctic ice has decreased by 80% including a 48% change in the composition of multi-year ice and seasonal ice between 2003 and 2008.

While these numbers reflect the increasing vulnerability of Arctic ice cover, what is missing is any estimate of the extent of welfare losses to the local inhabitants of the Arctic and the vulnerable populations along global coastlines affected directly by climate change. Add to this the biodiversity and ecosystem services impacts of increasing maritime traffic due to opening up of new and cost-effective sea routes plus the race for extraction of conventional hydrocarbons in the Arctic, and we are building up risks of a major regional ecological crisis – in addition to exacerbating an existing global climate crisis.

This edition of *The Circle* explores the economics of ecosystems and biodiversity (TEEB) from a range of perspectives. Esther Wolf writes about how valuing ecosystem services helps to create insight into their economic value.

The *human institution* of valuation lost its way in the 20th century, by becoming increasingly fixated on financial profits (to value a company's performance) and GDP growth (to value a nation's performance). Neither indicator tells the full story, thus valuations have been woefully inadequate to capture large losses in ecological and environmental values, since these are not picked up in terms of either profits or GDP. The value of seal hunting to Indigenous Arctic communities cannot be compensated via availability of globally-sourced supermarket products because hunting has an important social and cultural value, steeped in centuries of tradition. Damages to seal

populations by shipping or oil and gas extraction affect these hunting communities, and the Arctic biodiversity itself, in ways far more complex than those reflected in markets and prices. This is precisely the reason why valuation itself must evolve.

Valuation methodologies need to be able to capture the value plurality associated with complex inter-linkages of biodiversity and ecosystem services of the Arctic. And given the role of the Arctic in global climate regulation, these methodologies also need to assess the potential of these changes to affect populations not just locally, but also at a global scale. This is what The Economics of Ecosystems and Biodiversity for the Arctic scoping study, as written about in this issue by Mark Marissink, seeks to achieve as a means of mainstreaming Arctic biodiversity and ecosystem services into policy and decision-making processes.

The study will look at how the Arctic is valued, not just in terms of money, but in terms of other values as well. This is also explored by contributor Tomas Declercq who asks whether we have considered the true value of the Arctic services we

are so keen to exploit. Piama Oleyer, a traditional knowledge advisor to the Aleut International Association, writes about the difficulty in putting a dollar value on the cultural values of ecosystem services and biodiversity.

Although estimating ecological outcomes of continued warming in the Arctic is difficult to predict, it nevertheless must be attempted. Unfortunately, the nature of policy-making and business strategizing today is such that unless we are able to measure and comprehend the value of ecosystem services in economic and social terms, preventing or mitigating unsustainable exploitation of the Arctic will remain a doubtful goal. For an effective "*universal climate agreement*" to materialise at the 'COP21' meeting in Paris later this year, and for long term sustainability of the planet, measuring and managing the Arctic ecosystem has to become a matter of high priority and utmost urgency. ○



PAVAN SUKHDEV was appointed Study Leader for the G8+5 commissioned project The Economics of Ecosystems & Biodiversity.

WITHOUT ITS POLAR REFLECTOR TO COOL ITSELF, EARTH CONTINUES TO GET WARMER

Rapidly increasing methyl mercury in endangered ivory gull feathers

IVORY GULL numbers have declined more than 80% in Canada since the 1980s, and have the highest concentrations of mercury in their eggs of any Arctic bird, according to Dr. Alex Bond of the Royal Society for the Protection of Birds.

“We measured mercury in feathers from birds in museums from 1877-2007 and found a 45x increase in mercury in adult birds. The problem of high mercury is therefore a recent problem for this species,” he says.



Photo: Outward_bound, Creative Commons

“This is concerning, and adds more evidence for the problem of mercury in the Arctic.”

Research has shown that mercury is increasing in marine food webs, especially at high latitudes. The ivory gulls, as ice-associated animals, are also thought to be threatened by declining summer sea ice.

tists to determine the age of large swaths of Greenland’s ice, extending ice core data for a better picture of the ice sheet’s history.

“This new, huge data volume records how the ice sheet evolved and how it’s flowing today,” said Joe MacGregor, a glaciologist at the University of Texas at Austin’s Institute for Geophysics and the study’s lead author.

Greenland’s ice sheet is the second-largest mass of ice on Earth, containing enough water to raise ocean levels by about 20 feet. The ice sheet has been losing mass over the past two decades, and warming temperatures will mean more losses for Greenland. Scientists are studying ice from different climate periods in the past to better understand how the ice sheet might respond in the future.

Radars help create 3-D view of structure, age of Greenland’s ice

SCIENTISTS USING ice-penetrating radar data collected by NASA’s Operation Ice-Bridge and earlier airborne campaigns have built the first-ever comprehensive map of layers deep inside the Greenland Ice Sheet.

The new map allows scien-

Barge at large: Opportunity for collaboration

WWF IS URGING the Arctic Council to seize the opportunity presented by a drifting fuel barge to demonstrate the Council is serious about cooperating to prevent pollution. The barge broke loose last fall on its way to Tuktoyaktuk, Canada. After crossing through American waters, the ship now lies off Russia’s northeast coast.

WWF has been helping share information about the barge, but says it is now up to the

Arctic Council to help coordinate information exchange between countries regarding the barge, and to help the Russian Federation develop a recovery plan and rescue operation. While the vessel is said to hold only 3,500 litres of diesel fuel, its salvage and the prevention of fuel spillage would be symbolic of the Council’s willingness and capacity to coordinate action to prevent marine oil pollution.

Arctic ice cap sliding into sea at alarming rate

RESEARCHERS at Britain's University of Leeds have discovered one Arctic ice cap that appears to be literally sliding into the sea.

The Washington Post reports that ice is disappearing at a truly astonishing rate in Austfonna, an expanse of frozen rock far north of the Arctic Circle in Norway's Svalbard island chain. Since 2012, the ice cap covering the island has thinned by a whopping 50 metres, equivalent to the height of a 16-storey building, according to an analysis of satellite measurements.

"It is a very large signal," said Mal McMillan, a geophysicist and one of two researchers at Leeds' Centre for Polar Observation and Modelling who worked on the study. "The ice cap has slumped out into the ocean with a substantial loss of ice."

McMillan and colleague Andrew Shepherd analyzed changes in Austfonna's ice using data from satellites that measure, among other things, changes in elevation. They found that the gradual melting of the island's 1,550-cubic-mile ice cap recently shifted into overdrive, for reasons that aren't fully understood. Small ice caps like the one over Austfonna are believed to be more vulnerable to climate change-related thawing because rela-

tively more surface area is exposed to the air and sea.

Arctic experts are closely watching changes in polar ice because of the potentially

profound implications for sea-level rise. About a third of the increase in sea level in recent decades is attributed to melting glaciers and ice

sheets. Researchers worry that more rapid melting could eventually swamp coastal cities around the world.

Preparing for the Worst

THE FINNISH Environment Institute has used a recent tanker collision to test capacity for oil spill recovery on broken ice. The test exercise took place outside Kemi, Finland in March 2015 where two vessels had collided and spilled 200 tonnes of oil. Two ice-breakers were conducting the mechanical oil recovery—the ice-breaker Louhi equipped with three skimmers and ice-breaker Letto with one wider skimmer. A total of 185 observers from

12 countries attended the exercise.

"The exercise ran smoothly, but many questions remained unanswered," said one observer, WWF Finland's Sanna Kuningas. "Using the skimmers did not seem efficient, the skimmers only managing to sweep the upper layer of the broken ice. Many observers were wondering how things would go if the weather and ice conditions would be more severe."

Weather and sea condi-

tions in the high Arctic can be much more challenging compared to the light winds and comfortable temperature experienced during the exercise. Also the thicker, often unpredictably present ice and especially Arctic multi-year ice would introduce much greater challenges and limitations, not to mention the remoteness of the high Arctic area with its accompanying unsolved logistical and infrastructure questions of oil spill response.



Copyright Jyrki Nikkila



Valuing the Arctic in economic

The Economics of Ecosystems and Biodiversity (TEEB) presents an approach that can help recognize, demonstrate and capture the values of ecosystem services and biodiversity. [TOMAS DECLERCQ](#) asks whether we have considered the true value of the “free” yet critical Arctic services we are all so eager to plunder.

THE ARCTIC constitutes about 6% of this planet's surface and is home to around four million people. For thousands of

years Indigenous peoples have subsisted on its natural resources such as fish, soils for reindeer herding and the great

Siberian rivers flowing into the Arctic Ocean that provide fresh water. Livelihoods now also rely on income from tourists visiting its incomparable landscapes and participating in activities such as dog-sledding and ice fishing. The Arctic continues to provide inspiration for culture, peace and serenity.

However, the Arctic is heating up at about two to three times the global average. Before mid-century it will have a nearly sea ice-free ocean in early

Collection of reindeer before movement to winter grazing area.

decision making

autumn months making coastlines vulnerable to possible storm surges. Habitat important for reindeer herding and for key Arctic species such as seals and polar bears is being destroyed. The Arctic also plays a key role in some planetary boundaries that are being crossed – in terms of climate change, biosphere integrity, land system change and ocean acidification. As the ice cap recedes and technologies improve, the Arctic is increasingly seen as the solu-

tion to satisfying future strategic oil, gas and mineral needs. Access to the opening Northwest Passage and especially the Northern Sea Route, with tankers, refrigerated vessels carrying fish and cruise liners is sought while commercial fishing in Arctic territories is seen as crucial to global food security. For the rest of the world the Arctic is sometimes seen as a tool for growth and development in terms of Gross Domestic Product (GDP).

THE MAIN CONCERN IS THAT PEOPLE PUT A PRICE ON THE ARCTIC AND TREAT IT AS A COMMODITY.

The Arctic's abiotic natural capital – oil, gas, minerals and metals – are being privatized. But would we make the same economic decisions if we were to incorporate the *real* value of Arctic ecosystem services that may be degraded as a consequence? Do we know what it really costs to replace the Arctic services provided for free? Have we weighed the risks of losing some of the Arctic's irreplaceable services, such as climate regulation?

Arctic waters provide habitat for fish that are caught to be sold for local subsistence and even for food security beyond the Arctic. But some commercial fisheries are treating these waters like a free lunch. The total

landed value of marine species in the Arctic region may not represent a critical share of an Arctic country's GDP, but it is a fundamental revenue share for the coastal communities and subsistence fishers. By-catch of king salmon in the Bering Sea, for example, affects Yupik fishermen on the Yukon River. This may take away their basic livelihood and even deny some fundamental human wellbeing dimensions such as freedom of choice and the right to food.

There is an impressive amount of ➤

TOMAS DECLERCQ
works for
the United
Nations
Environment
Programme in
Geneva. He has provided guidance to the development of the TEEB Arctic scoping study.



Photo: AGFORWARD project, Creative Commons

HAVE WE WEIGHED THE RISKS OF LOSING SOME OF THE ARCTIC'S IRREPLACEABLE SERVICES, SUCH AS CLIMATE REGULATION?

Arctic cooperation, both at the science and the policy level.

Governments work together across borders to provide correct incentives and implement changes including land use planning, regulation, and community access rights. Providing a bridge between policy and science, valuation can be used as a policy tool to demonstrate to governments that the paradox between nature and development is a false one. While the Arctic should not be completely reduced to measuring its economic value, TEEB – The Economics of Ecosystems and Biodiversity– is finding a way to use valuation as a policy tool and therefore address some concerns.

The main concern is that people put a price on the Arctic and treat it as a commodity. The following distinction should be communicated clearly: value does not necessarily equate price. For example, Indigenous Peoples in the Arctic also value nature and consider their natural surroundings as a source of inspiration. Pricing this cultural value is simply impossible and undesirable. But at the same time, the cultural values that approximately 400,000 Indigenous Peoples hold for their nature should be included in policy decisions. Therefore, TEEB advocates plenty of mechanisms for valuing in non-monetary terms such as multi-criteria analysis and participatory appraisal. The result of a valuation exercise also does not necessarily lead to the introduction of market mechanisms. And even if valuation would be informing a market mechanism, did you know that most payments for ecosystem schemes are between governments?

Another concern is how to deal with

an uncertain ecological future due to crossing of imminent ecological thresholds and 'tipping points'. For example, the Arctic is increasingly releasing stored carbon as permafrost thaws, leading to feedback loops. Rich Arctic fish stocks may rapidly decline due to interactions among several forces and

cumulative impacts. Nobody knows what irreversible damage an oil spill in ice conditions may cause to ecosystem services provisioning. Once this floor or ceiling is reached, the Arctic *will* change the rules of the game. In these circumstances of radical uncertainty, economic valuation tends to be less useful. Please



Inuit hunter Simon Idlout, Nunavut, Canada.



Steffen Widstrand/WWF

do not wait for perfect information to act and call upon complementary approaches such as 'safe minimum standards' and the 'precautionary principle'.

Another question is, how do we include the plurality of ethical and cultural worldviews of the people that call the far north home in valuation exer-

cises? A certain degree of subjectivity is indeed part of any valuation exercise. A best available value can be estimated, but must therefore include a discussion on the different perspectives and relationships that various actors have with nature, and what risks these may involve. A valuation exercise at local

scales may be easier to deal with in terms of plurality of ethical and cultural standpoints.

A last concern is that certain values simply cannot be measured in the same units; they are incommensurable. Monetary estimates should therefore clearly distinguish which dimensions they do and do not cover. You would for example not claim that reindeer herding is worth X US Dollars in ecosystem services provisioning. Instead, you would communicate that land-use planning and ecosystem-based management of reindeer herding could result in an increase in food provisioning of X USD; and you would showcase in non-monetary terms its cultural value for conserving or restoring traditional ecological practices compared to other scenarios.

The Arctic is becoming the symbol of the age of the Anthropocene, with humans as a determinant species for its future. This is an extraordinary responsibility to define the life of future generations. But this vast region should be valued for what it is ---irrespective of its current or future use by humans. Monetary values can be a complementary rationale and should not in any way undermine the recognition of the Arctic's intrinsic values

I truly believe in the development of a new economy in the Arctic: one in which its values are fully reflected in public and private decision-making and a broadened focus from short-term stability to long-term resilience. The Arctic free lunch is over! ○

“ In a world where climate change is creating uncertainty and extremity in the Arctic world, it is necessary at this point to consider all ecosystem elements as critical to ecosystem services. Recognize however that there is no life without safe water and air.

TEEB Arctic Scoping Study

Taking responsibility, identifying

The current trends in the status of biodiversity, ecosystems and related ecosystem services present both challenges and opportunities for the business sector. Therefore understanding the importance of ecosystem services and natural capital in the context of business decision-making is becoming increasingly important, according to [MARIANNE KETTUNEN](#).

The links between business, biodiversity, ecosystem services and natural capital are manifold. On one hand, land and resource use by business sectors is known to contribute to the degradation of ecosystems and biodiversity loss. On the other hand, business sectors also depend on well-functioning ecosystems and the availability of ecosystem services, even to the extent that biodiversity

and ecosystem services can create the basis for new innovative business opportunities. Consequently, while several business sectors are known to contribute to the degradation of ecosystems and biodiversity loss, these

sectors can also play a proactive role in addressing the problem.

TAKING RESPONSIBILITY TO PREVENT NEGATIVE IMPACTS

In the Arctic region, many current and emerging business opportunities, such as commercial fishing, tourism, and mineral and gas extraction, are known to have possible negative impacts on biodiversity and the ability of ecosystems to maintain different services. These impacts include, for example, pollution and spills, habitat loss and fragmentation, introduction of invasive species, and increases in disturbance to wildlife and people dependent on Arctic nature.

With the growing interest in mining, oil and gas development and shipping, the risks posed by business sectors to Arctic biodiversity and ecosystem services are likely to increase. Consequently, the sectors need to recognise and appropriately manage their ecosystem service impacts, including taking into consideration the benefits to and values identified by local and Indigenous communities (e.g. provision of livelihood and spiritual importance of ecosystem services). If the importance of nature to various stakeholders is better understood, this supports more informed decision-making that builds on the understanding of alternative outcomes and implications and adequately takes into account trade-offs and synergies between various services and related benefits. For example, consideration of ecosystem services can help to assess possible negative impacts occurring off-site, such as impacts of oil, gas and mining operations on fisheries and water purification.

IDENTIFYING INTERDEPENDENCIES AND OPPORTUNITIES

On the other hand, a range of Arctic businesses and companies are directly dependent on the supply of natural resources (fish, timber, genetic material etc.). Similarly, businesses related to recreation and tourism rely on their access to nature. Furthermore several industry sectors, such as mining, oil and gas, depend on ecosystems' abilities

Definitions

Ecosystem services: Direct and indirect contributions of ecosystems and biodiversity to human well-being. These are commonly classified into provisioning, regulating and cultural services. Classification also includes habitat services, referencing the importance of ecosystems in providing habitats for species and protecting genetic diversity. The importance of ecological processes underpinning the services is often recognised as supporting or maintenance services.

Natural capital: An economic metaphor for the limited stocks of physical and biological resources found on earth. Natural capital stocks provide flows of ecosystem services.

Nature-based solutions: Concrete approaches for the management of natural resources that build on the understanding of ecosystem services and natural capital, such as conservation and restoration of wetlands for water purification, conservation of ecosystems' carbon storage to mitigate climate change etc.

to maintain water supply and mitigate flooding, erosion, and natural hazards at the locations of their operations. Understanding of ecosystem services helps to highlight the often overlooked dependencies that business sectors have on

MARIANNE KETTUNEN



is Principal Policy Analyst in the Biodiversity and Nature Conservation

Programme with the Institute for European Environmental Policy.

dependencies, seizing opportunities



Lights of an oil rig float in the fog behind a subsistence fish camp. North Slope, Alaska

Photo: Pason Weeber, Expedition Arctic, Creative Commons

the environment, therefore helping to prevent the degradation of natural foundations that businesses depend upon.

Increased understanding of ecosystem services can also create opportunities for the development of sustainable businesses. For example, nature's role in water retention and purification can be 'harnessed' by businesses that adopt nature-based solutions for their water management. For example, conservation and restoration of wetlands have been shown to be a potentially cost-effective option for managing water resources around the world. Furthermore, Arctic nature provides a range of opportunities for the development of novel value-added products. Organisms in the Arctic regions have evolved under extreme conditions, developing a variety of unique physiological and biochemical characteristics. These characteristics already provide a basis for a range of biotechnological innovations and related businesses with several companies estimated to be involved in research, development and/or sale of products

derived from or based on the genetic resources of the Arctic.

TOWARDS BUSINESS ECOSYSTEM ASSESSMENTS

Responsibilities, risks and opportunities associated with biodiversity and ecosystem services are still often overlooked and underestimated by businesses, and are not fully accounted for along the entire value chain. To address this, the World Business Council of Sustainable Development (WBCSD) has developed guidelines for Corporate Ecosystem Review (CER) and Corporate Ecosystem Valuation (CEV) that help to improve corporate decision-making through assessing and valuing ecosystem services. The aim of these guides is to help managers proactively develop strategies to manage business risks and opportunities arising from their company's dependence and impact on ecosystems.

Ecosystem service assessments can strengthen business performance in several ways. For example, they can help sustain revenues and reduce costs,

determine levels of liability and compensation, and provide social benefits. In general, systematic integration of ecosystem service considerations into business decision-making supports the objectives for the long-term environmental and socio-economic sustainability of the Arctic region, bringing benefits to both biodiversity conservation and people.

For further information, see for example The Economics of Ecosystems and Biodiversity (TEEB), TEEB Nordic, TEEB Finland and TEEB Arctic (upcoming). ○

“ There is no inherited capacity in human nature to safeguard the Earth's biological assets – moral and intellectual strength are needed to achieve conservation and wise use of living resources through cultural and personal ethics and practices. Sustainability is a prerequisite for such balance, but it does not come without restraint and concerted efforts by all.

TEEB Arctic Scoping Study

Tourism and ecosystem services

There is always a delicate dance between industries providing wealth for jurisdictions, and the potential harm they bring in the form of environmental impacts. This balance is particularly important in industries such as tourism.

ILJA LEO LANG says sustainability measures are in place to protect the very ecosystem services the expedition cruise industry depends upon.

ECOSYSTEM SERVICES can be defined as the benefits society as a whole derives from nature. This is especially relevant when it comes to non-disturbance of animals and birds and non-material benefits such as the aesthetic value of

a pristine, undisturbed Arctic environment.

The Association of Arctic Expedition Cruise Operators (AECO) has a comprehensive set of guidelines for operators in the Arctic who strive to employ practices and procedures that are substantially more protective of the environment,

local cultures and cultural remains than the current requirements by local, national and international regulations. AECO's members coordinate and implement innovative technologies and measures to reduce the environmental impact of cruising.

AECO's environmental industry

standards are essentially the expedition cruise industry's contribution to sustain Arctic ecosystem services and biodiversity.

For example, AECO is in the forefront of educating tourists about how to behave in the Arctic. This happens through AECO's guidelines about responsible, environmentally friendly and safe tourism, and by communicating the importance of protecting the Arctic to visitors in order to create 'Arctic Ambassadors'. AECO members work with visitors in order to influence the local communities in a constructive way. This involves making expedition cruise guests adhere to AECO's sound environmental and cultural standards for operations in the Arctic. AECO visitors are for example asked to contribute to local communities by purchasing certified craft and souvenirs, to not pick flowers, not take stones or build cairns and to ask permission of residents before taking photos.

AECO's Executive Director, Frigg Jørgensen says, "Basic measures in regard to providing passengers and guests with a correct code of conduct are vital for the success in small communi-

ties. AECO's new *Animated Guidelines* which allow visitors to the Arctic to educate themselves about safe, environmentally-friendly and considerate behavior has proven to be particularly successful."

For the expedition cruise industry, protection of Arctic ecosystem services and biodiversity relies upon communication and research. One example of this is AECO's decade-long involvement with the Clean-Up Svalbard Campaign which involves cruise tourists in Sval-

ILJA LEO LANG is with the Association of Arctic Expedition Cruise Operators, an international organization for the expedition cruise industry, dedicated to responsible, environmentally friendly and safe tourism in the Arctic.

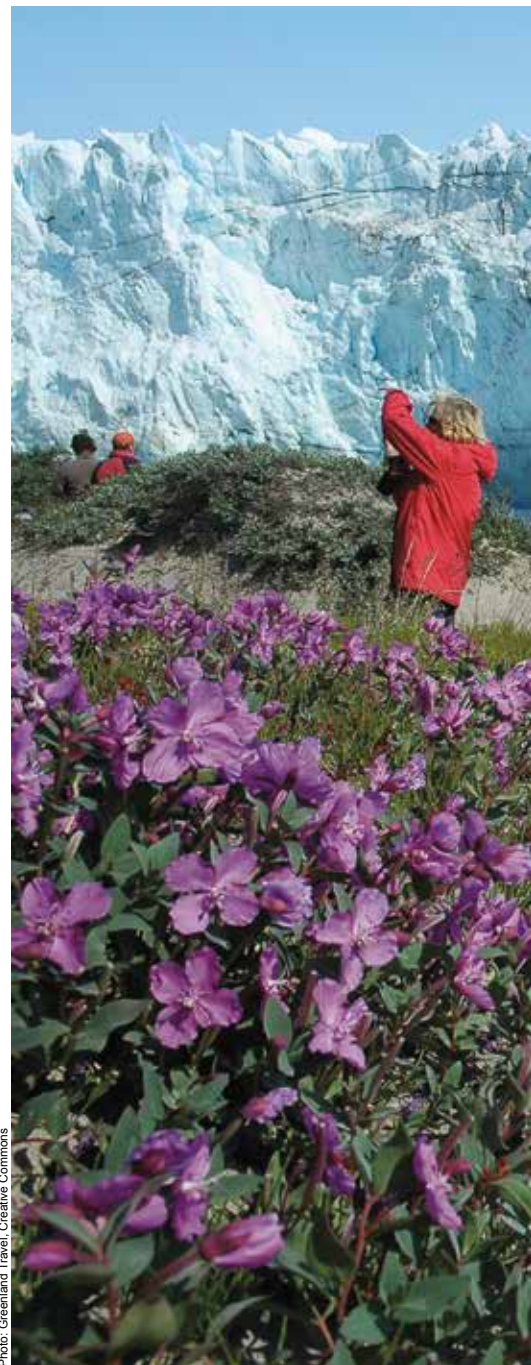
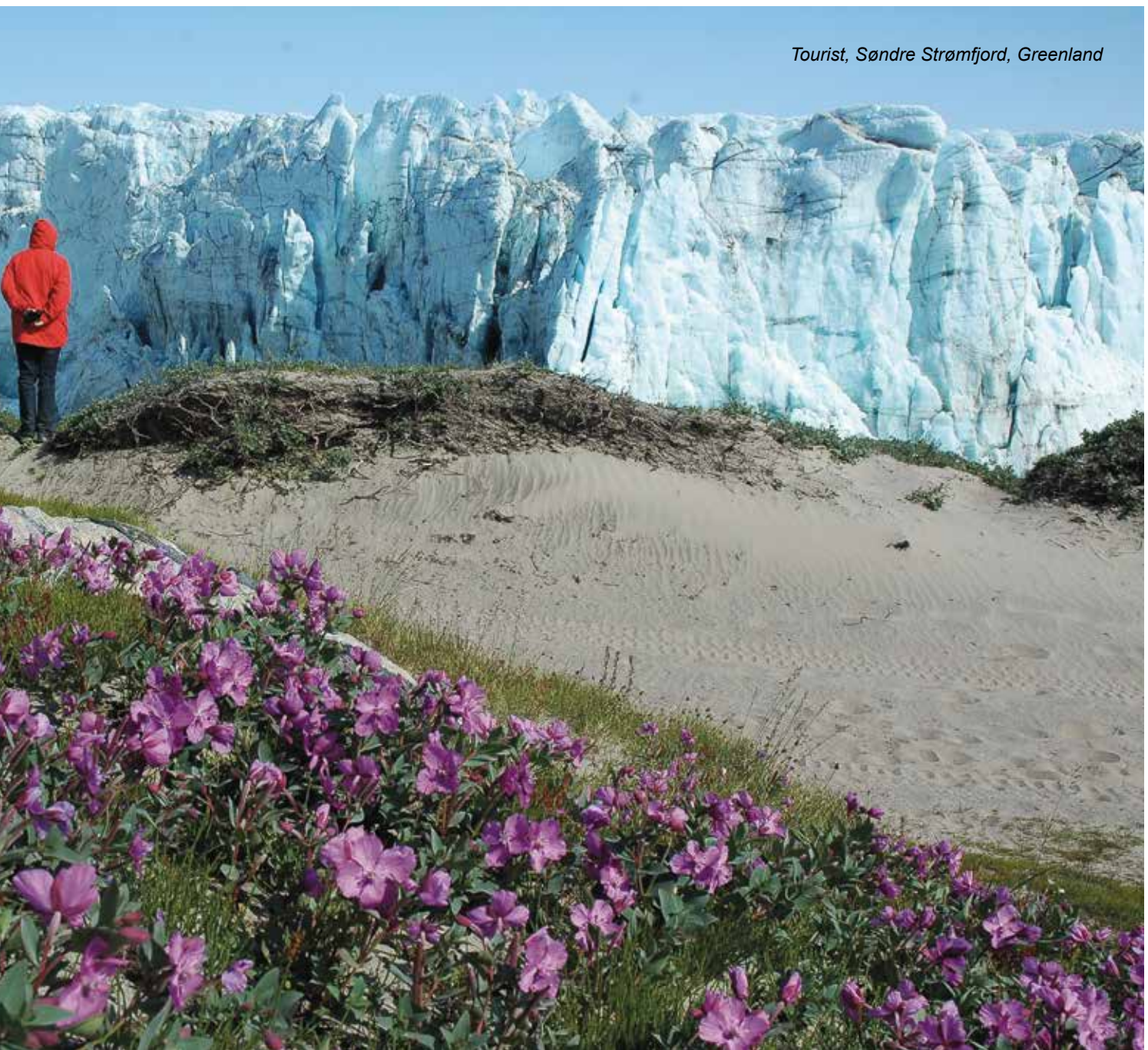


Photo: Greenland Travel, Creative Commons



bard in cleaning up tons of sea-trans-ported garbage from beaches around the Svalbard archipelago. Another example is the ongoing collaboration between AECO and researchers from a number of universities. Among AECO's many self-imposed mandatory industry guide- lines is a biosecurity guideline, which describes measures such as cleaning of clothes and washing of boots in order to prevent seeds and alien species from spreading throughout the Arctic.

There are many individuals, govern-

ments, private companies and orga- nizations that share the common goal of making sure the Arctic is used in a sustainable way. All want to protect this pristine area from negative impact and preserve it for the future.

Arctic cruise tourism can be a driver for a better Arctic environment – if the individual operators get together and cooperate with other sectors to raise the bar in regard to sustainability, voluntary guidelines and the implementation of ambitious best practices.

If the tourism industry as a stake- holder is involved in closer dialogue and cooperation with other sectors, the potential for reducing the environmen- tal impact of human activities in the Arctic is huge. ○

■ Read more about AECO's guidelines for Arctic operations at: www.aeco.no/guidelines

When you take away our fish you

Some of the ecosystem values of the Arctic are very concrete local commodities such as food, shelter, and provisions. As **PIAMA OLEYER** writes, these are also linked to cultural values much harder to quantify, but no less precious.

OUR ANCESTORS have inhabited the Aleutian region for nearly ten thousand years. We raised our children to eat from our land and sea, not by necessity but by preference. Every spring I took a big bowl out and we created salads of such variety to feast on. All summer I taught my children to know which plants, roots, seeds and berries were

edible. We made teas, salads and recipes and potions from traditional knowledge. Sadly, there came a time when we went to harvest some of the products of the sea and couldn't eat them due either to toxicity or regulations about who could take products out of our waters. Natural and manmade disasters are already happening with dire consequences. We ➤

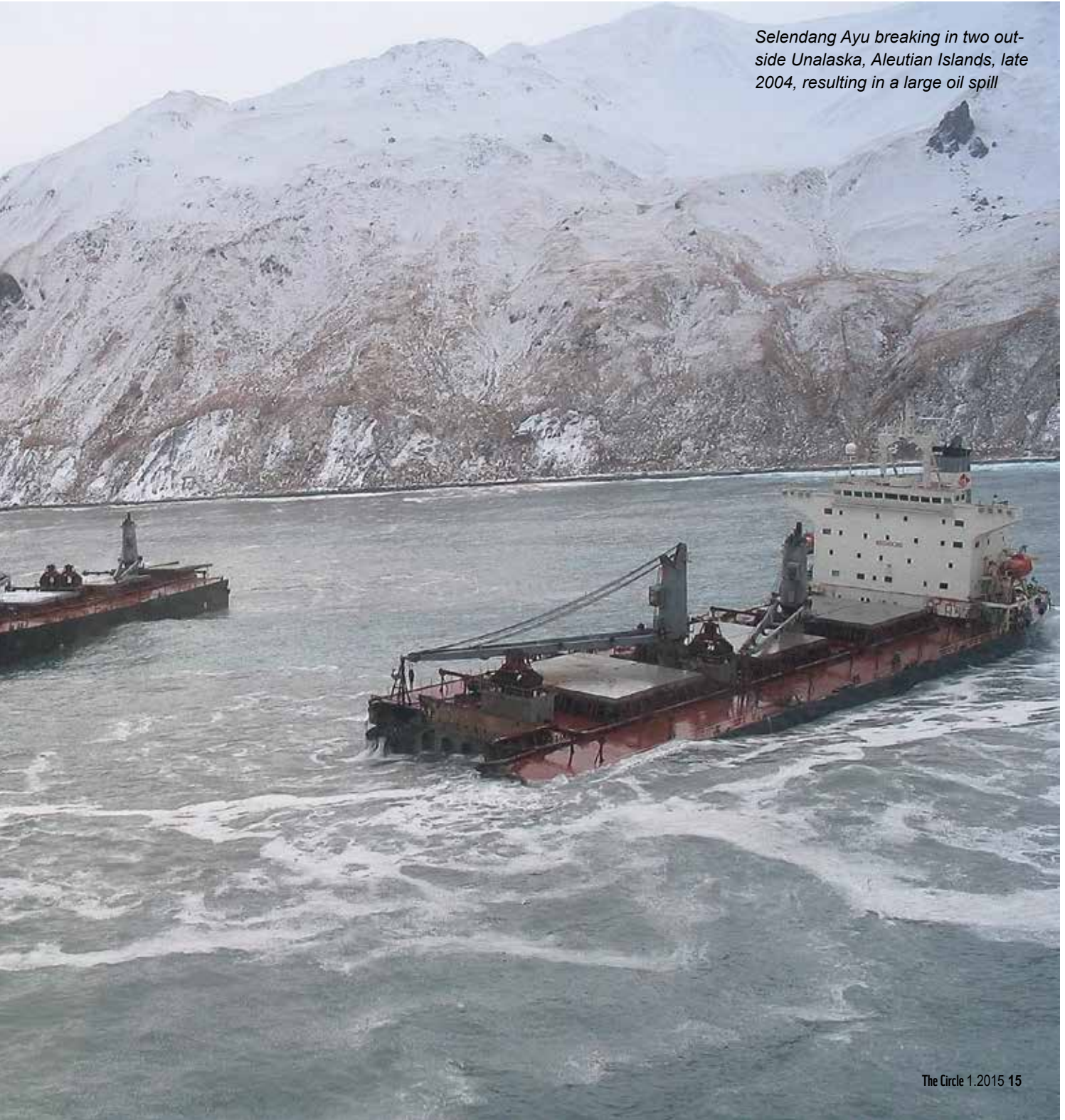


Piama Oleyer with her boat which carries fish from local fishermen to canneries to save time, energy and fuel going back and forth from fishing grounds. She is the Traditional Knowledge Advisor for the Aleut International Association in the TEEB study. The opinions expressed are the author's.



take away more than just our food

Selendang Ayu breaking in two outside Unalaska, Aleutian Islands, late 2004, resulting in a large oil spill



have already lost so much that it is no longer 'a matter of time', it's a matter of how low we will draw our bottom line. It's a matter of not allowing the continuance of the degradation of our natural environment.

To what extent must we keep accepting unbalanced policies that weigh heavy on the value of extracted resources? These policies aren't designed to benefit the people who've lived here for thousands and thousands of years. Policies are designed to benefit the few companies who now 'own' our resources. Businesses (even our own) trade traditional harvest areas for leases to industry because Grandma can't afford the \$3.25 per square foot for her basket weaving grass. In Unalaska, salmon found their home stream, the Illiuliuk River, only to meet a choking death caused by mining silt and road chemicals washing downstream over the years. When I was a child, I could cross the river on the backs of the fish without getting wet. That abundance no longer exists. People can no longer eat food from our beaches due to risk of illness and actual death. Unalaska has been declared a 'dead bay' due to industrial activity.

Cultural losses can't be quantified with a dollar value. When you take away our fish you take away more than just our food. So much in life revolves around gathering it, preparing it, sharing it. With the demise of certain activities, entire concepts are lost and the

"I WISH I HAD A PICTURE OF THAT WHALE STUCK ON THE BOW OF THAT MAERSK SHIP"

gaps are obvious when trying to teach our language. Our traditional cultural knowledge is altered. My mother spoke about the great depression when the world seemed to have lost the will to live because they lost their money. "We were poor but we didn't know it because we had everything we needed," she would say. When all your needs are met, people are not poor even if you don't have money.

It is our duty to take care of our place on this planet. We Unangan are the stewards of this area. Our oceans provide an abundance of wealth. We should all be living at our peak potential rather than subsisting to exist. Much in our culture is based on sharing our wealth; this was our way of life. In the Aleutians, we live by an ocean harvest in the most bountiful waters in the world. Over the years, we have been forced to adapt to a new way of harvesting the sea. Whether we exist as commercial or subsistence users, we comply with the regulations governing every aspect of what we have always eaten. We are told who can fish, what to fish, where, when, how and how much, and who we can or can't give or sell our catch to. Today in our region, a continuous stream of gigantic ships carry our resources away and regulations are written based on who has the most money. These policy-makers are the same ones who allowed bottom trawlers to drag their massive ground level nets right up to our front doors destroying the habitat of the ocean floor. Subsistence users have a near zero by-catch which means they do not accidentally catch and kill anything they aren't supposed to.

Super-cargo ships and industrial trawlers bear down on a collision course with the local fishermen in the

area around Unimak Bight where these monstrous ships regularly plow through their fishing grounds. The only defense our helpless fishermen have is to put their own lives and boats at risk and stand their ground (fishing grounds) and set their gear as usual. Then they plan to document the injuries they suffer when these immense ships run right over them and their gear. This dangerous attitude is a final effort to change the ways in which the mega-fisheries make it impossible for local people to continue their traditional lifestyle. Who is this Goliath they face, whose visibility is cut off by the sheer height of the stacked containers? These enormous ships don't even see the fishermen. Is it because of their size or the value of their payload that they believe they have the right-of-way? Perhaps they just don't understand; a lot of them are foreign ships so there's a communication gap. Fishermen can't call them and talk to them in Chinese so of course they hail them in English, to no avail. There is often very low visibility in the area and even with Automatic Identification System, (AIS) small vessels are still difficult to see on radar (or perhaps hard to distinguish a ship from a whale). "I wish I had a picture of that whale stuck on the bow of that Maersk ship," says Tom Robinson, President of the Qawalangin Tribe of Unalaska where Dutch Harbor acts as a maritime gateway to the world. The whale he is referring to was run over and killed and it was not the first. Horrific events have been happening for much too long. What will it take for changes to be made when our complaints fall on deaf ears? This is no longer 'a matter of time', it's happening right now and has been happening in my back yard for years.

According to the *Risk of Vessel Accidents and Spills in the Aleutian Islands*, a special report by the Transportation Research Board of the National Academies, during the past 15 years there have been 3,400 oil spills in the past 15 years (<http://onlinepubs.trb.org/Onlinepubs/sr/sr293.pdf>). Most of these are small but the report estimates

“ Benefits of people being connected to nature through traditional hunting and fishing... include healthier people (less drug/alcohol/violence), empowered people are more motivated to protect local habitats and species which leads to healthier ecosystems, cultural and spiritual benefits, benefits of creating strong connections with others (family and friends) through cooperative harvests.

TEEB Arctic Scoping Study

there are up to 5 large “damaging” spills every year. I don’t know how they define “damaging” and why they don’t consider the other 3000-plus “small” spills damaging. I have personally witnessed catastrophic maritime events over the years which have wreaked disaster upon our shores.

As Indigenous people in the region, we need to call the shots on the methodology of cleaning up those spills. With the increased value of organic foods, how can we say our Alaskan waters are pristine, after chemicals are dumped in the water to disperse crude oil, every time there is an oil spill? Tom Robinson says “There needs to be an efficient, ecologically friendly oil spill response at a mechanical level, not using dispersant. We do not condone or approve of the use of oil-dispersant chemicals in our waters.” We acknowledge that these events are going to happen multiple times and at varying magnitudes in our very near future. We want to be prepared. We need to guarantee that the ecosystem will continue to produce as it has for thousands of years. We need to ensure that our communities can sustain a local economy where children won’t have to move away to have a better life.

Time and time again, our resources have been obliterated by outside merchants, yet our people have adapted as they always have. Our culture remains; our place in the world remains. In spite of the countless regulations placed upon us, we still find ways to harvest our foods. We still manage our own territory, though our voice is not always heard. ○

“ The use of nature amenities is part of the culture and tradition for the people living in the Arctic. The nature amenities have values as part of the nutrition, but nature amenities also provide the local inhabitants a significant source of recreation.

TEEB Arctic Scoping Study

CASE STUDY:

Putting a price tag on nature – does it add value?

Valuing of ecosystem services draws attention to the economic benefits of biodiversity and highlights the growing costs of biodiversity loss and ecosystem degradation. The Arctic, for example, represents a tremendous wealth in natural resources and provides immense ecosystem services, such as unique biodiversity, culture, tourism, shipping and climate regulation. By valuing these ecosystem services, ESTHER WOLFS says one can create insight into their economic value. This allows, for example, assessing the possible negative impact that oil and gas extraction efforts may have on the economic value of these ecosystem services and biodiversity.

ECOSYSTEM SERVICE valuation research addresses the relevant ecosystems, ecosystem services and their beneficiaries in a defined area and applies a range of economic valuation and evaluation tools. It is extremely important for stakeholders to participate, by providing local information and valuable insights and creating public support for the concept of ecosystem services among target audiences.

Research areas could include: the socio-economic value of the Arctic’s ecosystem services using an ecosystem valuation framework; how environment-degrading economic activities in the Arctic affect economic values; what trade-offs can be identified; and how these trade-offs can be managed to optimize the long-term economic benefits of the Arctic’s ecosystem services.

In our research we use the classification of ecosystem services from The Economics of Ecosystems & Biodiversity (TEEB) as defined in their 2008 interim

report derived from the Millennium Ecosystem Assessment (MA, 2005):

- Provisioning services (products obtained from ecosystems, such as food and building materials).

- Regulating services (benefits obtained from regulation of ecosystem processes, such as erosion control and storm protection).

- Cultural services (non-material benefits obtained from ecosystems, such as spiritual and religious values and recreation and ecotourism).

- Habitat (nursery service and gene pool protection).

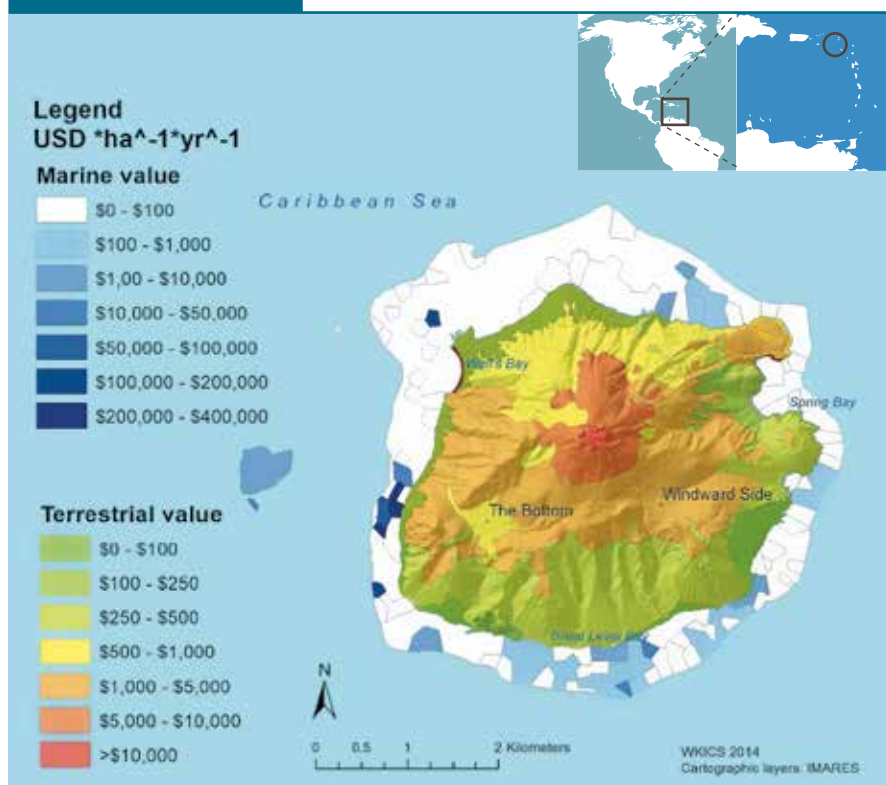
Essential for the valuation of these ecosystem services is to find ways to ➤

ESTHER WOLFS is

the founder and director of Wolfs Company which works to show clients the contribution of, and often intrinsically crucial dependence on natural capital.



Saba - total economic value



measure benefits, which do not enter markets and, as such, have no directly observable monetary benefits. Therefore, different methods have been developed to assign a value to non-marketable ecosystem services, such as Contingent Modeling, where one establishes a willingness to pay by stakeholders for environmental services. The approach is to value nature using different market and non-market valuation methods depending on the use or non-use values of the relevant ecosystem services. This is done through the perspective of various stakeholders such as local residents, visitors, tourist industry, international citizens and other relevant users or interested parties. By summing up the worth of the range of valued ecosystem services, the annual Total Economic Value of the natural environment is estimated.

It is important to understand that valuing ecosystem services is an instrument and not a goal in itself. The valuation results should be used for developing tools that can be easily applied to raise awareness for nature conservation, sup-

port decision-making on the economic benefits of investing in nature, develop sustainable financing mechanisms to raise funds for nature conservation, serve as input for spatial planning or assess economic loss if natural assets are damaged by, for example, oil spills. These tools can answer questions relating to environmental management issues at stake as identified by stakeholders and local experts. By increasing evidence-based information and transparency on issues that are related to the natural environment more equitable decisions can be made.

One example of such a tool is a value map indicating the most valuable ecosystems in the marine and terrestrial environment of a specific area. By adding up the values for the various ecosystem services, these maps combined form the Total Economic Value (TEV) maps. See the picture of the TEV map of Saba.

Insight into the value of different areas for different beneficiaries of ecosystem services can be very useful for spatial planning purposes. First, natural areas with higher values are more important to conserve. Second, different uses of ecosystem services might be in conflict with each other. For example, having fishermen and tour operators in the same area can cause friction that is more easily resolved by identification of the important parts of the marine environment for them. Third, the value maps can be combined with spatial information on environmental threats. Spatial analysis of threats and benefits enable conservationists with limited budgets to prioritize their efforts: areas with high values and high threat levels deserve the most urgent attention. It can also inform government priorities. The government of Saba decided to investigate whether it can extend the boundaries of its terrestrial park based on the Saba value map. ○

■ More information on actual cases is to be found on www.wolfsccompany.com/Benefits-of-TEEB-Caribbean-Netherlands (www.wolfsccompany.com/wp-content/uploads/2014/05/Benefits-of-TEEB-Caribbean-Netherlands1.pdf)

Example of one value of Alaska's ecosystems

Existence value of Alaska's ecosystems

Steve Colt, Institute of Social and Economic Research University of Anchorage Alaska, estimated the existence value of Alaska's protected terrestrial ecosystems among United States citizens to range from 309 million USD to almost 30 billion USD. These estimates were based on two Alaska-specific studies, which found annual willingness to pay \$ 3 USD per household to prevent an oil spill, such as the Exxon Valdez spill, and an annual willingness to pay of \$ 25-50 USD per household to preserve wildlife habitat in sub-Arctic Bristol Bay. Colt, 2001.



IMPLEMENTATION

Norway on track to capture benefits and values of ecosystem services

As the project to scope out the use of TEEB in the Arctic reaches completion, some Arctic states are undertaking a TEEB exercise on a national basis. [FINN KATERÅS](#) says in Norway important steps have been taken, but insufficient knowledge of Arctic ecosystems is a limitation.

IN 2011 the Norwegian Government appointed an expert commission on values of ecosystem services to see how the economics of ecosystem services and biodiversity (TEEB) and the ecosystem services approach could be applied in

Norway. The Commission was asked to describe the consequences for society of the degradation of ecosystem services, to identify how relevant knowledge can best be communicated to decision-makers, and to make recommendations

about how greater consideration can be given to ecosystem services in private and public decision making.

It concluded that the ecosystem services approach can be a useful supplement to Norway's environmental and

resource management, to show more clearly why protecting nature is important to our well-being. The Commission argued that the values of ecosystem services must be better demonstrated and reflected in decision making, and that values in nature must be communicated through policy instruments, regulations and incentives.

The Commission concluded that the state of ecosystems in Norway is relatively good, but the country's biological diversity and ecosystems are also under pressure from many directions. Important ecosystem services from Norwegian Arctic ecosystems include fish and seafood, biochemicals, genetic resources and nature-based tourism. The greatest threats to biological diversity and related ecosystem services in Arctic marine

areas are climate change and ocean acidification.

The Commission pointed to the need for improved knowledge about biological diversity and ecosystem services in Norway, and made

recommendations related to increased research and enhanced monitoring. It underlined that there is a need for more knowledge about Arctic ecosystems, where the effects of climate change, ocean acidification and environmental toxins will be particularly important.

In September 2013 the report was distributed for a broad public consul-

THE RESEARCH COMMUNITY IS INCREASING ITS FOCUS ON ECOSYSTEM SERVICES AND ON LINKS BETWEEN NATURAL CAPITAL AND HUMAN WELL-BEING,

tation among affected stakeholders, including authorities, business and industry, academic communities and non-governmental organizations. This consultation provides an important basis as the Norwegian Ministry of Climate and Environment is considering follow-up on the commission's report. Around 50 stakeholders submitted their views, but few of these explicitly discussed Arctic perspectives and challenges.

Several efforts are going on to recognize, demonstrate and capture values of biodiversity and ecosystem services in national policy and management. The Norwegian Environment Agency is for example involved in considering values of ecosystem services, including in socio-economic analysis, environmental impact assessments and planning efforts. Mapping and assessment of ecosystems may provide a better foundation and understanding for work with ecosystem services, and work has started on a larger assessment of Norwegian ecosystems and their services.

Statistics Norway is working on how national statistics and environmental accounts can better reflect ecosystems and ecosystem services, both at the national and the international level. The research community is increasing its focus on ecosystem services and on links between natural capital and human well-being, including through funding and development of research programs under the Norwegian Research Council.

Overall assessments and consider-

ation of ecosystem services are reflected in several recent policy documents, including in the Government's Reports to the Parliament and in national strategies related to climate change, public protection against floods and avalanches, seafood, adaptation to climate change, public health and outdoor recreation.

Further follow-up of the report on values of ecosystem services will be presented in the National Action Plan on Biodiversity. This action plan is part of Norwegian obligations under the Convention on Biodiversity (CBD) and is to be presented by the Government as a Report to the Norwegian Parliament in 2015.

Questions related to economic instruments on ecosystem services may also be considered by the Green Tax Commission, which looks at how use of climate and environmental taxes can be used to secure lower greenhouse gas emissions, improved environmental conditions and sound economic growth. This commission will present its report to the Ministry of Finance in December 2015.

Norwegian authorities are also engaged in a number of international activities on TEEB-related issues, including in global, European, Arctic and Nordic settings. The TEEB Arctic Scoping Study is one example of this, giving national governments a valuable opportunity to share experiences and to understand more about opportunities and limitations in the ecosystem services approach. ○

■ Hyperlink to the expert commission's report (NOU 2013:10) in English: <https://www.regjeringen.no/en/dokumenter/nou-2013-10/id734440/?docId=NOU201320130010000ENGEPI&q=&navchap=1&ch=2>

FINN KATERÅS, is

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Environment Agency,
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Norway



Everyone benefits from hunting and fishing, clean and safe drinking water and berries and mushrooms. Without food and water we would not survive. These are important staples in our diet and a critical component to health and well-being; as well as culture and feeling close to nature.

TEEB Arctic Scoping Study

Essential system under threat

Despite its seemingly desolate landscape, the Arctic hosts an astounding diversity of species and habitats, and represents one of the most unique ecosystems on the planet. It is critically important to the biological, chemical and physical balance of the globe. Arctic biodiversity underpins planetary health and well-being, it contributes to the healthy functioning of the global ecosystem and is the foundation for many of the essential ecosystem functions and benefits on which we all depend.

Dr. **BRAULIO F. DE SOUZA DIAS** says The Arctic Biodiversity Assessment, recently launched by Conservation of Arctic Flora and Fauna (CAFF), the biodiversity working group of the Arctic Council, has made it very clear that Arctic biodiversity is being degraded.

Climate change is by far the most serious threat to Arctic biodiversity, exacerbating other threats such as ocean acidification, habitat degradation, pollution and, in some areas, unsustainable harvesting. The loss of biodiversity is expected to compromise the critical functions and benefits of Arctic ecosystems, with detrimental impacts on local livelihoods and lifestyles.

While climate change is the most significant driver of biodiversity loss, it is also expected to open up potentially significant economic opportunities in the Arctic, ranging from the opening of shipping routes to better accessibility of natural resources and decreasing costs for their extraction. We also know that the impacts of climate change on local livelihoods will not necessarily all be negative. Potential positive impacts might include higher summer salmon stocks, increased root and berry growth and larger whale populations. While net primary productivity may increase overall in the Arctic as a result of climate change, the effects of climate change on Indigenous peoples and local communities in the Arctic are very complex. Positive changes might cause further conflicts between traditional livelihoods and other land-use options. Managing change in the Arctic therefore requires full consideration of all environmental, socio-economic and cultural impacts, in particular on Indigenous peoples and local

communities, as part of an ecosystem-based management approach.

The *Arctic Biodiversity Assessment* recommends “mainstreaming” biodiversity – that is, the incorporation of biodiversity objectives and provisions into ongoing and future international standards, agreements, plans, operations and/or other tools specific to development in the Arctic. This would include economic activities such as oil and gas development, shipping, fishing, tourism and mining. This is well in line with the first goal of the Strategic Plan for Biodiversity 2011-2020, which calls for addressing the underlying causes of biodiversity loss.

WHILE NET PRIMARY PRODUCTIVITY MAY INCREASE OVERALL IN THE ARCTIC AS A RESULT OF CLIMATE CHANGE, THE EFFECTS ON INDIGENOUS PEOPLES AND LOCAL COMMUNITIES IN THE ARCTIC ARE VERY COMPLEX.

However, for such mainstreaming to be effective, the methodology and language

for achieving mainstreaming needs to resonate with economic decision-making – that is, with economic decision makers, because ultimately all decisions are taken by individuals. While a simple comparison of costs cannot and should not be the sole basis for deciding whether or not a development project should be undertaken, monetary gains and profits are nonetheless regularly considered against environmental impacts.

How, then, to generate such resonance? It is here that the work of the TEEB initiative, with its TEEB Arctic Scoping Study, can play an important role and add further value to the *Arctic Biodiversity Assessment*. Since its inception, one of the main objectives of the TEEB process has been to foster understanding between the economic and ecologic communities by integrating pertinent knowledge and methodologies in the evaluation of ecosystem services, using appropriate valuation methodologies, thus further operationalizing the concept of ecosystem services for human well-being that was developed

DR. BRAULIO F. DE SOUZA DIAS is the executive secretary of the Convention on Biodiversity.



and promoted under the 2005 Millennium Ecosystem Assessment.

When the global TEEB reports were launched in October 2010 at the tenth meeting of the Conference of the Parties (COP) to the Convention on Biological Diversity, held in Nagoya, Japan, they generated significant interest. The reports were recognized as an important methodological tool for implementing the Strategic Plan for Biodiversity 2011-2020, and in particular Aichi Biodiversity Target 2, which specifically calls for the integration of the manifold values of biodiversity, including economic values, into development and poverty reduction strategies and planning processes. In fact, the COP emphasized that increased knowledge of biodiversity and ecosystem services and the application of that knowledge are important tools for communicating and mainstreaming biodiversity, and invited the Parties to the Convention to make use of the TEEB study findings in order to make the case for investment for biodiversity and ecosystem services.

One of the stated goals of the TEEB initiative has been to examine the economic costs of biodiversity decline, and the costs and benefits associated with actions to reduce these losses. A basic premise of its work has been that valuation may be carried out in more or less explicit ways, depending on the situation at hand. Monetary valuation in particular is recognized as not always being necessary or appropriate – for example, when it is seen as contrary to cultural values or fails to reflect a plurality of values. At the same time, the open architecture of the TEEB approach provides interfaces with non-economic analysis and policy tools for effective interaction and synergy, such as the guidance adopted under the Convention related to Indigenous peoples and local communities. It is these features that make the TEEB approach so useful for the development of practical guidance for policymakers at the international, regional and local levels, in order to foster sustainable development and better conservation of ecosystems and biodiversity, including in the Arctic. ○

Trollsteinen ridge, Svalbard

Photo: Truls Høy Ekholt, Creative Commons





HUMANKIND IN THE CENTRE?

Mainstreaming biodiversity values

Putting economics and biodiversity in one sentence or one report always generates a lot of discussion. The concept of ecosystem services puts humans square in the centre of everything – what's in it for us? As [MARK MARISSINK](#) writes, many people object to this view. ➤

PEOPLE TEND to see nature as a complex web of interconnections and with a range of different values – spiritual, intrinsic, material etc. To single out humankind as the centre of attention then seems to be a bit ... well, self-centered. The discussion rises even higher when monetary values are mentioned.

The Economics of Ecosystems and biodiversity (TEEB), however, is not necessarily about monetary values, or about monetarisation. Yet it is about nature's value to us and it does put humankind in the centre. But, whether we like it or not, that is pretty much the way things are done in politics and decision making. That is also why it is so important to mainstream biodiversity values (*i.e.*, to make them visible in all decision making). The need for mainstreaming was confirmed by the Arctic Council when adopting the recommendations from the Arctic Biodiversity Assessment,

and that's why it is important to explore what TEEB methodology can contribute in an Arctic context. But how did it come about?

Almost ten years ago, a study was published that changed the debate on climate change. The Stern report showed that climate

change would not only affect humankind's future on earth, it would also affect our economy. Projected changes in temperature would cost us 5-20% of our global GDP by the year 2100. On the other hand, the report also stated that it would cost only a fraction of this to halt the increase in greenhouse gas emissions, if done in time.

Although it was not met with universal acclaim, the impact the Stern report had on policy makers gave food for thought in the international negotiations on biodiversity. Surely an economic case could be made for the conserva-

TEEB FOUND THAT CONSERVATION AND SUSTAINABLE USE OF BIODIVERSITY WOULD INDEED BE BENEFICIAL FROM AN ECONOMIC POINT OF VIEW.

tion and sustainable use of biodiversity as well? *The economics of ecosystems and biodiversity* was launched, led by Pavan Sukhdev at *Deutsche Bank*, in order to provide answers. Not unlike the Stern report, TEEB found that conservation and sustainable use of biodiversity would indeed be beneficial from an economic point of view.

TEEB was very influential in the discussions leading to the new Strategic plan for biodiversity, adopted by the Conference of the Parties to the Convention on Biological Diversity in Nagoya in 2010 and subsequently endorsed by the United Nations General Assembly. Target 2 in the plan states: *By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.*

TEEB studies have since been carried out in a number of countries and also for specific sectors. They have become more policy-focused over time. The approach and methodology for country scoping studies have been detailed in the 2013 TEEB Guidance manual for country studies. Compared with country studies, however, the policy landscape in the Arctic is diverse and complicated and the Arctic TEEB Scoping Study has been broadened to include information and discussion related more generally to improving understanding of the full

range of Arctic ecosystem services, as well as information and discussion on aspects of governance and of valuing ecosystem services in the context of the circumpolar Arctic and Arctic Council. It does not conclude with a defined set of specific policies for assessment in a full TEEB study, but rather provides guidance and examples on policy focus areas that could be further refined and assessed using TEEB methodology.

Another acronym that needs to be mentioned is IPBES, the Intergovernmental Platform on Biodiversity and Ecosystem Services. Under the auspices of IPBES global, regional and sub-regional assessments of ecosystems and biodiversity will be carried out in order to provide guidance for better decision making. IPBES explicitly tries to consolidate different knowledge systems and different world views in an inclusive process. No specific study for the Arctic is foreseen; rather, the Arctic is covered by two regions (the Americas, and Europe and Central Asia). The TEEB Arctic Scoping study and a possible follow-up will bring a much needed Arctic perspective to the regional and sub-regional studies to be carried out in these regions, and will thus ensure that the Arctic is not forgotten in future global decisions on biodiversity and development. ○

MARK MARISSINK



heads the unit for nature and biodiversity in the Swedish Environmental Protection Agency and is the Swedish representative to the Arctic Council working group on the Conservation of Arctic Flora and Fauna.

■ WWF led a consortium of partners in the TEEB Arctic Scoping study: the Conservation of Arctic Flora and Fauna working group; the UNEP TEEB Office; the UNEP Regional Office for Europe; and GRID-Arendal. As an Arctic Council project, Sweden took the lead through CAFF. The report will become public following acceptance by the Senior Arctic Officials, this is anticipated to happen following a Council meeting in fall 2015




Photo: Mike Gifford, Creative Commons

*Surfers, Long Beach,
Tofino, Vancouver
Island.*

Managing resources; managing tensions

There are a number of examples of where valuation of ecosystem services has successfully influenced policy and planning. One of those is on the west coast of Vancouver Island, Canada where one of the most diverse, collaborative marine planning processes in the world has been created. It is now serving as a model for marine planning globally. In determining the value of ecosystems and biodiversity, [STACEY SOLIE](#) says an inclusive decision-making process and the ability to transparently compare trade-offs inherent in different development scenarios are crucial to success. >



RAINFALL AS HIGH as 22 feet annually supports lush temperate rainforests and raging rivers, and the coast is carved into an array of fjords, inlets and bays. Of the world's marine mammal species, one out of three live here, including thousands of gray whales that migrate along the coast on their way north to feed and south to breed. Nuuchah-nulth Indigenous peoples have depended on the west coast's abundant natural resources for sustenance for thousands of years. They and newer residents in the area pursue a range of livelihoods including fishing, shellfish harvesting, shipping, mining, logging and aquaculture. The island's resources support a growing tourism industry that brings over a million people each year to whale-watch, surf, kayak, and camp. These activities collectively generate about US \$630 million annually, with many sectors poised to grow.

Management of the coast's resources has long created tension as different sectors are often in competition with each other for access and control. Conflict is common in populated, productive coastal areas around the world. To manage this tension, since the 1990s, residents have been laying the social groundwork for The West Coast of Vancouver Island Aquatic Management Board (WCA), which represents a uniquely inclusive and collaborative approach to coastal management that is now being replicated in other regions, including along the coastline of British Columbia through the Marine Planning Partnership (MaPP). WCA's planning

Moonrise over Barkley Sound and the Broken Islands Group

process uses ecological, economic, and social data to map resources and sensitive areas and to identify zones for development and protection. Lack of data or access to data is often one of the biggest challenges to spatial planning, but WCA was able to gather over 200 data layers, resulting in a publicly available atlas, showcasing rich information about the ecology and human uses of the region. They've produced a report – the Integrated Coastal and Ocean Management Strategies – one of the only examples in Canada; created the first implementation strategy under Canada's Wild Salmon Strategy; and have carried out “millions of dollars worth of work in restoration, assessment, sustainable local fisheries, and other innovative projects,” according to Andrew Day in his report, *Innovation and Communications about Marine Protection, Aquatic Conservation*.

A key to the success of WCA is that its membership is comprised of trusted representatives from all levels of government including First Nations, the federal government, the Province of British Columbia, and regional representatives, together with representatives from key sectors such as fishing, aquaculture, and tourism, and from non-profit and scientific organizations. To foster widespread trust, board members engaged in extensive communications, conducting repeated community meetings over several years, collecting the community's visions and values, sharing draft plans, receiving feedback, and continually revising products. The Board also engaged in one-on-one interviews

THE WEST COAST OF VANCOUVER ISLAND AQUATIC MANAGEMENT BOARD REPRESENTS A UNIQUELY INCLUSIVE AND COLLABORATIVE APPROACH TO COASTAL MANAGEMENT

forging and strengthening relationships with thousands of constituents as WCA developed founding principles and objectives, which grew to include sustainable economic growth that maintains the residents' aesthetic, spiritual and cultural values.

The Natural Capital Project (NatCap) was invited by WCA to help create spatial plans, using NatCap's approach to including nature's benefits in spatial planning. For the initial effort the WCA/NatCap team focused on two regions – Barkley and Clayoquot Sounds, where the board faced many difficult questions about balancing growing demands on local ecosystems with conservation of the island's unique wild character and cultural heritage.

NatCap brought additional science capacity to WCA's planning process. NatCap developed mathematical models that predict future relationships between local people and nature-based benefits called ecosystem services, such

as clean water and shoreline stability. NatCap's tools (all of which are now available in the free, open source InVEST software) show how different development actions – such as building more homes, or permitting more aquaculture – likely affect ecosystem services such as water quality or recreation opportunities. A habitat risk assessment brought diverse stakeholders together in a participatory process to agree on the best available information and to explore the cumulative effects of multiple activities on local ecosystems and on those ecosystems' ability to provide diverse benefits to local communities, now and in the future. This clarity about how different future scenarios would play out in specific places allowed the board to engage the community in a transparent decision-making process around how to best achieve development goals along the coast. The NatCap/WCA partnership helped WCA identify clear, measurable metrics with which to measure progress toward their stated goals. These metrics are now being used to guide on-the-ground decisions as plans are continually adapted and implemented. ○

STACEY SOLIE is the interim Communications Manager for the Natural Capital Project and the co-creator and founding editor of The Nature Conservancy's Science Chronicles. She has written for The New York Times, The Daily Beast, and other local and national news outlets.



THE PICTURE

Fishing in the sapotit, August 1963



Photo: Douglas Wilkinson, Canadian Museum of Contemporary Photography

Inuit fishermen are seen here using a sapotit, or stone weir, to confine and capture fish. The picture was taken by Canadian photographer Douglas Wilkinson (1919-2008). It is held in the permanent collection of the Canadian Museum of Contemporary Photography



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