

ANNUAL REPORT

2017-18



Future Earth Annual report 2017-18

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This annual report covers the period from 1 April 2017 to 31 March 2018

Annual report 2017-18

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“ Future Earth’s focus on cutting edge science and innovation is at the vanguard of the transformation we need to ensure we live on a planet we can call home. Our research networks are showing there is a clear path to global sustainability that engages science, policy makers, civil society, and business. Future Earth’s mission has never been so relevant. ”

Johan Rockstrom,
co-chair advisory committee
Future Earth



“ Science has helped us understand the vulnerabilities of planet Earth and of all who inhabit it. Future Earth is now striving to deploy this understanding of natural systems, generated through decades of scientific research on global environmental change, in conjunction with our understanding of human-made systems to help pull planet Earth back to a safer space while increasing the resilience of communities. ”

Leena Srivastava,
co-chair advisory committee
Future Earth



Summary from the executive director



In 2018, three years after the world committed to the UN Sustainable Development Goals (SDGs), it's clear that we need to move much faster to meet them by 2030. Scientific research tells us that there is an urgency to our work. Our current development path is triggering biodiversity loss, global temperature rise, unsustainable energy consumption, and a host of other global challenges. If we continue in this manner, our

earth will not support us, and we will give up much of the development progress we have made in the past 100 years.

Fortunately, research and innovation can help us overcome these challenges, but it will take a dedicated effort. To accelerate large-scale transformation, we must build tools and solutions that focus on changes at the intersection of natural and social systems, and on the interlinked nature of the SDGs. Taking a systems approach to global sustainability ensures that our actions scale beyond any individual SDG or national effort, enabling us to advance towards the peaceful, equitable, and healthy planet that is envisioned by Agenda 2030.

We'll also need to innovate to maintain the stability of these systems. This requires "break-the-box" thinking from the social, technological, policy, and academic spheres. It means exploring less-traveled pathways instead of relying on easy-to-replicate cases.

At Future Earth, we believe solutions will emerge from the interaction of groups that normally remain siloed, and from seeking out non-traditional knowledge sources.

Our annual report this year showcases some of our many cross-sector collaborations and our work in various systems, driving global change.

For example, we recently sponsored 10 SDG Labs, exploring complex themes such as urban greenspace in Nigeria or Indigenous knowledge on health in Fiji.

Looking forward, we will continue to focus on the systems approach. We're already piloting several initiatives to scale, including our Exponential Roadmap for decarbonization driven by the technology sector, to be launched at the 2018 Global Climate Action Summit in San Francisco. To achieve the SDGs, we need to seize every opportunity to collaborate. Our chances of generating change are better together.

Amy Luers
- August 2018

A global network of researchers and innovators

Global hubs **5**

Colorado hub

Montreal hub

9 Knowledge-action networks*

Global research projects

20

5 Regional centers and offices

ca. **20**

National networks

Connecting to international platforms:
10+ global policy partnerships, such as the United Nations Framework Convention on Climate Change



Sweden hub

Paris hub

Tokyo hub

- Global hubs
- National networks
- Regional centers, partners & offices



What we are doing




Global carbon budget

This report, published every year by one of Future Earth's global research projects, the Global Carbon Project, provides an in-depth look at the carbon dioxide emissions of nations around the world. The 2017 report delivered both good and bad news: Global carbon dioxide emissions rose again in 2017, ending a three-year hiatus, but emissions remained flat in a number of nations despite strong economic growth.

The research synthesis is a collaboration of more than 80 experts worldwide and is an example of the value of Future Earth's global networks. Future Earth's communications team works with scientists from the Global Carbon Project to synthesize and communicate the budget targeting UN negotiators and national policymakers.

The release of the 2017 report coincided with the UN Climate Change Conference (COP23) in Bonn, and was complemented by news releases, infographics, videos, and other outreach activities. The results from the 2017 report were quoted in nearly 3,000 media outlets worldwide.



The 10 science 'must-knows' on climate change

In a 2017 report presented at COP23 in Bonn, Germany, Future Earth and the Earth League laid out the top 10 science facts on climate change that leaders from around the world should know about – from the impacts of climate change on migration and civil unrest, to the pathways for developing carbon-free economies.

The report was jointly released with Patricia Espinosa, Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC) and Future Earth. Summarizing recent Earth-systems science and risks of approaching tipping points, a statement by Ms Espinosa called for urgent action on emissions reductions to meet the Paris Agreement. The Secretariat coordinated the synthesis, review, editing, and launch of the report in collaboration with experts from across the network.

The report was quoted by United Nations Secretary General António Guterres during COP23. It was distributed to negotiators and was picked up by major media outlets, including the *New York Times*.



Sleeping giants

The recently launched Sleeping Financial Giants Project, a collaboration between Future Earth, Stockholm Resilience Center, and Global Economic Dynamics and the Biosphere Programme, aims to engage the finance sector to help it realize its direct links to global sustainability. It has been recognized that financial actors play a critical role in Earth's climate system, and financial flows have an effect on sustainability at a global scale.

The project communicates research on tipping points in major ecosystems, focusing especially on the Amazon rainforest and the boreal forests. In the last 12

months, Future Earth has organized two workshops with representatives of major financial institutions in Stockholm and in London.

Ultimately, the project will produce visualizations and a peer-reviewed scientific report. It also aims to engage CEOs of financial institutions in early 2019 at the World Economic Forum in Davos, Switzerland.



The Water Solution Lab: Bangalore

The Divecha Center for Climate Change has recently introduced a Water Solution Lab in Bangalore, India, in partnership with the Sustainable Water Future Programme, a global research project of Future Earth. The objective of the Water Solutions Lab is to address water sector challenges in India, with a special focus on the city of Bangalore.

The Water Solution Lab works with national and international partners in India to develop practical solutions to water-related problems by bridging the gap between science, policy and governance, and between theory and practice. The lab is developing a technical solutions repository, brokering and facilitating dissemination of solutions, and helping researchers learn from each other.

In 2017, workshops were developed to assess naturally occurring pollutants affecting water quality in India and neighboring regions, and increasing frequencies of urban floods across the world.



PREP: Climate Data for Everyone

An initiative by Future Earth and the World Resource Institute is making climate data accessible, understandable, and actionable for adaptation decision-makers and practitioners.

PREP, the Partnership for Resilience and Preparedness, is solving key data challenges that are holding up climate adaptation decision-making around the world: a sea of uncurated data, no clear channels for two-way communication between communities facing adaptation decisions and data providers, and high technical hurdles between communities and the data visualizations they need for decision-making.


Together with over 30 different partners from a wide range of industries, and some of the biggest names in research and technology – Amazon Web Services, Microsoft, ESRI, NASA, and NOAA – PREP have developed and launched the peer-to-peer, open source and map-based platform, PREPdata.

PREPdata offers useful, timely, and credible data, and visualizations that data adaptation planners need to analyze

vulnerability and build resilience to climate change. PREPdata users can intuitively explore and layer curated climate, physical, and socioeconomic datasets, track indicators on customized dashboards, and share their stories with practitioners around the world. Over 7,000 unique users have visited PREPdata from 150 countries, and over 300 adaptation practitioners attended PREPdata's first training webinar.

PREP has worked with two states in India, Madhya Pradesh and Uttarakhand, to visualize local data and co-produce sector specific dashboards for the states. In addition, the Divecha Divecha Center for Climate Change hosted a PREP meeting gathering data providers, researchers, decision makers, and nongovernmental organizations in south Asia to discuss and build partnerships about data and tools for climate adaptation and resilience planning.

For more, visit: www.prepdata.org



Carbon Law Accelerator: Exponential climate action

The Global Carbon Law, the simple rule of thumb to halve carbon emissions every decade to meet the Paris Agreement – formulated with the help of Future Earth staff – is gaining momentum: it was, for example, discussed at the World Economic Forum and in *The Economist*. The Nordics are also adopting a carbon law trajectory through business networks such as the Haga Initiative.

The law, based on a scientific paper, prepared the ground for the formulation of an exponential roadmap that will be rolled out at major summits and conferences during 2018 and 2019 aimed at encouraging ICT companies and industry leaders to scale-up action in line with the Paris Agreement on climate.



Futures CoLab

Futures CoLab is a platform and process to connect decision-makers in government, business, and civil society with researchers and other subject-matter experts to explore solutions to global systemic challenges. A collaboration between Future Earth and the MIT Center for Collective Intelligence, Futures CoLab brings together hundreds of researchers and innovators from across the globe to engage in facilitated asynchronous online dialogues.

The most recent Futures CoLab exercise was conducted in collaboration with the ClimateWorks Foundation to explore the implications of possible alternative futures for climate philanthropy. In this exercise, 150 people from around the world – and from a range of scientific disciplines and sectors – were guided through a four-week structured process of strategic foresight. The goal of this, and other Futures CoLab exercises, is not to predict or explain these unfolding challenges, but rather to help investors and decision-makers explore the implications of global changes and the possible responses.



Science behind everything

Global research project highlights

Future Earth has a rich history of generating research that is at the forefront of sustainability science. We currently support 20 Global Research Projects and nine Knowledge Action-Networks, important foundations of how we work.

In the last year alone, Future Earth scientific research has won global headlines for high-impact findings, including:



Photo: Dikaseva

◆ **Calculating that the planet's vegetation holds roughly 450 billion tonnes of carbon**, roughly equal to the amount of carbon that humans release into the atmosphere over the course of 50 years at current emission rates. The study published in the journal *Nature* also highlights what we've lost. Researchers found that our forests and grasslands could store roughly double the amount of carbon if they were to be restored. (Lauk C et al., 2017).

◆ **Finding a link between volcanic eruptions and social unrest in Ancient Egypt**, a strange link but evidence shows that massive volcanic eruptions disrupted the course of the Nile River by cooling the planet's atmosphere. As a result, this may have led to food shortages, and in ancient times, caused heightened tensions in the region. (Manning JG et al., 2017).

◆ **Developing a comprehensive database of ozone pollution patterns across the globe**, which will help to give scientists and public health managers better insights into trends and patterns of exposure to harmful pollution and human health. The study, published in *Elementa: Science of the Anthropocene*, found that ground-level ozone is a greenhouse gas and air pollutant that, at high levels, is detrimental to human health, and crop and ecosystem productivity. (Fleming ZL et al., 2018)

Future Earth regions

Future Earth recognizes that each region of the globe faces unique challenges and develops unique solutions to make progress on sustainability. Our Regional Centers and Offices are a central part of the Future Earth Global Secretariat and build on the expertise and innovation existing around the world. They help to adapt the vision of the program for local contexts and ensure that regional priorities are integrated into the global mission of Future Earth.

Asia Regional Center

The Asia Regional Center is hosted by the Research Institute for Humanity and Nature (RIHN) in Kyoto, Japan. The Asia region is home to the International Project Offices of four Future Earth Global Research Projects: Global Carbon Project (Japan and Australia), Integrated Risk Governance (China), Monsoon Asia Integrated Research on Sustainability (China and India), and Water Future (Australia).

In addition, Integrated Marine Biosphere Research (IMBeR), Earth System Governance (ESG), and the Global Land Programme (GLP) have regional offices or nodes in the region. The Kyoto Regional Center also provides support to the Systems of Sustainable Consumption and Production (SSCP) Knowledge-Action Network.

The [Monsoon Asia Integrated Research on Sustainability \(MAIRS-FE\)](#) project has an explicit regional mandate and is strengthening its project organization, with an International Project Office in Beijing and a Regional Project Office in Bangalore.

A regional initiative, the [Sustainability Initiative in the Marginal Seas of South and East Asia \(SIMSEA\)](#) headquartered

in the Philippines, pursues transdisciplinary research on a range of issues relating to the seas of the region. Recently confirmed financial support from the Philippines government will help sustain the momentum.

In the past year, National Committees have been formally launched in eight countries and regions ([Australia](#), [China](#), [India](#), [Japan](#), [Korea](#), [Mongolia](#), the Philippines, China:Taipei), with preparations underway for a National Committee in Indonesia.

The Asia Regional Center is guided by a [Regional Advisory Committee](#) composed of senior scientists and stakeholders. The Regional Center is complemented by a [Regional Office](#) based at the Indian Institute of Science in Bangalore that covers India, Sri Lanka, the Maldives, Bangladesh, Myanmar, Pakistan, and Nepal.



Photo: Daryan Shamkhali

South Asia Regional Office

A South Asia regional conference on “Future Earth” was organized in July 2017, attended by scientists from South Asia including members of the Indian National Committee on Future Earth, the Future Earth Regional Center, chair and some members of the FE Asia Science Steering Committee and International Council for Science regional office for Asia and Pacific.

A Workshop on “Water Challenges and Solutions in India”, with focus on urban water issues, was conducted from 31 July to 01 August 2017, in collaboration with Interdisciplinary Centre for Water Research (ICWaR) and the Sustainable Water Future Programme.

Another workshop on the “Performance and Potential of Wind Energy Systems in India” was held during 22 and 23 August 2017. The workshop included participants from industry, research institutes, academic institutions, and decision-makers.

A series of lectures and interaction was organized with Prof. Yuan Xu, Department of Geography and Resource Management, who leads the Environmental Policy and Governance Programme at the Institute of Environment, Energy and Sustainability at The Chinese University of Hong Kong. The theme of lectures and the interaction was “Implementing energy and environmental policies in China”.

As part of our interactions with the policy makers, the Director of Future Earth South Asia Regional Office along with his colleagues have met with the Members of Parliament at the Constitution Club in New Delhi on 27 March 2018. The primary purpose of the meeting was to discuss the impact of climate change on the Himalayan glaciers and water security of the Indo-Gangetic plains, a serious problem faced by a billion people.



Various locations across the EM/MENA region are also undergoing drastic political and social transitions, armed conflicts, and forced migration. Such factors are pushing social and environmental systems to critical thresholds that can no longer buffer those external shocks, such as extreme drought or new waves of refugees. The difficulties faced by people within their own lives, both in urban centers and in rural areas, are often remarkably similar, especially those in situations of greater vulnerability or risk.

Already now, this region has a high degree of urbanization. Between 1970 to 2020, the region saw a 200% growth in urban structures and it is expected that over the next forty years there will be an additional 200% growth of large cities. Inhabitants of regional urban centers will face the repercussions of climate changes through events such as extreme flooding and heat waves, reduced air quality, and enhanced scarcity of water resources due to high consumption and diminishing precipitation rates.

The need for strategic urban solutions for projected extreme city conditions has become crucial. As most countries face increased urbanization and population movements towards urban centers, climate change adaptation must now be considered an obligatory part of every city's urban planning process. This applies not only to managing existing challenges, but forethought and preparation for the projected environmental extremes of the future.

동지중해/중동 및 북아프리카(EM/MENA) 지역 도시주의 환경 문제

북아프리카, 중동 및 북아프리카 지역의 도시들은 기후변화와 환경오염에 직면하고 있다. 또한 심각한 사회적 불평등, 내전, 이주, 식량 안보 문제와 같은 복합적인 도전에 직면하여 지역 차이를 증대시키고 있다. 이러한 상황은 도시의 취약성을 더욱 악화시키고 있다.

EM/MENA 지역 내의 여러 도시에서 심각한 대기오염, 홍수, 가뭄, 열파, 해수면 상승, 극한 기후 변화 등의 다양한 위험이 발생하고 있다. 이러한 위험은 도시의 건강과 삶의 질을 위협하며, 특히 도시의 취약계층에 더 큰 영향을 미친다. 이러한 위험은 도시의 건강과 삶의 질을 위협하며, 특히 도시의 취약계층에 더 큰 영향을 미친다.

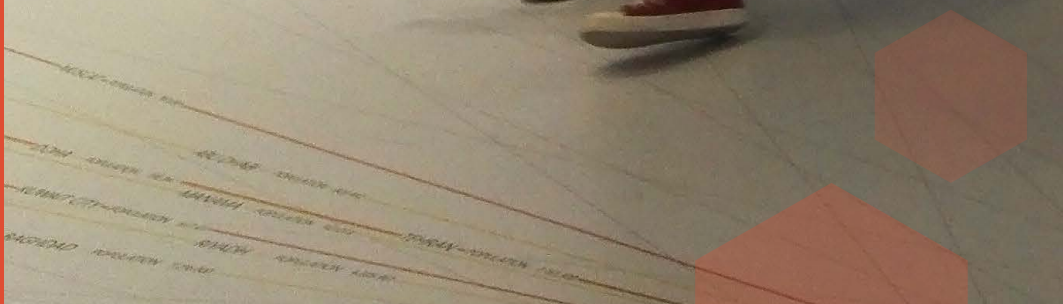
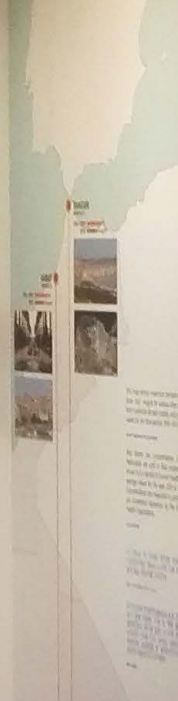
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Nicosia

ΝΙΚΟΣΙΑ

Text describing Nicosia's urban challenges and context.





Middle East and North Africa Regional Centers

The Middle East and North Africa (MENA) region is home to roughly 400 million people and is a climate change “hot-spot”. Future Earth MENA Regional Center (FEMRC) works to identify and implement mitigation and adaptation strategies in a collaborative and regionally-coordinated way. The Center serves countries in the Eastern Mediterranean, the Middle East and North Africa and is hosted by the Cyprus Institute in Nicosia. FEMRC is supported by a Regional Office with a specific focus on North Africa, hosted by the Bibliotheca Alexandrina in Alexandria, Egypt.

In late 2017, FEMRC and the Cyprus Institute were invited to attend the Seoul Biennale on Architecture and Urbanism, a large-scale, high-visibility public event that addresses themes of urban settings on a global scale. We were provided with two large exhibition spaces free of charge to showcase activities and the challenges faced by the region.

FEMRC’s work was highlighted in an exhibition led by artist and curator, Melina Nicolaidis, which created opportunities to

increase the visibility of regional activities and develop new partnerships.

The collaborative initiative helped to identify basic commonalities within the environmental challenges faced by people living in the urban centers in the region of the Eastern Mediterranean, Middle East and North Africa.

In cities from Rabat to Muscat, residents are dealing with frequent and life-threatening heat waves, dwindling water supplies, and air-borne dust. In the project, each participating city was represented by comparative scientific data from numerical climate models for temperature and rainfall, plus air quality values, which help illustrate the growing pressures on these urban centers.

The ongoing objective is to illustrate the need for a path towards creating an integrated regional adaptation strategy for cities of the future.



Collaborative funding

The Program for Early-stage Grants Advancing Sustainability Science (PEGASuS) seeks to increase knowledge, promote innovation, and establish evidence-based solutions to the world's most difficult sustainability challenges.

PEGASuS brings together researchers from different disciplines and across borders to take creative approaches to exploring the relationships between people and the planet. With the ultimate goal to generate self-sustaining research projects that have real-world impacts on the health and well-being of human societies.

In 2017, Future Earth announced the first round of PEGASuS grants, focusing on biodiversity and natural assets. Five projects were selected for funding out of over 200 submitted proposals from over 50 countries, and collectively received \$446,000 (USD).

- ◆ Drug Trafficking and Central American Protected Areas: Focusing on Participatory Governance to Conserve Ecosystem Services and Biodiversity, Bernardo Aguilar González PI, Fundación Neotrópica, Prof. David Jesse Wrathall (Oregon State University) and Prof. Jennifer A. Devine (Texas State University).
- ◆ Farmer-led Agroecological Research in Malawi (FARM) for Biodiversity, Rachel Bezner Kerr PI, Cornell University.
- ◆ Toward Biodiversity-related Opportunities for Sustainable Development: a Global Social-ecological Mountain Comparison, Markus Fischer PI, GMBA and University of Bern.
- ◆ Nurturing a Shift towards Equitable Valuation of Nature in the Anthropocene (EQUIVAL), Unai Pascual PI, ecoSERVICES and Basque Center for Climate Change.
- ◆ Cross-pollinating Knowledge Systems: Exploring Indigenous Local Knowledge About Native Bee Diversity and Ecology, Wendy R. Townsend PI, University of Florida.

PEGASuS

PEGASuS is funded in part by the [Gordon and Betty Moore Foundation's Science Program](#) and the [NOMIS Foundation](#). PEGASuS is jointly administered by Future Earth and [Colorado State University's Global Biodiversity Center](#).



SDG Labs



Photo: MR CITY Lab

Future Earth, together with partners, has created the Sustainable Development Goal (SDG) Labs – a global, competitive call for innovative solutions to complex sustainability challenges – that are seeded at a small, “prototype” scale, that display capacity to be scaled-up.

A typical SDG Lab consists of a team of researchers that actively connect with community leaders, entrepreneurs, and others in their home country or region, to address sustainability issues using both academic and traditional knowledge. This group comes together for a limited time to address social, ecological, or technological innovations, or, more likely, a combination of all three.

The first set of 10 SDG Labs were set up before the International Conference on Sustainability Science (ICSS) in August 2017, selected from a global call that resulted in over 350 proposals. The labs received seed funding and were invited to make presentations of their activities at the conference. The funded labs will be showcased in an upcoming eBook by Springer.

The SDG Labs included, among others:

- ◆ “Integrating Indigenous and local knowledge into human health planning in Fiji”; a series of workshops that connect western academic medical expertise with practitioners of traditional medicine.
- ◆ “Lusaka 2021: What if we all lived downstream?” A city-wide, participatory, and sustainable flood management project in rural Zambia”.
- ◆ MetaMAP; a digital collaboration platform based on design thinking and visualization of SDG interactions from Australia.

A second round, called SDG Labs Africa, was initiated for the Seedbeds to Transformation conference, to be held in South Africa in May 2018.



ESA's Earth Explorer Aeolus satellite lifted off on a Vega rocket from Europe's Spaceport in Kourou, French Guiana, on 22 August 2018. Photo: ESA - S. Corvaja



European Space Agency collaboration

Future Earth's partnership with the European Space Agency (ESA) strengthens our links with the observation community and ensures that ESA's strategic direction is guided by Future Earth research.

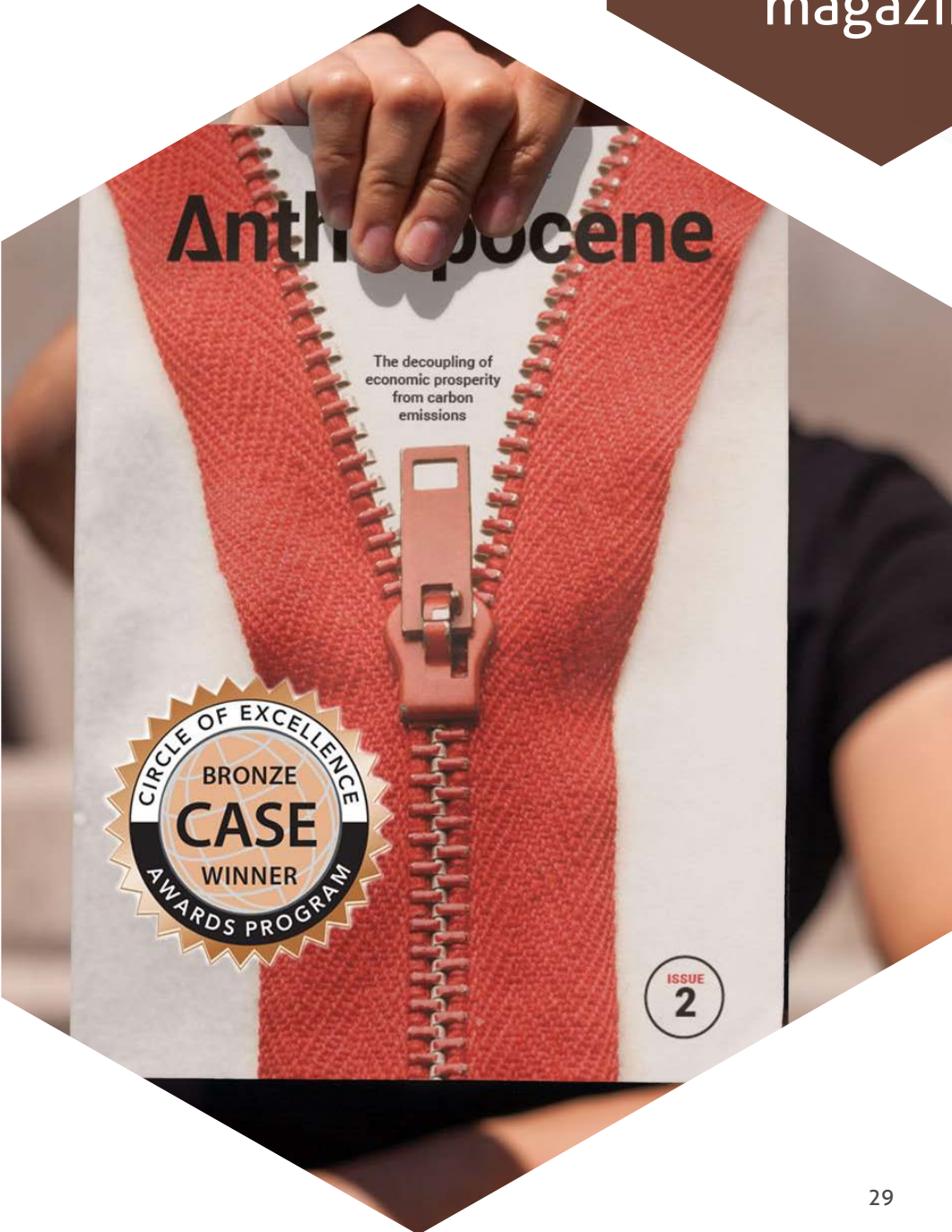
A funding call for joint ESA-Future Earth activities that helped progress Future Earth's objectives, while making use of ESA data and/or tools was awarded in 2017; it resulted in the following workshops, ranging from the role of new satellites in science, synthesizing data related to open fires and coast waters research.

- "Challenges and promises of using predictive, spatially continuous variables in species distribution models: methods and applications", February 2018: Global Mountain Biodiversity Assessment (GMBA).
- "Concurrent remote-sensing inversions of ocean and atmosphere: new science and emerging opportunities", March 2018: Surface-Ocean Lower-Atmosphere Study (SOLAS).
- "International Biomass Burning Initiative (IBBI) workshop", July 2017: International Global Atmospheric Chemistry (IGAC).
- "Understanding the effect of environmental and climate change on coastal lagoon management: potential and challenges for Earth Observation", September 2017: Future Earth Coasts (FEC).



Shaping the narrative

Anthropocene magazine



Future Earth publishes Anthropocene magazine, a digital, print, and live magazine in which the world's most creative writers, designers, scientists, and entrepreneurs explore how we can create a sustainable human age that we actually want to live in. The magazine has posted over 600 original articles that were read almost 900,000 times; and we've developed a global network of paying members, with articles translated into French, Spanish, and Portuguese. In 2017, the magazine won the Excellence in Journalism Award from the Renewable Resource Foundation.

We sat down with Kathy Kohm, Anthropocene Magazine's Editor-in-Chief, to find out what drives her, what differentiates the magazine from other sustainability publications, and what future plans she has for the magazine.



Tell us a little bit about yourself and what drew you to this project?

I started out my career as a forest ecology major and ended up as a science journalism editor and designer.

I've worked at Denali National Park in Alaska doing grizzly bear education and as an ecologist for the U.S. Forest Service. In the late 90s, I was part of the Society for Conservation Biology, serving on the governing board and as the founding editor of Conservation magazine, from which Anthropocene magazine evolved. During that time, I also edited several books, including *Balancing on the Brink of Extinction*, and *Creating a Forestry for the 21st Century*.

By 2015 however, I felt a profound change in the field. Whereas traditional conservation separated people from nature and painted a bleak future, new conversations were emerging that intertwined human and planetary well-being in novel ways that provided glimpses of sustainable paths to the future.

I wanted to capture that change in a new cutting-edge publication. I also wanted to cast a wider editorial net, tackling not only traditional conservation topics, but also ideas about decarbonizing economies, connecting human and ecosystem health, sustainable consumption, and more.

Anthropocene magazine seemed the perfect fit, and I keep an equation on a slip of paper pinned above my desk that neatly captures my editorial ambitions: Surprise + Clarity = Delight.

So how did the concept of Anthropocene magazine come about?

Josh Tewksbury, Owen Gaffney and I began hatching the idea in 2016. The word “anthropocene” was entering the popular lexicon, not only as a geologic layer in the rocks, but also as a new way of conceiving of humanity’s place on Earth. A magazine with the name seemed just the right combination of edgy and provocative and dovetailed perfectly with the mission of Future Earth.

The anthropocene prods us to be more aware of our species’ outsized impact on the planet. It put us – for better or worse – in the driver’s seat. So we figured it was the right time to launch a publication that talked about where we want to go.

What do you think differentiates the magazine from other sustainability and environmental publications?

There are many quality environmental newsletters, magazines, and sustainability PR materials, but readers understand them for what they are.

A select few institutions have added another editorial dimension to their brand that has propelled them forward as clear thought leaders in their fields, like the MIT Technology Review, Harvard Business Review, and Foreign Affairs, as a few examples.

Anthropocene magazine, built with a strong connection to Future Earth, is designed to be just that for the sustainability world. Its mission is not to promote any particular agenda, but rather to give a voice to alternative views,

Anthropocene Perspective



Look up. By turning an old-timey spin-down and even inside out. To solve a wicked problem like decarbonization of the world's economies, it behooves us to search out new vantage points—and to search a little, unorthodoxly.

In this second issue of *Anthropocene*, that's precisely what we've tried to do. Vivian Werner and Jennifer Wilson-Oliver Morton takes the lead on page 66. Solar geoeengineering, he says, demands a new and often troubling way of looking at our home planet. In the 1970s, Apollo missions gave us a God's-eye view of the Earth and helped launch the environmental movement. Now we're faced with the daunting task of keeping global warming below 2 degrees Celsius. It is in this context that Morton dares to propose us to confront the godlike power of geoeengineering. It's problematic. It's profound. And it represents an irrevocable change in the human relationship to the planet that can't be ignored.

Then, on page 76, Robinson Meyer, a staff writer for *The Atlantic*, flips our usual way of looking at the decarbonization problem on its head. In debates over how best to meet our fossil fuel addiction, there seems to be an almost magnetic pull to the demand side of the classic economic equation. Often we try to curtail consumption by making things we want less of—in this case, carbon-spewing fuel—more expensive. But policies such as taxing carbon pressure from the supply side of the equation. Drawing on the work of Matt Frost and Bill Hattala, Meyer wonders whether we might make some headway toward decarbonization through a remarkably simple plan: Small groups of authors, or even super-wealthy individuals, could buy coal and other fossil fuel reserves—and not mine them. True, it is a far proposal, but when you find yourself in a hole, it is time to stop digging.

And while we're challenging assumptions, don't think about the world's energy on energy equity on page 46. The short answer to the question posed in the title of the article, “How much energy will the world need?” is a lot more than you think. Talk your heart out about it, because the world gets ever closer to eliminating extreme poverty, the global appetite for energy will skyrocket. Gotta watch though, some complex numbers on energy demand to arrive at a simple conclusion: The challenge before us is not to do more with less, but rather to do more with more.

Technology will be pivotal. And one technology that is grabbing headlines is about every aspect of modern life: artificial intelligence. Technology writer Mark Hains provides a fascinating glimpse into how AI could make electrical grids vastly more efficient by making millions of tiny “yes” or “no” decisions that humans being would never bother to make.

If there is a theme for this issue, I'd say it is all about the lens through which we peer at our predicament. Change is uncertain, and a whole new set of possibilities comes into focus.

Kathryn Rubin
Editor-in-Chief

Become a supporting member of Anthropocene and get exclusive benefits.

Josh Tewksbury, Owen Gaffney and I began hatching the idea in 2016. The word “anthropocene” was entering the popular lexicon, not only as a geologic layer in the rocks, but also as a new way of conceiving of humanity’s place on Earth. A magazine with the name seemed just the right combination of edgy and provocative and dovetailed perfectly with the mission of Future Earth.

The anthropocene prods us to be more aware of our species’ outsized impact on the planet. It put us – for better or worse – in the driver’s seat. So we figured it was the right time to launch a publication that talked about where we want to go.

What do you think differentiates the magazine from other sustainability and environmental publications?

There are many quality environmental newsletters, magazines, and sustainability PR materials, but readers understand them for what they are.

A select few institutions have added another editorial dimension to their brand that has propelled them forward as clear thought leaders in their fields, like the MIT Technology Review, Harvard Business Review, and Foreign Affairs, as a few examples.

Anthropocene magazine, built with a strong connection to Future Earth, is designed to be just that for the sustainability world. Its mission is not to promote any particular agenda, but rather to give a voice to alternative views,

IDEA WATCH

Human-Driven Evolution Is a Hallmark of the Anthropocene

By Lizette Wade

side the most favorable combination of dry, unshaded, low-latitude, and relatively cool climate for solar generation. Potentially, all Mexico could be solar-powered on dry, How to pay for it? Although it would be a major investment, the price of industrial solar generation continues to drop quickly, and because Mexican solar power is cheaper to build and maintain than comparable facilities north of the border, international investors would have strong incentives. Fortunately, Mexico's recent constitutional reforms encourage foreign and domestic investment in the electricity sector. Connection of the solar boogie would go a long way toward helping Mexico achieve its mandated climate change goals, which include 35 percent renewable electricity generated by 2024. Electricity exports from Mexico to the US have soared for over a century and have burgeoned in recent years, which should make international long-term loan guarantees for solar plants relatively easy to obtain.

If the initiative were framed as a big, charismatic project that has the full backing of the Mexican government, generating the admission of the rest of the world, it would position Mexico as an energy, world leader in combating climate change. Mexico and the US would be connected by a truly beautiful wall—a symbol of unity, visible even from space.

During World War II, Londoners often sought shelter from German bombs in the city's subway tunnels. Then, they encountered another type of enemy: bombs of over-class magnetics. These weren't your typical above-ground magnetics. They were natives of the Underground, born in ponds of standing water that permeated the underground passageways. And unlike their open-air cousins, London's subterranean skaters seemed to love being humans.

Fifty years after the war ended, scientists at the University of London decided to investigate the subway population. They collected eggs and larvae from subway tunnels and garden ponds and reared both populations in the lab. The outdoor magnetics fed on bark, but the tunnel lugs preferred mammal blood. And when the carnivore put males and females from the different populations into clove cages designed to encourage mating, one single pairing produced offspring that resembled the dead underground magnetics were which new species, adapted to life in the subway tunnels people had built.

It's ironic like this one the gut Joseph Beu's thinking. As a conservation scientist at the University of Copenhagen, he has a lot about how humans are driving other species extinct. If the current rate stays steady, the planet is on its way to the next mass extinction, a severe one per per with the magnitude of climate change and pollution. The

ote impact that killed the dinosaurs. But he wondered whether there might be a flip side. Certainly people's planet-transforming activities had to be creating new species, too. But how, and how many? Beu decided to see whether he could count all the new species that humans had created or were on their way to creating, in a sort of micro-image of extinction rates and endangered species lists.

First, Beu had to come up with a list of human activities that could create new species. The most obvious one is domestication. By pulling one of the reins on a wild population that is most beneficial to humans and breeding for them, people can force evolution in different species, he'd say. Wolves became dogs, mobby grass became maize, wild boars became pigs, we've started applying the principle of domestication to helping wild species, too. For example, several environmental organizations—including The Nature Conservancy and SCORRE International—recently joined forces to breed mountain gorillas, selecting the best traits and raising their offspring in zoos.

Caribbean. His pilot project on the island of Curacao was to see how many species were already going on transplanting these born survivors into wild nests suffering the effects of climate change and pollution. The

As people's environmental track has expanded and our corresponding sense of responsibility for the planet has grown, we've started applying the principle of domestication to helping wild species, too. For example, several environmental organizations—including The Nature Conservancy and SCORRE International—recently joined forces to breed mountain gorillas, selecting the best traits and raising their offspring in zoos.

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IDEA WATCH

The Rise of the Wooden Skyscraper

New, mass-timber engineering could transform the twenty-first-century city from a carbon source into a carbon sink

By Susan Moran

Left: Marjan Sijm, completed in 2015, is a five-story apartment building in London constructed entirely of prefabricated solid timber. The 100-story Parkers Building in Portland, Oregon, is one of two commercial skyscrapers in the US that Wood Building Partners announced in 2015. Bottom: SAC Construction's 100-story project consists of vertical timber panels joined and pressed together in alternating directions to resist compressing and bending strength.

The building materials that have defined and fueled the great urban migrations of the twentieth and early twenty-first centuries are brick, steel, and concrete. The building blocks of low-carbon cities of the future may, ironically, be a much older, time-honored material—wood.

The carbon footprint of steel and concrete is enormous. Manufacturing and transporting concrete alone accounts for roughly five percent of global carbon dioxide emissions. Wood, however, is both renewable and a carbon sink. According to researchers at the University of Canterbury in Christchurch, New Zealand, construction of a mid-rise building made of steel or concrete results in emissions of roughly 1,600 metric tons of CO₂. By contrast, a similarly sized building constructed from a new generation of engineered woods known as mass-timber products has a zero-carbon footprint—and can even sequester up to 800 metric tons of CO₂.

If we use mass-timber products “to help satiate the world's insatiable demand for housing,” says Alan Oguschi, “a city becomes a bank, storing carbon.” Oguschi, a partner at Gray Oguschi Architects in Connecticut, is among a growing group of pioneering architects exploring the potential for mass-timber products replacing steel and concrete in everything from skyscrapers to big-box retail stores.

Unlike standard fire-by-steel, mass-timber products are made from smaller pieces of wood that are laminated together to create panels up to seven layers thick and up to 16 feet long and eight feet wide—making them ideal for tall buildings. The most established mass-timber product is cross-laminated timber (CLT). The panels

The Great Decoupling

The story of energy use, economic growth, and carbon emissions in four charts

By Bill Jackson, Jo Canevari, P. Clark, C. Le Quesne, and GP Peters
Data visualization by Nigel Hawton

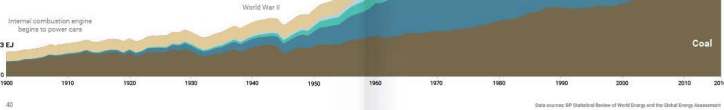
Does decarbonizing economies lead to economic prosperity—or economic downturn? In the past, carbon emissions and prosperity as measured by GDP have risen and fallen in tandem. Emissions drop off at various economic crises but then always rebound within a few years. But what if that long-standing trend is breaking up?

1

Overall global energy use has risen fivefold within one human lifetime.

The history of energy use is like our closets. We don't typically give up our belongings; we add to them. Coal didn't replace wood. It supplemented wood as energy demands grew, overtaking it a century ago. The same is true for oil and natural gas. Oil and gas didn't end the coal era. They added to it.

Global Primary Energy Consumption 1900–2016 (Quajoules per annum EJ)



Data sources: BP Statistical Review of World Energy and the Global Energy Assessment

How Much Energy Will the World Need?

Any climate plan that doesn't consider this question is bound to fail.

By W. Wray Gibbs

Photo: iStockphoto.com



Cutting Loose the **Climate Future** from the

Carbon Past

A God's-eye view is one thing, but what about a God-like power? Geoengineering demands a new way of looking at the world—one that can be troubling.

By Oliver Morton

to question groupthink when it arises, and to be a gathering place for the most creative minds working on the biggest environmental challenges of our time.

How do you see the current state of science journalism in a world dominated by talk of fake news?

Science journalism can be a powerful antidote to fake news if it stays within the traditional guardrails of the scientific process – evidence-based inquiry and openness to revision and growth.

The magazine looks a lot at technological solutions for a sustainable world. What do you think is more important: changing how we consume, relying on international accord, or relying on new technology?

All three are interconnected, moving parts. A new technology such as a long-lasting battery can change how we consume energy. An international accord that puts a price on carbon can spark new technologies that turn CO₂ into valuable products. And a shift in consumer behavior such as eating less meat can transform markets and stimulate innovations in other fields such as aquaculture.

The key is figuring out the best lever to pull in any one system at any one time to shift it toward sustainability.

What are your plans for the magazine's future?

Our next big editorial move is to take our sustainability science journalism from the page to the stage in a live series called *The Anthropocene Dialogues*.

The idea is to create gatherings of eclectic and extraordinary minds – scientists, artists, technologists, historians, and entrepreneurs – and to engage audiences in conversations about turning carbon dioxide into useful products, producing animal products without animals, geoengineering, and other high stakes, difficult problems.

Producing these stories and dialogues will look a lot like science journalism – rigorous reporting, fact checking, and professional editing. Delivering them will look more like theater – creating an immersive experience that is equal parts emotional and intellectual.

The Media Lab

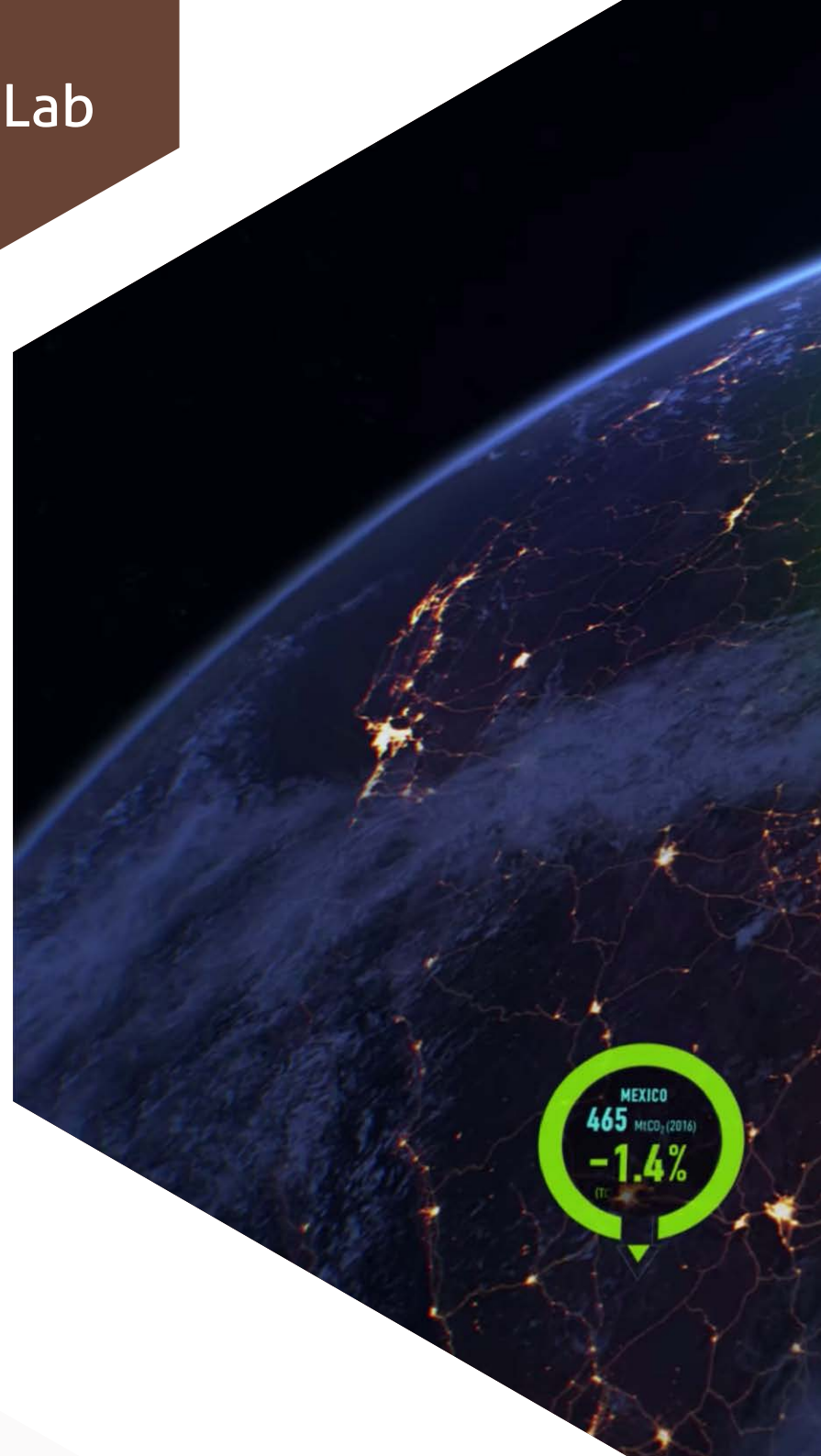
The Future Earth Media Lab is a unique international initiative that brings together scientists, creatives, and technologists around the challenge of connecting people, science, and planet for a sustainable future. It is already delivering ground-breaking projects in media and visualization, for example, the Voices of the Favela, a 360 film about the rich diversity of life, and a series of virtual reality hackathons.

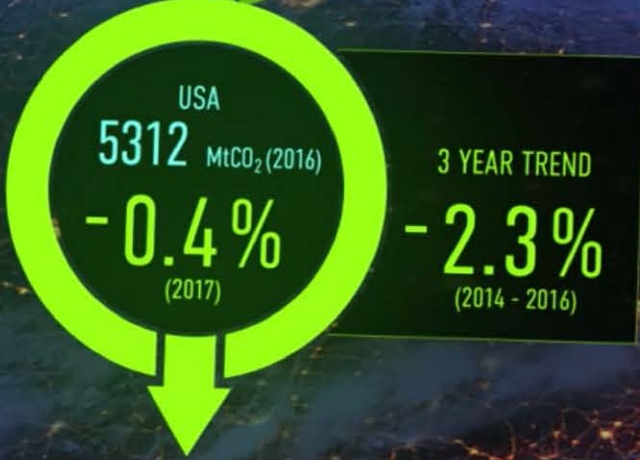
In 2017 the lab was invited to join a Bill & Melinda Gates Foundation pilot project, Diffusion, to explore new ways to syndicate science-related media to broader audiences, particularly aiming at the global development community and issues relating to health, sustainability, climate, and poverty reduction.


The lab also produced a data visualization of the Global Carbon Budget for the Global Carbon Project and an animation, the *State of the Planet*.

In December, the lab published a list of the 100 global sustainability papers in 2017 that made the biggest media impact. "This was the first time such a list has been assembled. We wanted to dig deep into what research is making an impact in the wider world. This analysis allows us to see the balance in the media between solutions focused research and research that describes the problems, and the balance between social science and natural science in the media," said Future Earth's Owen Gaffney.

Finally, in the year, co-founder Felix Pharand Deschenes joined the second cohort of New Zealand's Edmund Hillary Fellowship and was awarded a Global Impact Visa.







Strengthening networks
to build the field of
sustainability science



Knowledge Action Networks

Our research networks bring together innovators from academia, policy, business, civil society and more to address the world's most pressing sustainability challenges. In the last year, Future Earth's Knowledge-Action Networks (KAN), inter alia:

- Issued a call for solution-driven research on the health of the world's seas at the United Nations Ocean Conference in New York City (Ocean KAN);
- Spearheaded an event focusing on sustainable consumption in Asia (Systems of Sustainable Consumption and Production KAN);
- Played a major role in organizing the upcoming Cities and Climate Change Science Conference in Edmonton, Canada (Urban KAN).

We recently interviewed Anna Zivian, [Ocean KAN](#) Co-Chair and Senior Research Fellow at the Ocean Conservancy, Santa Cruz, California. The first meeting of the Ocean KAN was held in October 2017, which began the process of formalizing the agenda and forming working groups.

"By looking at a range of these topics and case studies, we can provide a more useful framework for developing strategy documents for what the Ocean KAN can provide," said Anna.

What have been some of the most exciting developments of the last year?

Preparing for and holding the in-person Development Team meeting in Portland was one of the highlights, because that allowed all of us to sit down and further develop some early ideas that we had discussed during virtual meetings.

Just getting to meet everybody who's involved in the development team, finding out what their backgrounds are, what their

contributions might be, what their interests are, and how they'd like to move the knowledge, action and network parts of the Ocean KAN forward. And at that meeting we talked about forming working groups and I think that was a really interesting, insightful, and exciting part of the work because it's one of the ways that we can move the knowledge-action network forward.

One of the areas we want to focus on is creating a landscape map for ocean science and knowledge.



Photo: E Wisniewska/Azote

We formed an executive team, which has been a real help to me as one of the Co-Chairs, and I will help to drive this work forward.

What is the Ocean KAN accomplishing through Future Earth that might not be happening otherwise?

I'm really excited about Future Earth's mission, especially as it is reflected in the KANs. They're not simply coalescing, synthesizing, and bringing together different scientific research projects – which is hugely important in itself – but also catalyzing action and developing networks for knowledge generation.

Future Earth has really taken the lead on creating this integrated, interconnected network, with different aspects of ocean science, different areas for ocean policy, different sectors including civil society, industry, and academia. It's challenging, but I think it's very worthwhile and I don't think it would be happening in such a comprehensive way without Future Earth and our other sponsors.

What inspired you to join the Ocean KAN as Co-Chair?

Having a more comprehensive, holistic view of the science and research agendas, and policy and societal needs is critical to understanding what is driving the work we're doing. So that's why I was enthusiastic about joining the Ocean KAN, putting my name forward as Co-Chair.

The Ocean KAN will hold their next in-person meeting in September 2018 in Paris.





Global Sustainability Scholars

Future Earth has partnered with University of Colorado Boulder to support the launch of the Global Sustainability Scholars Program (GSS). GSS recruits underrepresented undergraduate students and Early Career Fellows into the sustainability sciences and connects them with international networks of researchers and professionals.

The first cohort of scholars will travel abroad in 2019 to learn from international Belmont Forum Funded researchers focused on food, water, and energy issues in urban areas. Over the course of three summer programs, scholars will engage in paid research experience, working with top international researchers on pressing sustainability issues.

Future Earth has also sponsored the first GSS Early Career Fellow, Adrienne Hampton, who is working with the Future Earth secretariat on a range of initiatives.





Early career professionals

Engaging the next generation of researchers, practitioners, and academic activists in our sustainability projects is at the core of Future Earth's mission. Over the past year, Future Earth has increased its support for early career professionals from all over the world through various networks, programs and events, including the Early Career Researchers Network of Networks (ECR NoN) and through a competitive travel grant scheme for early career professionals.

The ECR NoN now brings together 28 international networks of more than 10,000 early career researchers from across disciplines, regions, and activity areas. Representatives came together at a workshop in London in January 2018, working collaboratively on a series of webinars and a joint publication.

In 2017, Future Earth created a competitive travel grant scheme that supported 20 young researchers and practitioners from 14 different countries, enabling them to participate in sustainability events worldwide to boost their career.



Photo: Alice Bradley and Hannah Moersberger



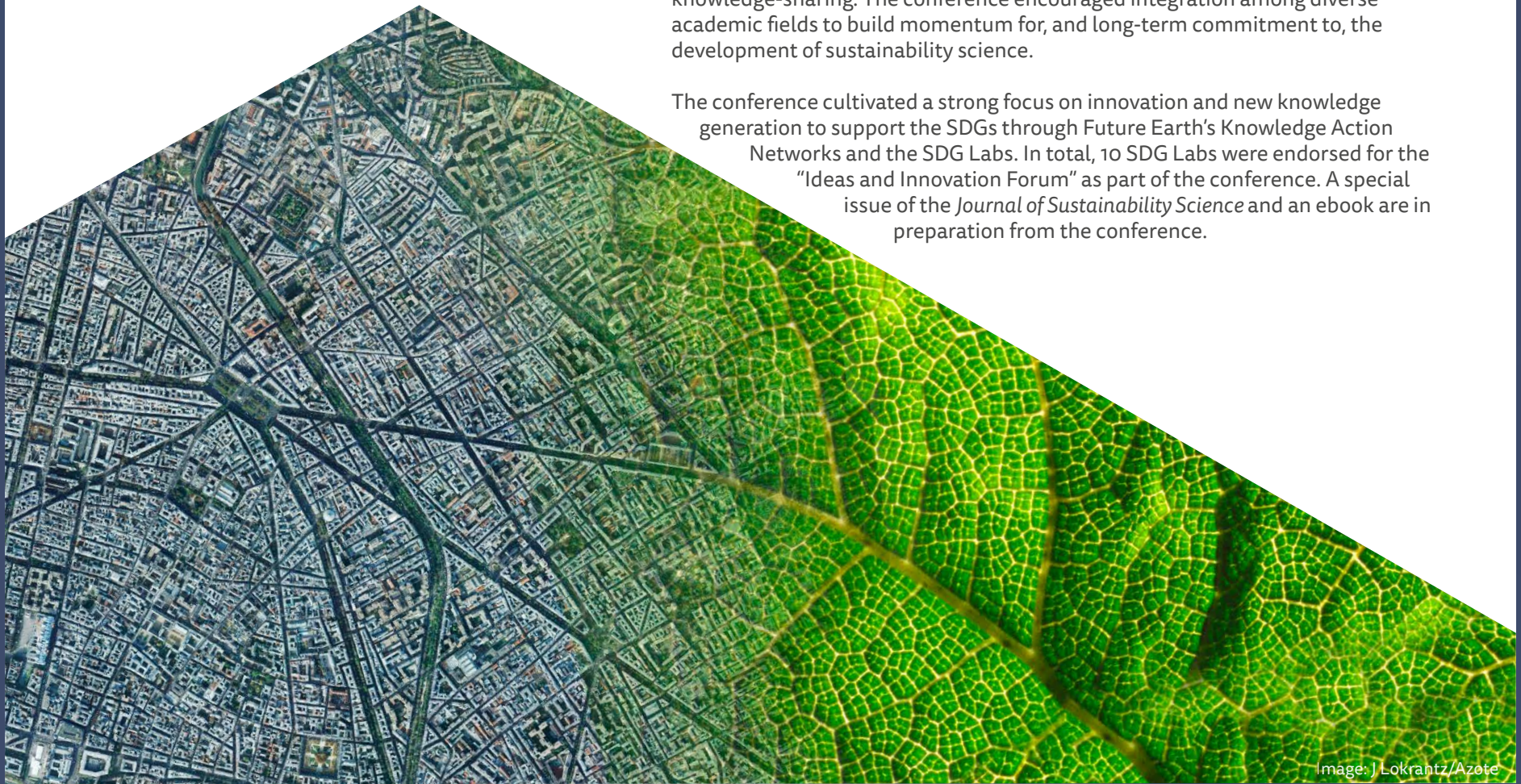
Convenings

In the last 12 months, Future Earth, led, coordinated, and participated in many high-level events around the world. A full list of events can be found in subsequent pages.

7th International Conference on Sustainability Science

ICSS 2017, held from 24 to 26 August, was co-organized by Future Earth, the University of Tokyo Integrated Research System for Sustainability Science (IR3S) and Stockholm Resilience Center. The landmark event brought together experts in sustainability science from around the world, creating a platform for international knowledge-sharing. The conference encouraged integration among diverse academic fields to build momentum for, and long-term commitment to, the development of sustainability science.

The conference cultivated a strong focus on innovation and new knowledge generation to support the SDGs through Future Earth's Knowledge Action Networks and the SDG Labs. In total, 10 SDG Labs were endorsed for the "Ideas and Innovation Forum" as part of the conference. A special issue of the *Journal of Sustainability Science* and an ebook are in preparation from the conference.





Cities & Climate Change Science Conference

The conference, co-organized by Future Earth, IPCC, [C40](#), [Cities Alliance](#), [ICLEI - Local Governments for Sustainability](#), [Sustainable Development Solutions Network \(SDSN\)](#), [United Cities and Local Governments \(UCLG\)](#), the [United Nations Human Settlements Programme \(UN-Habitat\)](#), [UN Environment Programme \(UNEP\)](#) and [World Climate Research Programme \(WCRP\)](#) was held in Edmonton, Canada on 5 to 8 March 2018. The conference set a global research agenda on cities and climate change, increased understanding of climate change on an urban level, and informed better decision-making at the local level.

Future Earth, alongside nine of the world's leading urban and scientific organizations, launched a joint statement describing how they will work together to support the implementation of the global research-action agenda on cities and climate change. The

statement, *The Science We Need for the Cities We Want: Working together to implement the global research and action agenda on cities and climate change*, reinforced a commitment to work together and bring the relevant expertise and resources to support the implementation of the global research agenda on cities and climate.

KNOWLEDGE-ACTION NETWORKS

Take part in these collaborative research communities focusing on important themes in global sustainability.

JOIN COMMUNITIES



LATEST DISCUSSIONS

Open Network

The Open Network is a free online tool for research collaboration and engagement for global sustainability, a space for professionals from around the world to gather and do the crucial work of building transformations to a more sustainable world.

In 2017, the network grew to a total of 5,800 members from more than 150 countries. Here are some key facts and metrics about the Open Network in the last 12 months:

132,000

Website pageviews

1,050

New discussion threads started

29,500

Messages sent and received

EVENTS

- 26 August

Impacts of sea-level rise from past to future (iSLR18)

Utrecht, Netherlands
- 29 August

Urban-Rural and Upland-Coastal Connectivities in Managing Sustainable Urbanizing World

Bogor, Indonesia
- 30 August

2018 Asia Conference

Taipei City, Taiwan
- 5 September

Congress FOOD 2030: Towards sustainable agri-food systems

Stuttgart, Germany
- 12 September

Calendar events added

Global Climate Action Summit

San Francisco, CA, United States
- 17 September

Cool forests at risk? IBFRA 18

10,000

Library entries viewed

170

Calendar events added

1,850

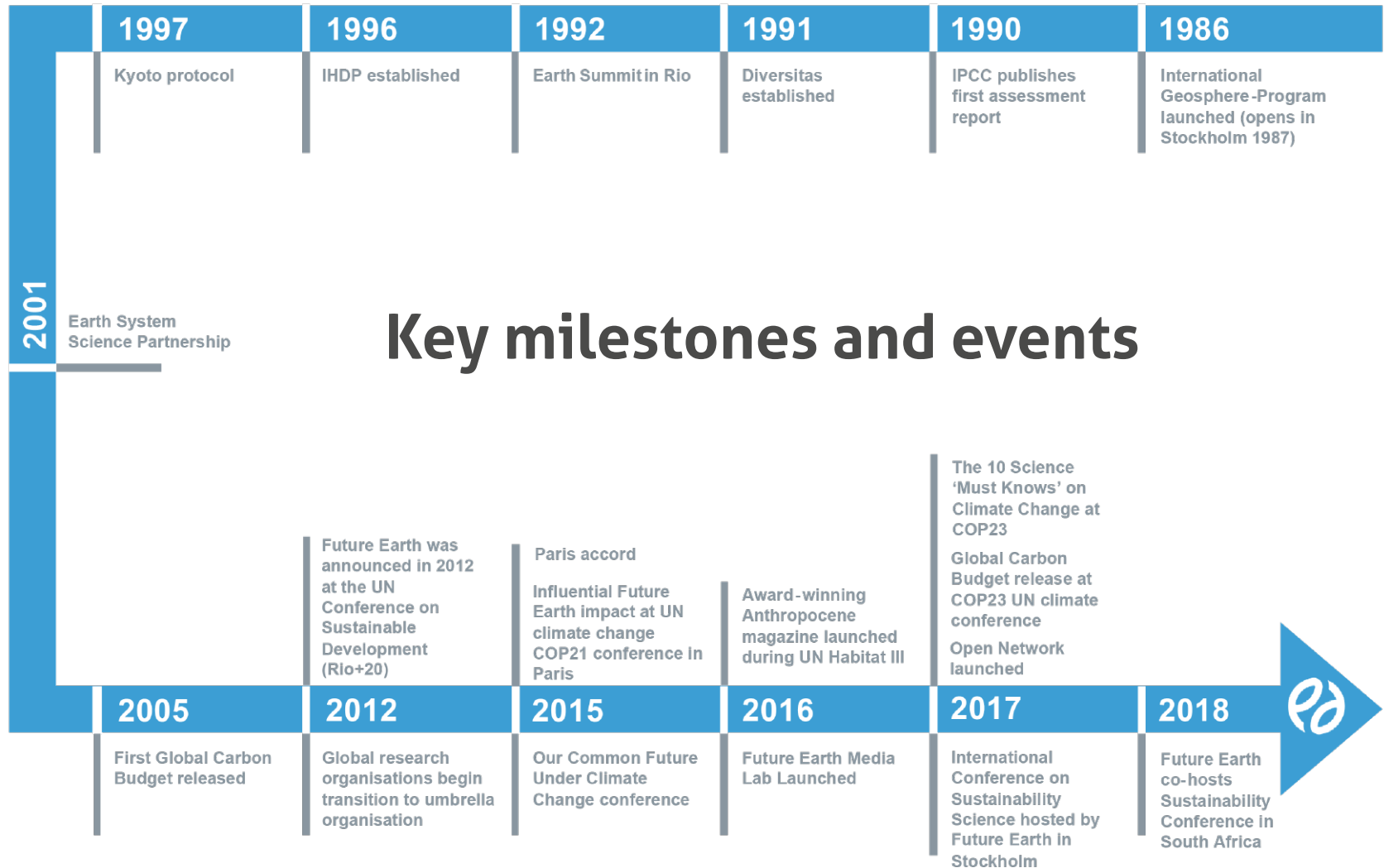
Discussion group posts written





About Future Earth

Visual timeline



Key milestones and events

The advisory committee

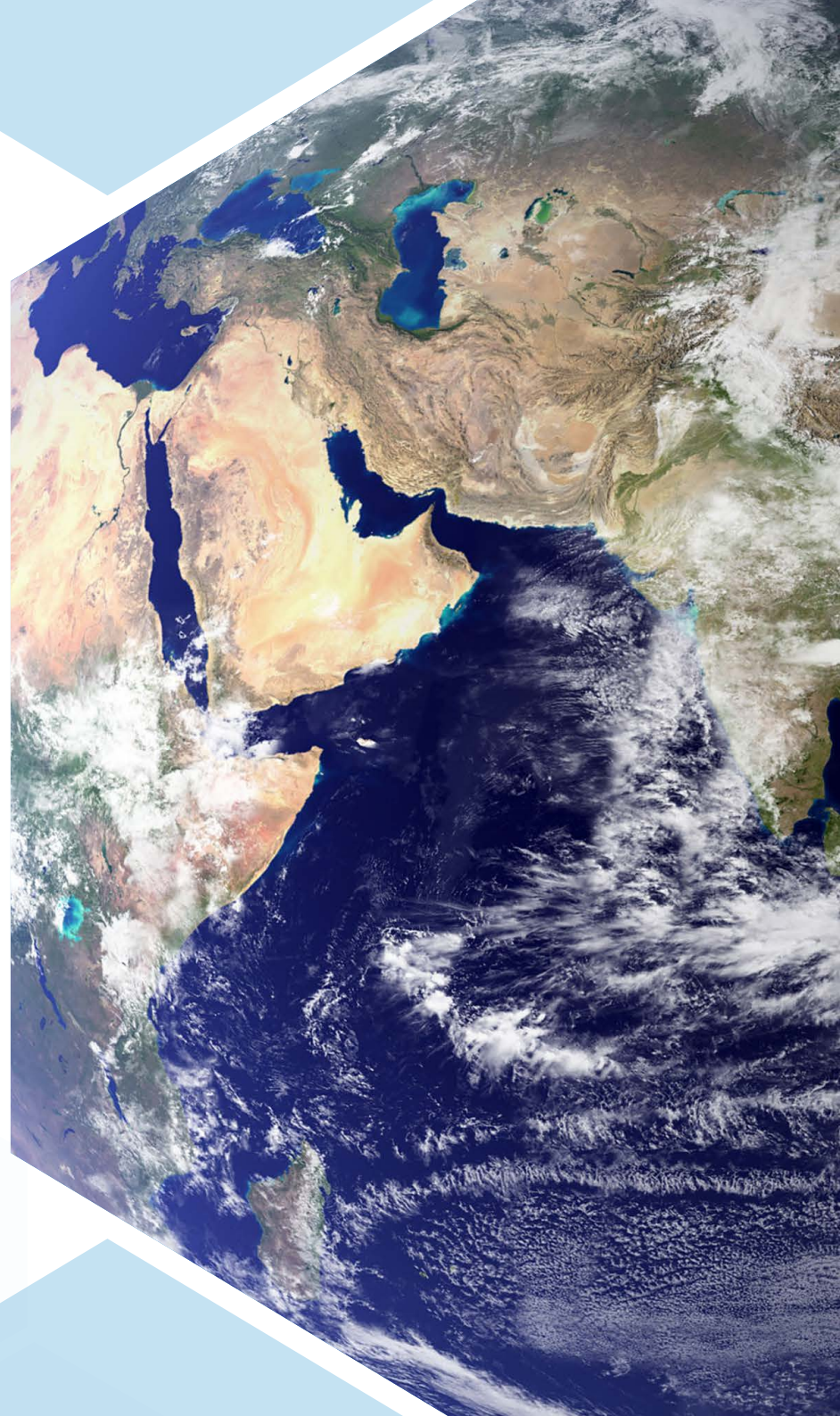
In December 2017, Future Earth welcomed two esteemed international scientists, Leena Srivastava and Johan Rockström, as Co-Chairs of a new Advisory Committee to succeed the Future Earth [Science](#) and [Engagement](#) Committees, which were instrumental in the initiation of Future Earth's transdisciplinary research framework from 2014 to 2017.

The full membership of the Advisory Committee was announced in March 2018 and includes prominent representatives from diverse scientific and geographical communities.

The Committee's role is to advise the Governing Council on emerging trends in sustainability and new and ongoing Future Earth initiatives, to ensure that Future Earth remains the preeminent platform for research and innovation to support transformations towards sustainability.

Online activities and stats

Our website and social media are key communication channels for sharing the updates, impact, and outcomes of Future Earth's research. The last 12 months saw significant viewership on our digital communications, with over 167,000 unique visitors reading the Future Earth website, and reaching more than 770,000 people on social media.





Events

Future Earth contributed to the following selected conferences

- PREP partners meeting, Washington, February 2017
- Disruptive Low Carbon Innovations (DLCI) workshop, London, April 2017
- First dialogue of the Sleeping Financial Giants, Stockholm, 2017
- Second dialogue of the Sleeping Financial Giants, London, 2018
- United Nations Oceans Conference, New York, June 2017
- “Air Pollution and Human Health in Asia” Plenary Future Earth Session at the 17th Conference of the Science Council of Asia, Manila, June 2017
- Advanced Institute on Disaster Risk Reduction with Systems Approach for Slow-Onset Climate Disasters, Taipei, July 2017
- ICSS 2017 - International Conference on Sustainability Science, Stockholm, August 2017
- Natural Assets KAN meeting, Bern, September 2017
- World Data System Asia-Oceania Conference 2017, Kyoto, September 2017
- STS forum Regional Action on Climate Change Conference (RACC), Kyoto, September 2017
- Global Forum on Science and Technology for Disaster Resilience 2017, Tokyo, November 2017
- UNFCCC COP 23, Bonn, November 2017
- The 6th Future Earth in Asia International Symposium on Sustainable Consumption in Asia, Kyoto, January 2018
- Early Career Researchers Network of Networks meeting, London, January 2018
- 2nd AEON Forum on Future Earth “Sustainable Consumption and Production”, Tokyo, January 2018
- PyeongChang Forum 2018, PyeongChang, February 2018
- 2018 Ocean Sciences Meeting, Portland, February 2018
- “Future Earth: a roadmap for a global energy transformation” Future Earth seminar at the Swedish Parliament, Stockholm, March 2018
- CitiesIPCC Cities and Climate Change Science Conference, Edmonton, March 2018
- IPBES-6, The future of biodiversity and human well-being through culture and the arts, Medellin, March 2018



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Global Research Projects

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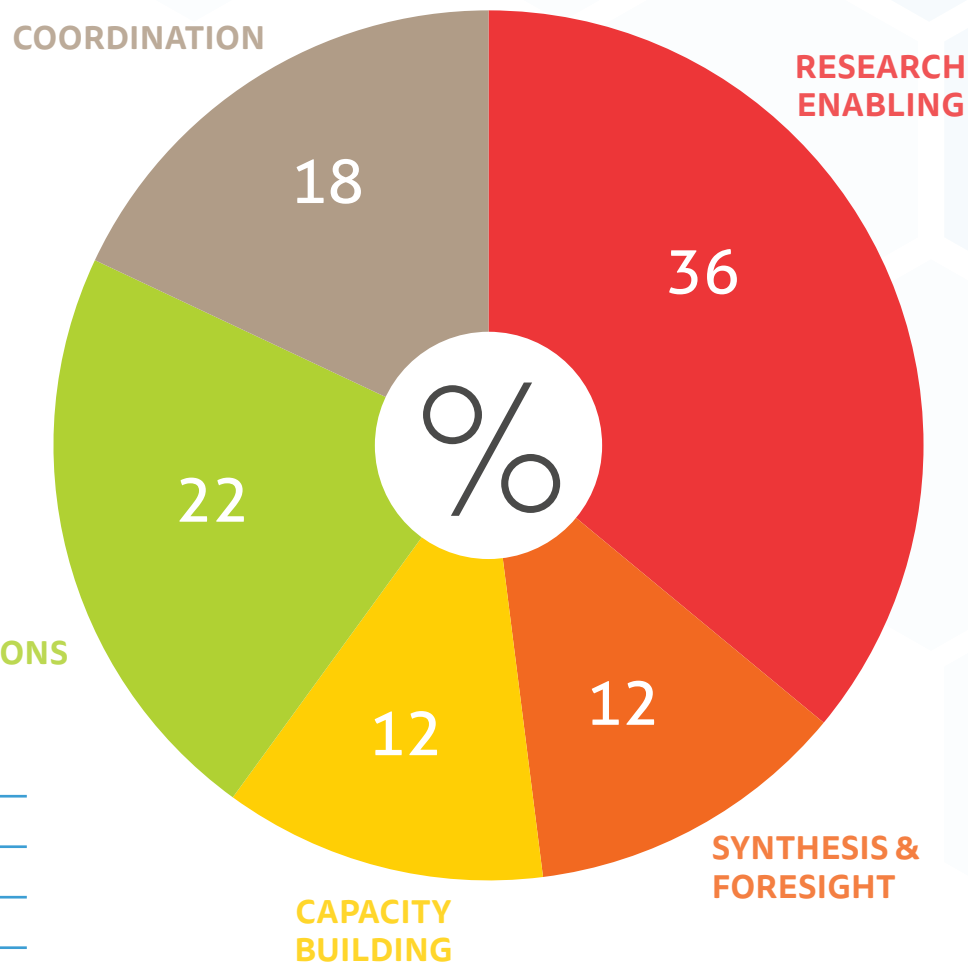
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Financial summary

Future Earth Global Hub Secretariat's funding consisted of 80% public sourced funds, including national contributions, and 20% private-sector funding, during the financial year 2017-18 (1 April 2017 - 31 March 2018).

Total expenses for the three financial years 2015-18 was 13.6 million EUR, of which 5.3 million EUR was expensed during the financial year 2017-18. Value-added research based activities, events and conferences for greater impact have increased significantly, while core expenses remain stable, compared to previous years. Some contributions were transferred to Future Earth's research networks through grants for meetings and workshops.

The charts show Future Earth Global Hub Secretariat's year 2017-18 expenses, divided by function.



Expenses by function 2017-18	million EUR	%
Research enabling	1.9	36%
Synthesis & Foresight	0.6	12%
Capacity building	0.6	12%
Communications	1.2	22%
Coordination	1.0	18%
Sum expenses	5.3	100%

Regional Centers and Offices

- **Asia** (host: Research Institute for Humanity and Nature, RIHN, Kyoto, Japan)
- **Europe** (host: Tyndall Centre for Climate Change, Norwich, UK, until mid-2017)
- **Middle East and North Africa** (host: Cyprus Institute, Nicosia, Cyprus)
- **South Asia** (host: Divecha Centre for Climate Change, Bengaluru, India)
- **Latin America** (Strategic Partner, host: Inter-American Institute for Global Change Research, Montevideo, Uruguay)
- **Southern Africa** (host: National Research Foundation of South Africa, opening in October 2018)



National networks

Australia	Belgium	Estonia	Republic of Korea
Austria	Benin	Finland	Romania
	China	France	Slovakia
	China: Taipei	Germany	Spain
		India	South Africa
		Ireland	Sweden
		Japan	Switzerland
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		Norway	
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Swedish Global Hub

- The Swedish Ministry of Environment (via Swedish Research Council, FORMAS)
- The Swedish Ministry of Higher Education and Research (via the Swedish Research Council, Vetenskapsrådet)
- The Erling-Persson Family Foundation

- European Space Agency
- Vinnova
- U.S. National Science Foundation

Paris Global Hub

- Center National de la Recherche Scientifique (CNRS)
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- Alliance Nationale de Recherche pour l'Environnement (AllEnvi)
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Japan Global Hub

- Science Council of Japan
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Colorado Global Hub

- U.S. Global Change Research Program
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