



ANNUAL REPORT 2019-20

futurearth
Research. Innovation. Sustainability

Future Earth Annual Report 2019-20

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This annual report covers the period from 1 April 2019 to 31 March 2020

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Executive Director's note

This year humanity experienced a global systemic crisis along the lines of which our Future Earth community had long predicted. Yet, this crisis still came as a shock to many. Each of us, I expect, is reflecting deeply on what this all means for our individual and collective futures.

Much of our work within Future Earth focuses on understanding, mitigating, and responding to global systemic challenges. So while the COVID-19 crisis came as a shock, it was not a surprise for the scientific community.

We understand how interdependent humanity is on each other and nature. Science has enabled us to project the cascading and catastrophic effects that the multiple and interacting forces of the changing climate, loss of biodiversity, and the rise of inequity, will have on global society. We run the models, We tell the stories. We work with decision makers to identify solutions. Yet, the COVID-19 crisis brought us to our knees in a matter of months. One message from this is that science, facts, knowledge matter. But we need knowledge not just about the changes underway, the challenges they create, and the solutions to address them. We most critically need knowledge about how to drive the societal transformations required to manage the global systemic crisis of our future. The real thing is still a wake-up call even for those of us that work on these crises for a living.

This is why the work of Future Earth is more important than ever, not only to anticipate the risks, but also to collaborate towards sustainable responses and solutions. For example, the integrated assessment of the Earth Commission is the first holistic attempt to establish scientific guardrails, to underpin science-based targets for life-supporting systems like land, water, and biodiversity. We need these targets to help companies and cities contribute to the recovery effort. In another first this year, we conducted a survey of over 200 global change scientists to gather their perceptions of global risk and compare them to the views of the business community annually surveyed by the World Economic Forum. This diversity of views is critical to help prioritize future investments. The need to work across boundaries and communities in this work is also critical. Our many national and regional structures can exchange best practices to help inform rapid societal change on a global scale. And of course, Future Earth's expert networks researching topics like health, infectious disease and emergent risk continue to produce more-than-ever relevant science to help guide decision makers towards a new normal.

The task at hand is to learn from this experience. Now, let's work together to find ways to bounce forward from this global crisis.

Amy Luers,
Executive Director, Future Earth

Message from the Future Earth Advisory Committee

The world is at a pivotal point where we either get traction on science for change, in a decade of transformation, or we continue to follow a path towards rising shocks and irreversible changes for people and planet, exacerbating extreme vulnerability for us and future generations. The COVID-19 crisis is a manifestation of the non-linear world of the Anthropocene, where globalization of travel, trade, and economies, intertwined with climate change and biosphere degradation, form a deadly cocktail translating global risks into real shocks.

The pandemic provides a preview of the scope and scale of response measures needed for unexpected extreme events, and proves our inability to rise up to the challenge as a world community. This is a deep lesson, as we are likely to face similar global shocks due to climate change and other planetary stressors. The complex, integrated nature of the world we live in today implies that such impacts are likely to be unlimited by borders and solutions must be inclusive, cross-disciplinary, and multi-lateral.

Future Earth, as the largest global community of researchers in earth systems and social sciences, will work harder to be a more authoritative integrator of that knowledge, contributing insights for transformative change towards a more resilient, equitable, and sustainable future for humanity on Earth.

Johan Rockström, Leena Srivastava,
Future Earth Advisory Committee co-chairs



This annual report covers the period from 1 April 2019 to 31 March 2020

Future Earth is governed by the International Science Council (ISC), Belmont Forum of funding agencies, the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), the United Nations University (UNU), the World Meteorological Organization, and the Science and Technology in Society (STS) forum.

A global network
of researchers
and innovators

19 Global
Research
Projects

8 Knowledge-Action
Networks

6 Regional Centers
and Partners

18 National
Networks

5 Global
Hubs





Facilitate research and innovation

Future Earth is rooted in the work of 20 long-established Global Research Projects. These networks have played a critical role in defining and advancing the field of Earth system science, and are now leading the evolution of our understanding of the Anthropocene. In 2019, these projects continued to produce world-class research, and strengthened sustainability communities through international open science conferences, technical workshops, training programs, and early career events.

Future Earth has also continued to expand work on two Global Systemic Challenges – Earth Targets and Societal Transformations. These cross-cutting themes help coordinate transdisciplinary science within our research network to accelerate progress towards global sustainability. Finally, Future Earth's partnership with the European Space Agency continues to facilitate the uptake of Earth observation data by our research networks to better understand changes in the Earth system.

Global Research Projects highlights

Each year, Future Earth's Global Research Projects advance cutting-edge Earth systems science. Here are the highlights for 2019-20, showcasing the broad efforts of these global networks.



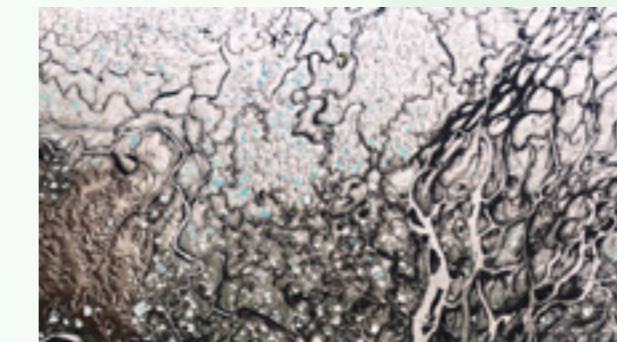
AIMES

Analysis, Integration, and Modeling of the Earth System (AIMES) guides and facilitates the integration of social and natural sciences through an Earth system modelling approach. AIMES' headline activity in 2019 was a workshop on the degradation of tropical forests in Manaus, Brazil to discuss the limitations of monitoring changes in ecosystem structure and loss of biomass associated with forest degradation, and explore how to better represent the drivers of degradation through future scenarios to support decision-making. Workshop participants are currently developing a roadmap and commentary article, as well as a summary for decision makers aimed at integrating new observation strategies and modelling of tropical forest degradation.



bioGENESIS

In 2019, bioGENESIS completed a Perspectives manuscript on "Evolution and Sustainability Science" to be submitted to Nature Sustainability, and the Scientific Committee held its annual meeting at Cornell University in April. The group also organized a two-session symposium entitled "Phylogenetic and Genetic Diversity: Linking Past and Contemporary Evolution to Sustainability" for the World Biodiversity Forum in Davos, Switzerland in February 2020.



ESG

The Earth System Governance Project forms the largest social science research network in the area of governance and global environmental change. It takes up the challenge of exploring political solutions and novel, more effective governance mechanisms to cope with earth system transformations. 2019 was the first operating year for the newly formed Scientific Steering Committee of the Earth System Governance Project and saw the relocation of its International Project Office from Sweden to Utrecht University in the Netherlands. The 2019 headline activity was a Conference on Earth System Governance held in Oaxaca, Mexico, hosted by the National Autonomous University of Mexico. The conference was organized around five analytical lenses structuring the new earth system governance research agenda and a sixth stream focusing on specific issues and challenges relevant to the Latin American region. In 2019, the Earth System Governance

Project also released its inaugural issue of the Earth System Governance Journal with Elsevier, as well as an elements and a book series with Cambridge University Press and one book series with MIT Press, synthesising the findings from the first 10 years of the network via its Harvesting Initiative. Additional 2019 highlights included the welcoming of a new Research Centre hosted by the University of Brasília, the establishment of a new Taskforce on New Technologies, a Speaker Series at Utrecht University, and the organization of an Early Career Winter School (Sustainable forest management, November 2019, Zapotec indigenous community of Capulalpam, Mexico).

conference in Estoril, Portugal (November 2019). Future Earth Coasts also co-hosted two workshops on earth observation data.



News. The key data was used for a graphic visualization – the “carbon budget bucket” – which reached over three million viewers following a retweet from youth climate activist Greta Thunberg. Additionally, GCP contributed a chapter to the United in Science report for the UN Climate Action Summit in September 2019. Finally, in response to the COVID-19 outbreak, GCP researchers examined the effects of coronavirus lockdowns on global fossil CO2 emission and published the first peer-reviewed article on the subject. The analysis shows a peak 17% drop in the daily emission in early April compared with the previous year (2019). The reduction for the full year could amount to the year-on-year drop required this decade to achieve the Paris Agreement climate target.

FEC

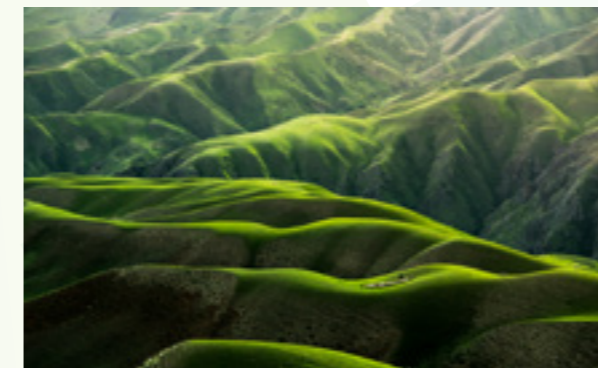
Future Earth Coasts (FEC) is an interdisciplinary program that combines biophysical models with studies of ecosystems, governance, and human behavior to map pathways for sustainable development of coastal zones. FEC underwent redevelopment in 2019 and implemented a new project office model based on five globally distributed offices, established an Executive Committee and FEC Academy, and developed new Governance Provisions. Notably, FEC contributed to World Water Week in Stockholm (August 2019), the Marine Regions Forum in Berlin (September – October 2019), and the Coastal and Estuarine Research Federation biennial

GCP

The Global Carbon Project (GCP) produces budgets for three major greenhouse gases; carbon dioxide, methane, and nitrous oxide. The Global Carbon Budget for 2019 was presented at the United Nations Framework Convention on Climate Change (UNFCCC) climate summit COP25. It projected that global fossil CO2 emissions were set to climb by 0.6% in 2019 to a record high of 37 gigatonnes. The growth rate is slightly lower than the previous years due to the decline in coal use and weaker economic growth globally. The CO2 data was published in more than 1,000 media outlets including the front pages of the New York Times and BBC



GLP



The Global Land Programme (GLP) is an interdisciplinary community of science and practice fostering the study of land systems and the co-design of solutions for global sustainability. The GLP 4th Open Science Meeting was held in Bern, Switzerland in April 2019 and gathered over 600 scientists from 83 countries to build understanding of how land systems can form the basis for sustainability transformations. GLP has expanded its active working groups to eight, including a co-coordinated working group with AIMES focused on the development of next generation, large-scale land-use models. GLP also published a special issue in Current Opinion in Environmental Sustainability entitled “Sustainability Governance and Transformation,” including an article highlighting its role as a global research network for sustainability transformations.

GMBA

Global Mountain Biodiversity Assessment (GMBA) is a platform for international and cross-disciplinary collaboration on the assessment, conservation, and sustainable use of mountain biodiversity. Since April 2019 it has released an update of its mountain inventory, initiated development of a new and improved version of the inventory, and implemented an online data uploader in its mountain portal. On the research front, GMBA launched a new working group on mountain soil biodiversity, supported a working group on Long-Term Social-Ecological Research in mountains with the organization of two workshops (highlighting the contributions of mountain research to global conventions, agendas, and national environmental policies), acquired seed-funding for the blueprint of a Swiss long-term social-ecological mountain observatory, and contributed to the organization of a workshop on essential biodiversity and societal variables in mountains by the Group on Earth Observations Initiative - Global Network for Observations and Information in Mountain Environments. In terms of outreach, GMBA participated in invited talks and sessions for various conferences, including the Global Land Program open science meeting, the Ecosystem Service Partnership (ESP) Africa Regional Conference, the ESP World Conference, the International Mountain Conference, and the World Biodiversity Forum. In collaboration with the Mountain Partnership of the Food

and Agriculture Organization, the GMBA has also launched the initiative “Tales of Mountain Biodiversity” in preparation of the International Mountain Day 2020 dedicated to mountain biodiversity. Finally, to support negotiations on priorities, goals and targets for mountains in 2030 and beyond, GMBA issued a new version of the Policy Brief “Elevating Mountains in the Post-2020 Global Biodiversity Framework 2.0” together with the UN Environment Programme (UNEP), GRID-Arendal (GRIDA), and the Mountain Research Initiative (MRI) and is engaged in follow up work on mountain-specific indicators within the post-2020 framework.





The mission of International Global Atmospheric Chemistry (IGAC) is to facilitate atmospheric chemistry research towards a sustainable world by fostering community, building capacity, and providing leadership. IGAC fosters community through its biennial science conference, numerous thematic workshops throughout the year, and a communication strategy that includes IGACnews, monthly eBulletins, and other announcements. IGAC builds capacity through its early career program and national/regional working groups. IGAC provides intellectual leadership through its numerous scientific activities that are led by the community. In 2019, IGAC's Tropospheric Ozone Assessment Report (TOAR) was published as a set of eight

peer-reviewed publications (Elementa special collection) and an online database of surface ozone observations. The TOAR provides robust metrics on the impact of ozone on climate, human health, and crop/ecosystem productivity.



Integrated History And Future Of People On Earth (IHOPE) is a global network of researchers and research projects using integrative frameworks to provide long-term, human-scale perspectives combining Earth system science with the social sciences and the humanities. In 2019, IHOPE member Tom McGovern and colleagues negotiated a joint project with UNESCO entitled BRIDGES. This new sustainability science coalition integrates humanities, social science, and local and traditional knowledge perspectives into



research, education, and action for global sustainability. The National Geographic Society, in collaboration with IHOPE, issued a Request For Proposals entitled "Enduring Impacts: the Archaeology Of Sustainability," which focuses on the analysis of archaeological and paleoenvironmental data in order to increase understanding of human-environmental interactions over time and contribute to mitigating contemporary environmental and climatic crises. In late 2019, the final of three IHOPE workshops for "If the Past Teaches, What Does the Future Learn?" was completed at the US National Socio-Environmental Synthesis Center (SESYNC). The project examines how long-lived ancient cities can help plan durable future agglomerations. It will be published in Delft University's open access Research in Urbanism Series. A key finding was that durability, measured in the longevity of urban regions, is intimately related to diversity and flexibility at many material and management scales and contexts.



Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS) acts as a communication hub and coordinator of global scientific research in the field of ecosystem-atmosphere exchanges. It aims to enhance understanding of how interacting biological, chemical, and physical processes transport energy and matter through the land-atmosphere



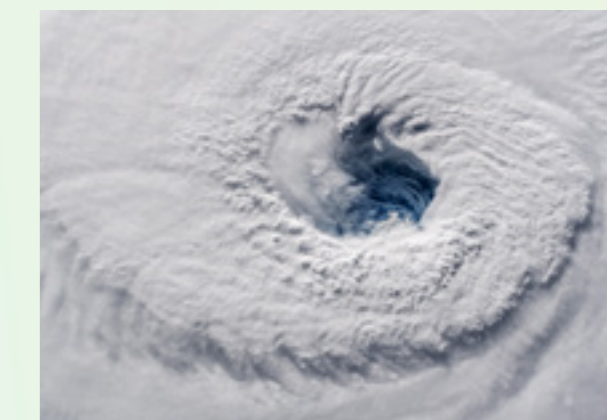
interface at all scales, and how these exchanges can impact key societal issues. The network links iLEAPS scientists to key societal challenges related to health, biodiversity, climate, food and fuel security, and the United Nations' Sustainable Development Goals. In 2019, iLEAPS Scientific Steering Committee (SSC) members met in Boulder, Colorado to engage with the Future Earth U.S. Global Hub, as well as fellow Global Research Projects AIMES and IGAC. iLEAPS held a workshop on fluxes and chemistry of volatile organic compounds following the 2019 European Geosciences Union General Assembly in Austria. Additionally, iLEAPS held two workshops for early career scientists on (i) modelling and observing urban fluxes, at the Institute for Advanced Metropolitan Solutions in Amsterdam and (ii) air quality-ecosystem interactions in Boulder, Colorado.



Integrated Marine Biosphere Research (IMBeR) promotes integrated marine research through a range of research topics towards sustainable, productive, and healthy oceans. In 2019, IMBeR hosted the Future Oceans Open Science Conference in Brest, France to initiate cross-disciplinary discussions on ocean sustainability. The discussions focused on three themes: (i) understanding and quantifying the state and variability of marine ecosystems; (ii) improving scenarios, predictions, and projections of future ocean-human systems; and (iii) improving and achieving sustainable ocean governance. At the conference, IMBeR launched the new Interdisciplinary Marine Early Career Network (IMECaN) providing a networking platform to develop collaborations, training, and leadership across policy engagement and science communication, specifically in the Global South.



The mission of Integrated Risk Governance (IRG) is to reduce adverse impacts of extreme natural events to safely protect human society and to achieve the UN Sustainable Development Goals. In July 2019, supported by the Chinese government, IRG held its Scientific Steering Committee meeting in Xining, China and co-organized two international symposiums in Qinghai Plateau and Shenzhen, China. Both symposiums concluded that the support of new IT technologies (e.g., big data, AI, blockchain, etc.) and an improved understanding from the scientific community of systemic risk and its dynamic processes provide new opportunities for governments, businesses, scientists, and civil society in dealing with the impacts of natural disasters.



MAIRS



Monsoon Asia Integrated Research For Sustainability (MAIRS) is a regional consortium for the integrated study of social and earth system processes in the Asia Monsoon Region. In 2019, the network was involved in various international workshops as a contributing organization: a Food, Land, Energy and Water System workshop in Asia in Nanjing, China (May 2019); the 8th Congress of the East Asian Association of Environmental and Resource Economics in Beijing, China (August 2019); the CORDEX 2019 Side Event with a theme on Future Risk, Future Earth in Beijing (October 2019); and a sub-forum on Environmental Health at the Beijing Forum (November 2019).

oneHEALTH

In 2019, oneHEALTH was awarded a new project by the U.S. Department of Defense on the ecology, epidemiology, and economics of Rift Valley Fever in South Africa involving government partners, local universities, and NASA. A paper reflecting major outputs from work over recent years was published in a special feature on land use change in the journal *EcoHealth*. Project members participated in the Consortium of Universities for Global Health Planetary Health Working Group, activities of the Health Knowledge-Action Network, and The Lancet Commission on One Health. The group led the development of initial framing and indicators for a One Health target



for the UN Post-2020 Biodiversity Framework, and in early 2020 oneHEALTH's work was featured in the *New York Times*, addressing the Covid-19 pandemic.

SOLAS

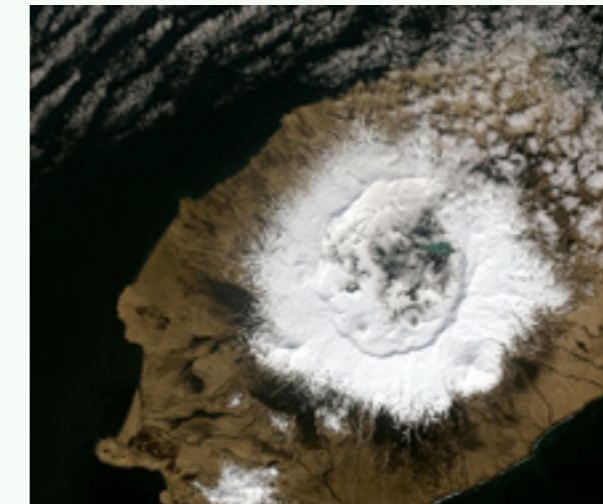
Surface Ocean-Lower Atmosphere Study (SOLAS) seeks to increase our understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and atmosphere. In 2019, SOLAS launched a new website and held its Open Science Conference 2019 in Sapporo, Japan, which welcomed 190 attendees from 30 countries and included a daylong workshop on SOLAS science contributions to the climate intervention debate. As affirmed by the SOLAS position statement on climate intervention, this debate must be informed by sound and robust science, and the SOLAS community has specific expertise and a responsibility to make multi-faceted contributions to climate intervention discussions. In response to the urgent need to improve representation of aerosols and changes in their climatic activity in predictive Earth system models, two SOLAS co-sponsored working groups (on Biogeochemical Processes at Sea-Ice Interfaces [BEPSII], and on Cryosphere and Atmospheric Chemistry [CATCH]) also launched a joint endeavour to explore photo- and biogeochemical feedbacks between polar atmospheres and oceans.

bioDISCOVERY

The bioDISCOVERY Global Research Project fosters collaborative interdisciplinary activities on biodiversity and ecosystem science. This year bioDISCOVERY, along with the University of Zurich Research Priority Programme on Global Change and Biodiversity, organized the inaugural World Biodiversity Forum with the aim to redefine and set the agenda for biodiversity as a focal point over the next 10 years across sectors. The five-day scientific conference welcomed over 500 participants in Davos, Switzerland, including leading researchers, early career researchers, practitioners, decision-makers, and societal actors. At the end of the Forum, participants adopted the Davos Resolution.



PAGES



Past Global Changes (PAGES) supports science aimed at understanding the Earth's past environment in order to make predictions for the future. PAGES' scope of interest includes the physical climate system, biogeochemical cycles, ecosystem processes, biodiversity, and human dimensions, on different time scales that reach back centuries to thousands of years. In 2019, PAGES supported many activities engaging early career networks through a targeted workshop, a webinar on publishing scientific articles, and meetings at the 20th Congress of the International Union for Quaternary Research (INQUA) and at the 14th International Conference on Paleoceanography. Additionally, Past Global

Changes Magazine, aiming to communicate paleoscience in an accessible and informative style, published two issues on Paleo Constraints on Sea-Level Rise and on Ocean Circulation and Carbon Cycling. Moreover, various PAGES working groups held many activities (workshops, symposiums, conference sessions) and issued many products (e.g. synthesis, articles, etc.) over the year.

PECS

The Programme on Ecosystem Change and Society (PECS) aims to integrate research on the stewardship of social-ecological systems, the services they generate, and the relationships among ecosystems, human wellbeing, livelihoods, inequality and poverty. Research under PECS employs a range of transdisciplinary approaches and methods with comparative, place-based research that is international in scope at its core. To celebrate its 10-year anniversary, PECS will host a special issue in *Ecosystems and People* in 2020, so in preparation PECS members gathered at the Leuphana University in Lueneburg, Germany in December 2019 to develop the necessary content. Also in 2019, PECS started the process of expansion to a nodal and regional coordination structure. Two additional networks in North America and Latin America will be established in the near future to ensure broad geographical representation.

Earth Targets

Future Earth coordinates transdisciplinary science within our research network through cross-cutting research themes. Since 2018, the concept of Earth Targets has been a main focus, recognizing the necessity of taking a whole Earth system approach to create solutions to global systemic challenges. Under this theme, there are two ongoing initiatives: the Earth Commission and Science-Based Pathways for Sustainability.

Earth Commission

The Earth Commission is a group of leading natural and social scientists preparing a major synthesis to underpin the development of science-based targets for a safe and just planet. The Earth Commission is the scientific foundation of the Global Commons Alliance, a network of scientific, business, and nongovernmental organizations aiming to transform the global economy. The alliance responds to a clarion call from business and cities for science-based targets to protect the global commons, the shared resources on which we all depend – healthy land and oceans, freshwater, biodiversity, and a stable climate. The Earth Commission is drawing on expertise from across Future Earth's networks, and the members were appointed in September 2019 following an open call

for experts. An inaugural meeting was held in November 2019 to establish the Earth Commission's scientific approach, operating model, and expert working groups which will be appointed to undertake specific aspects of the analysis. In early 2020, the Commission participated in an important convening with the Global Commons Alliance to develop a prototype of science-based targets for nature. The Commission also convened a workshop with the broader biodiversity science community to synthesize the scientific evidence base to support the development of global biodiversity goals for the post-2020 global biodiversity framework of the Convention on Biological Diversity. By the latter half of 2020, all five working groups of the Commission will be launched, and a peer-reviewed publication on its conceptual framework will be produced.



Science-Based Pathways for Sustainability

The Science-Based Pathways for Sustainability initiative seeks to mobilize knowledge needed to define and implement pathways for the Life-Supporting Sustainable Development Goals (SDGs) for water, climate, oceans, and land. The initiative's methodological framework was developed together with a core team of scientists from the Future Earth community, and is based on three key elements: (i) participatory scenario development, (ii) SDG interaction assessment, and (iii) transformations analysis. A pilot phase of the initiative was launched in France in May 2019, convening more than 120 participants from research and practice. Two multi-stakeholder workshops were then held in October and November 2019 to explore pathways related to biodiversity and freshwater, and their initial outcomes were presented in various international conferences. Efforts were also made this year to expand activities into other countries and regions, including an upcoming national workshop organized by the Future Earth Philippines Programme, engagement from the German and UK National Committees for Future Earth, fundraising efforts in Canada, and ongoing discussions with regional partners in both Asia and Africa to implement the initiative and secure funding. Two additional workshops, focused respectively on land and oceans in France, as well as an international workshop on cross-scale interactions, are scheduled for late 2020.



Societal Transformations for a Healthy and Equitable Planet

There is an emerging realization that in the face of global, interlinked challenges like climate change, biodiversity loss, and increasing inequality, adaptation simply isn't enough. To meet these challenges head-on, we must completely transform the fundamental norms of our societies. Such efforts (starting with the two initiatives described below) are another ongoing focus of the Future Earth community's collective approach to system change, from multiple and intersecting social, biophysical, and technological angles.

Sustainability in the Digital Age

As we learn more about the complexity of global sustainability challenges, there is growing consensus that widespread societal transformations will be needed to urgently address them. Big data, artificial intelligence, blockchain, and other digital technologies are already driving societal transformations at a scale and pace unparalleled in history. The potential for leveraging the digital age to benefit people and the planet is massive. To seize the potential and minimize the risks, researchers, tech innovators, policy and business leaders, civil society, and citizens must collaborate to steer the transformations already underway towards the climate-safe and equitable world we want.

Sustainability in the Digital Age is an initiative building an international network of experts to explore and act on opportunities to leverage the digital revolution to enhance global sustainability and equity. Over the past year, Future Earth engaged over 250 experts from academia, business, government, and civil society to develop a Research, Innovation, and Action Agenda: Digital Disruptions for Sustainability (D²S Agenda). This effort included convening the Expert Advisory Committee guiding the development of the D²S Agenda in August 2019 and hosting a workshop in September 2019 in partnership with the UK Office for AI, the International Observatory on the Societal Impacts of Artificial Intelligence and Digital Technologies (OBVIA), and Centre National de la Recherche Scientifique (CNRS). The latter workshop

was supported as part of the Canadian Institute For Advanced Research (CIFAR)'s AI & Society Series in partnership with UK Research and Innovation (UKRI) and France's Centre National de la Recherche Scientifique (CNRS). The D²S Agenda was officially launched in March 2020 and explores how four digital disruptors – unprecedented transparency, intelligent systems, mass collaboration, and mixed reality – are already shifting the dominant economic, governance, and cognitive systems that are maintaining society on an unsustainable and inequitable path. Within these three systems, powerful levers of systems change were identified, and the Agenda examines the potential transformative impacts of these levers, what's needed to steer and scale them, and risks that might arise.



Exponential Roadmap 1.5

The 2019 Exponential Roadmap highlights 36 solutions that can scale exponentially to halve greenhouse gas emissions by 2030 worldwide. Scaling of solutions comes from sharp policy, climate leadership by companies and cities, and a finance and technology shift towards green solutions with exponential potential. Published in September, and launched at the 2019 United Nations Climate Summit in New York City, the Roadmap is also supplemented by a high-ambition narrative, *Meeting the 1.5°C Ambition*. This narrative outlines why holding global average temperature increase to just 1.5°C above pre-industrial levels is important, shows how far we are from achieving this, and presents solutions to meet the ambition. In addition to partnering with Future Earth, the Exponential Roadmap initiative brings together technology innovators, scientists, companies, and NGOs such as WWF, Ericsson, Sitra Innovation Fund, Stockholm Resilience Centre, Mission 2020, KTH, Royal Institute of Technology, Internet of Planet, and more.

European Space Agency Collaboration

Future Earth partners with the European Space Agency (ESA) Climate Office to encourage innovative ways of using satellite Earth observation data to support transformations towards sustainability. The partnership strengthens Future Earth's links with the Earth observation and climate communities and ensures that ESA's strategic direction is guided by robust science from Future Earth.

This year, support from the European Space Agency in June 2019 helped improve understanding of environmental changes in mountains by identifying the most important climate variables – like temperature, precipitation, snow, radiation, wind and more – to monitor climate change and its impacts in high elevation contexts. A workshop in Bern, Switzerland, co-organized by the Mountain Research Initiative and the Group on Earth Observation's Global Network for Observation and Information in Mountain Environments (GEO-GNOME), identified indicators and key criteria for data collection protocols and standards, and listed in-situ and remote-sensing methods feasible for application in high elevation regions.

In December 2019, ESA supported a workshop led by Future Earth Coasts in Estoril, Portugal, aimed at establishing a new community



across different scientific disciplines and economic activities relating to the Atlantic basin, particularly from the South and Central Atlantic, for routine use of Earth observation data in support of the Sustainable Development Goals. The workshop coincided with the 3rd Marine Technologies Workshop 2019 organized by Instituto Hidrográfico, and brought

together technicians and scientists from marine-related activities in Fisheries and Aquaculture, Spatial Planning, Coastal and Risk Management, Security, and Pollution.





Build and mobilize networks

As society grows ever more connected, Future Earth is capitalizing on the power of networks – linking science, policy, business, and civil leaders – to bring about collaborative solutions for complex environmental problems.

Much of the strength of Future Earth lies within our community of Knowledge-Action Networks (KANs), national and regional entities, and ongoing collaborations with science funders and with early career scientists. Future Earth has also been hard at work preparing for the inaugural Sustainability Research and Innovation Congress, a first-of-its-kind event gathering academia, business, nongovernmental organizations, and governments to address global sustainability challenges.

Knowledge-Action Networks (KANs)

Emergent Risks and Extreme Events

The Emergent Risks and Extreme Events KAN provides an open platform for scientific communities from multiple disciplines working on extreme events, disaster risk reduction, and governance to exchange information and engage in collaborative research activities. The Emergent Risks and Extreme Events KAN is a joint initiative of Future Earth, Integrated Research on Disaster Risk (IRDR), and the World Climate Research Programme (WCRP). The network's 2019 highlights include organizing the Herrenhausen Conference on Extreme Events: Building Climate Resilient Societies in Hanover, Germany. Over 130 scientists and practitioners from 30 countries convened to discuss the relations between climate extremes, societal resilience, and sustainable development goals, with the aim to identify major obstacles and how to overcome them, and to develop strategic agendas for research and for best-practice design and implementation. Additional highlights included a town hall calling for open collaboration in the KAN at the AGU 2019 Fall Meeting and publication of the book, *Climate Extremes and Their Implications for Impact and Risk Assessment*.

Finance and Economics

In 2019, the Finance and Economics KAN made significant efforts to plan the future of the network. The KAN prepared an Activities Plan and developed a call for membership of a network Development Team that will serve to increase the breadth and scale of activities. The KAN also successfully published a paper titled "Finance and Management for the Anthropocene" in *Organization and Environment*, and a book, *Palgrave Studies in Sustainable Business In Association with Future Earth*, which is intended to help reinvent business and economic models for the Anthropocene to engender sustainability and create ecologically conscious organizations. The network has begun collaboration with the Complex Systems Society to focus its work on data-intensive complex systems, while also participating in a workshop hosted by the Sleeping Financial Giants Initiative in Tokyo. Lastly, the network contributed to the "Finance: Making Money Work for Green Goals" chapter of the *Our Future on Earth 2020* report.

Health

The Health KAN officially launched and held its inaugural meetings in Taipei City in May 2019. The Development Team (DT), with co-chairs Prof. Anthony Capon and Prof. Kristie Ebi, gathered over 90 participants to discuss how to solve global common health threats in the face of climate change, biodiversity loss, land-use change, and other issues. Participants established a strategic governance plan to improve collaboration across national boundaries and activities to facilitate the promotion and protection of human health. Furthermore, a research agenda was developed, and a strategy for action and implementation of knowledge was also discussed. The DT launched a global call for the creation of a Steering Committee (SC) and a reorganization of the Advisory Group (AG) to drive work forward. The SC commenced its work in 2020, and made action-oriented contributions to reduce spread of COVID-19 and mitigate its impact through a widely distributed blogpost that was revised and submitted for a peer-review manuscript and developed into a policy brief. The SC also worked closely with the AG on formulating processes for a hosting institution and applied for funding under the Horizon 2020 call "Building a Low-Carbon, Climate

Resilient Future: Climate Action in Support of the Paris Agreement” with a Climate and Health Knowledge Accelerator.

Natural Assets

The Natural Assets KAN studies the functioning of the Earth system in the Anthropocene and aims at actively contributing to Sustainable Development Goal 15: Life on Land. In 2019-20, members of the Natural Assets KAN contributed to the biodiversity chapter of the Our Future on Earth 2020 report. The chapter titled “The Unravelling Web of Life” explores how society might negotiate a new global biodiversity framework through the Convention on Biological Diversity in late 2020. The development of post-2020 targets provides a critical opportunity to set out a new ambitious plan of actions to conserve and restore global biodiversity.

Ocean

In 2019, the Ocean KAN developed a strategic plan and governance document for the network, and participated in the first global planning meeting for the UN Decade of Ocean Science for Sustainable Development. Anna Zivian, Co-Chair of the Ocean KAN Development Team, and two postdoctoral researchers (funded through Future Earth’s PEGASuS) attended the inaugural meeting to contribute towards establishing a common vision, narrative, and the necessary knowledge needed to support sustainable development for the next decade (2021-2030).

Under PEGASuS II, and in partnership with the University of California Santa Barbara – National Center for Ecological Analysis and Synthesis (UCSB-NCEAS), Future Earth supported two working groups in 2019 and continues to support two postdoctoral researchers based at UCSB-NCEAS. Both working groups include members of the Ocean KAN Development Team.

Systems of Sustainable Consumption and Production

The Systems of Sustainable Consumption and Production (SSCP) KAN emphasises the need to address whole provisioning systems, including consumption practices and production conditions, as well as lifecycle impacts and the economic, political, social, and cultural imperatives that impel consumerist lifestyles. The network presently supports six Working Groups focused on political economy, sustainable consumption and production in cities, social change, communicating sustainable consumption and production, global value chains, and circular economies. In the wake of the COVID-19 pandemic breakout, the network developed an initiative “COVID-19 and Sustainability Transitions” that aims to understand the behavioural and institutional dimensions of the pandemic and to explore how it can contribute to sustainability transitions through the organization of an interactive online Open Forum (March 2020) which attracted over 300 participants. The SSCP KAN, in collaboration



with the Asia Regional Center, also organized an international symposium: Why Systems of Sustainable Consumption and Production is essential to achieving the SDGs (February 2020).

Urban

In 2019, the Urban KAN Development Team played a pivotal role in shaping a report with the World Climate Research Programme, Global Research and Action Agenda on Cities and Climate Change Science, as an output from the Cities IPCC Science Conference. The network also produced a paper on networking urban science, policy, and practice for sustainability. Funding for the network was obtained through the National Science Foundation (NSF) Accelnet call with the NATURA project, a project developing nature-based solutions for urban resilience in the Anthropocene. The network’s Development Team met in Canberra, Australia (November 2019), hosted by Future Earth Australia and the Australian National University, to define the network’s work agenda, key issues, and areas which can create and accelerate transformative change for sustainability. A preliminary list of key research priorities for cities, as well as a publication on transformations in cities, were drafted and are being developed. The KAN also organized a network vitality survey on how to better serve its community, exploring the feasibility

of organizing webinars. Finally, the Urban KAN successfully applied for a session at the Sustainability Research & Innovation Congress 2021 on Urban Science for Rapid Global Urban Sustainability Transitions.

Water-Food-Energy Nexus

The Water-Food-Energy Nexus KAN aims to foster the production of knowledge to better understand the interactions between water, food, and energy systems, as well as their trade-offs and synergies. One of the KAN’s 2019 highlights was a major contribution to Future Earth’s Our Future On Earth 2020 report. Network co-Chair Pamela Katic and Chair Jiaguo Qi co-authored a chapter titled “Food: Rethinking Global Security,” with contributions from Steering Committee members. The Water-Food-Energy Nexus KAN has also been working on establishing a Nexus Journal to highlight relevant issues and the policy implications of the research it is showcasing. The KAN is also collaborating with Monsoon Asia Integrated Research for Sustainability (MAIRS-FE) on developing proposals related to the water-energy-food-land framework in China and the Mekong River countries. Lastly, the network was involved in producing a second webinar series on sustainable development in Africa and the role of science and social engagement in shaping the future of the African continent.

Future Earth Regional Entities: Updates from around the globe



Asia

This year the Asia Regional Center, in partnership with the Research Institute for Humanity and Nature (RIHN), launched the TERRA (Transdisciplinarity for Early Career Researchers in Asia) School, a short-term intensive program on capacity building, co-creation, and transdisciplinary research in practice. The program convened early career researchers in December 2019 to explore how to address the challenges facing humanity in Asia. In the new year, the Asia Regional Center hosted an international symposium with the Systems of Sustainable Consumption and Production Knowledge-Action Network on what food consumption and production might look like in a post-growth economy and what systemic transformations are needed for work, trade, and everyday life to enhance sustainability at local and global scales.

Other active networks and activities in Asia this year included the Science Council of Japan's Urgent Statement on Climate Change and a Call for Action, developed in collaboration with Future Earth members, several international conferences supported by the Chinese National Committee for Future Earth, and a 2019 Future Earth East Asia International Symposium organized by the Korea National Committee. The Future Earth Philippines Program conducted multiple national workshops to develop Knowledge-Action Projects, and a Philippine national workshop for the Science-Based Pathways for Sustainability Initiative is planned for late 2020. Future Earth Taipei supported the symposium and inaugural meeting for the Health KAN in May 2019 and held a training workshop on a new regional research initiative, "Health Investigation and Air Sensing for Asian Pollution" which was endorsed as a Future Earth Asia regional research activity. Future Earth Taipei also established seven working groups relevant to the KANs to promote thematic sustainability science and held a widely-attended launch event for the Future Earth publication, Our Future on Earth 2020. At Future Earth Australia, an Early Career Researcher and Practitioner (ECRP) executive team was created to provide advisory guidance for the program moving forward, and a workshop on the future of coasts brought together ECRPs to share their work and network across disciplines. Future Earth Australia also hosted the Urban KAN steering committee meeting in November 2019, and at the end of the year launched a 10-Year Strategy for Sustainable Cities and Regions, developed through an extensive consultation process and overseen by leading urban research, practice and policy experts from around Australia. Planning continues for the first Sustainability and Research Innovation congress to be held in Brisbane in 2021.



Europe

Multiple European National Structures participated in the development and dissemination of Future Earth's 10 New Insights in Climate Science 2019. Individual activities of the networks also included the following highlights. Future Earth Finland organized a well-attended panel event on climate change and health at the University of Helsinki in November 2019, and continued the collaboration with the PEEX "Pan-Eurasian Experiment" study – a multidisciplinary climate change, air quality, environment, education, and research infrastructure program focused on the Northern Eurasian particularly arctic and boreal regions and China. The German Committee Future Earth expanded knowledge exchange in Europe this year through multiple activities. For example, its Working Group on Societal Resilience and Climate Extremes organized an international Herrenhausen Conference this year, with participation from more than 130 scientists and practitioners from 30 countries and UN organizations, to discuss the role of climate extremes as threats to human well-being and sustainable development. The Working Group on Sustainable Work published a position paper on the social-ecological transformation of the working society, and the German Committee Future Earth organized a live German-language webinar featuring authors and committee members for the launch of the Our Future on Earth 2020 report. The Irish National Committee has also been active in mobilizing the national sustainability community, e.g. through the production of a number of videos for the 2020 Earth Day, featuring Irish experts in the field. The Slovakian National Committee organized a symposium on Landscape Diversity and Biodiversity while Switzerland continues to host four Future Earth Global Research Projects (GRP): PAGES, GMBA, GLP, and bioDISCOVERY, and their related activities. The UK National Committee selected three core themes that will guide its work for upcoming years: Circular Economy 2.0; Just Transitions to Zero-Carbon Societies; and Earth Targets. The Global Environmental Research Committee, hosted via the UK Royal Society, convened to discuss Future Earth research and provided a report with recommendations to the Future Earth Global Secretariat and the UK National Committee. The Romanian National Committee co-organized the meeting "Global Warming Impacts on Environment and Society" as part of a series of scientific conferences about climate change impacts, mitigation and adaptation measures in Romania that took place during December 2019 through February 2020. Also in February, the Romanian National Committee held its annual meeting and hosted a launch event for the publication, Our Future on Earth 2020. In Russia, the newly established National Committee ran a popular research funding competition on six big sustainability issues and developed a concept for a summer school on global challenges.



Latin America

Work in this region centers on the activities of the Inter-American Institute for Global Change Research (IAI), a strategic partner of Future Earth. In the last year, IAI has developed a new Science, Technology, Policy (STeP) Fellowship program to enhance science communication in policy-making and strengthen scientific input to government agencies in Latin America and the Caribbean. The program will cater to early to mid-career scientists interested in creating evidence-based policies to address and assist sound decision-making for challenges throughout the Americas. The IAI has also funded six transdisciplinary projects on the role of ecosystem services in adaptation to global change for human wellbeing. These projects create opportunities for students and early career researchers to gain knowledge in transdisciplinary approaches as well as working at the science-policy interface. In the autumn, IAI and Future Earth partnered on a joint session at the Transformations 2019 conference in Santiago, Chile and hosted a booth together at the AGU Fall 2019 meeting.



Middle East and North Africa (MENA)

In 2019, the Middle East and North Africa (MENA) Regional Center continued to host regional offices for both the GLP and iLEAPS GRPs. Looking forward, the Regional Center will be hosting a conference – in collaboration with the University of Bahrain – on “Water in the MENA Region: Preparing for a Changing World” in February 2021. The conference will bring together leading regional experts, professionals, and researchers to review the current state of water issues and recent trends, innovations, and practical solutions that address the challenges of maintaining water security in the region in a rapidly changing world.



Southern Africa

In 2019, the Future Earth Regional Office for Southern Africa (FEROSA) hosted a regional Stakeholder Platform, at the National Research Foundation (NRF) in Pretoria, South Africa attended by over 70 delegates from 11 African countries. This kicked off full operations for the office with a finalized Memorandum of Understanding (MoU) between the NRF and the Future Earth Global Secretariat, and the presentation of the FEROSA Operational Framework. The Operational Framework incorporates a research agenda focused on regional and global priorities, funding and governance frameworks, and will anchor FEROSA's five-year strategic plan (2021-2025). The strategic plan will be informed by a situational analysis that will map the relevant research and outreach activities in the region. Other notable activities include hosting a panel session during the Innovation Bridge and Science Forum South Africa to ignite conversations about science and innovation for impact, and participating in an upcoming Southern African Program on Ecosystem Change and Society (SAPECS) working group meeting.



South Asia

The South Asia Regional Office of Future Earth, in collaboration with the Divecha Centre for Climate Change (DCCC) and the Indian Institute of Science (IISc), jointly carried out various outreach activities, organized workshops and conferences, engaged with stakeholders including government bodies and legislatures, and partnered with many national and international institutions in 2019. The headline event in 2019, the Water Future International Conference “Towards a Sustainable Water Future,” was held in Bengaluru, India in September 2019. The Conference convened 700 participants from across the globe to discuss the current state of global water resource challenges and future pathways to accelerate the implementation of water-related SDGs. Other notable activities include the creation of the Governing Council for the Water Solution Lab, the creation of the South Asia Regional Office Governing Council and its inaugural meeting, and the international conference on “Digital Solutions to Accelerate Adaptation to Climate Change in Agriculture” in Bengaluru, India in January 2020, organized by MAIRS-FE and CCAFS. The South Asia office also hosted widely-attended launch events for the Our Future on Earth 2020 report.



Sustainability Research and Innovation Congress

Future Earth and the Belmont Forum have partnered to establish the first in a global congress series focused on Sustainability Research and Innovation (SRI2021). It will bring together the world's foremost research and innovation communities to work across disciplines and sectors to support a global transformation to sustainability. The Congress will be hosted by Future Earth Australia and a consortium of leading Australian research institutions, selected through a competitive and open bidding process. While initially planned for June 2020, the global outbreak of COVID-19 and concerns over the health and safety of participants led conveners to postpone the Congress, which will now take place in Brisbane, June 12-15, 2021.

Over 150 quality submissions for session proposals came in throughout the year from all over the world, with approximately half from Future Earth communities. A broad program featuring diverse speakers from multiple countries, academic disciplines, and sectors of society is being developed with the support of an international program committee. The event is also prioritizing accessible virtual participation, gold- standard, independently verified carbon offsets for flights, and a thorough assessment of the overall

environmental impact of the congress, including lodgment and catering. In addition, SRI will offer multiple opportunities for virtual engagement in the run up to the Congress, including webinars, blogs and Facebook live interviews. Finally in preparation for the inaugural event, conference organizers convened a Town Hall at the AGU Fall Meeting in San Francisco (December 2019) to hear perspectives on what the essential elements are for better support of sustainability science and key design principles to incorporate into SRI2021.



PEGASuS

The Program for Early-stage Grants Advancing Sustainability Science (PEGASuS) was established to provide \$2 million in direct support over a five-year period for Future Earth Global Research Projects, Knowledge-Action Networks, and new partners to collaborate, increase knowledge, promote innovation, and establish evidence-based solutions to the world's sustainability challenges. PEGASuS aims to generate self-sustaining research projects that have real impacts on the health and well-being of human societies and the natural world.

PEGASuS 2:

Ocean Sustainability, a partnership between Future Earth, the National Center for Ecological Analysis and Synthesis (NCEAS), and the Global Biodiversity Center at Colorado State University, launched in early 2019. The Program provides support for two NCEAS working groups focusing on ocean-related sustainability challenges. The first centers on the establishment and monitoring of the Palau National Marine Sanctuary, and culminated in a final research report presented to the President and citizens of Palau on December 19th, 2019, which explored the ecological and socioeconomic effects of the sanctuary to date. The second working group is facilitating the implementation of a globally coordinated and sustained ocean observing system to assess the status and trends in ocean biodiversity around the world. PEGASuS 2 also supports two postdoctoral

researchers, Drs. Erin Satterthwaite and Alfredo Giron, working in collaboration with both NCEAS working groups and the OCEAN Knowledge-Action Network. Both are actively engaged in science-policy through the United Nations Decade of the Oceans for Sustainable Development.

PEGASuS III and IV will both launch in 2020. In PEGASuS III, Future Earth will partner with the African Academy of Sciences (AAS) and the Belmont Forum to support integrated research focused on establishing international transdisciplinary research teams focused on the development of science-based targets and pathways to the SDGs for African nations. PEGASuS IV will be established as a "take it further" grants program, providing opportunity to the 15 international research teams funded through the Belmont Forum Sustainable Urban Food-Water-Energy Nexus program.

Earth Leadership Program

After 20 years of success in training over 200 sustainability leaders in North America, the Leopold Leadership Program re-launched as the Earth Leadership Program in March 2020. In partnership with the Stanford Woods Institute for the Environment and the University of Colorado Boulder, the new program aims to support regional networks of collaborative academic leaders around the world, as well as in North America, and to connect these networks under a common purpose. The Earth Leadership Program remains committed to the fundamental principles that have made the Leopold Leadership Program so transformative: interdisciplinary learning, building future leaders empowered to collaborate and innovate, and strengthening the connections among scholars – past, present, and future – in the service of solution-focused, engaged sustainability research.

The Earth Leadership Program is led by Dr. Sharon Collinge, a 2004 Leopold Leadership Fellow and full professor in the Environmental Studies Program at the University of Colorado Boulder. Applications for the 2021 North American cohort opened alongside the program's launch, with additional cohorts planned for Latin America, Europe, and Oceania. Over the next year, the structure of the Earth Leadership Program will continue to evolve as it seeks to build greater connections among existing fellows, bring new fellows into the program, and build new programs around the world.

Earth 
Leadership
Program
Knowledge To Impact



Belmont Forum Collaboration

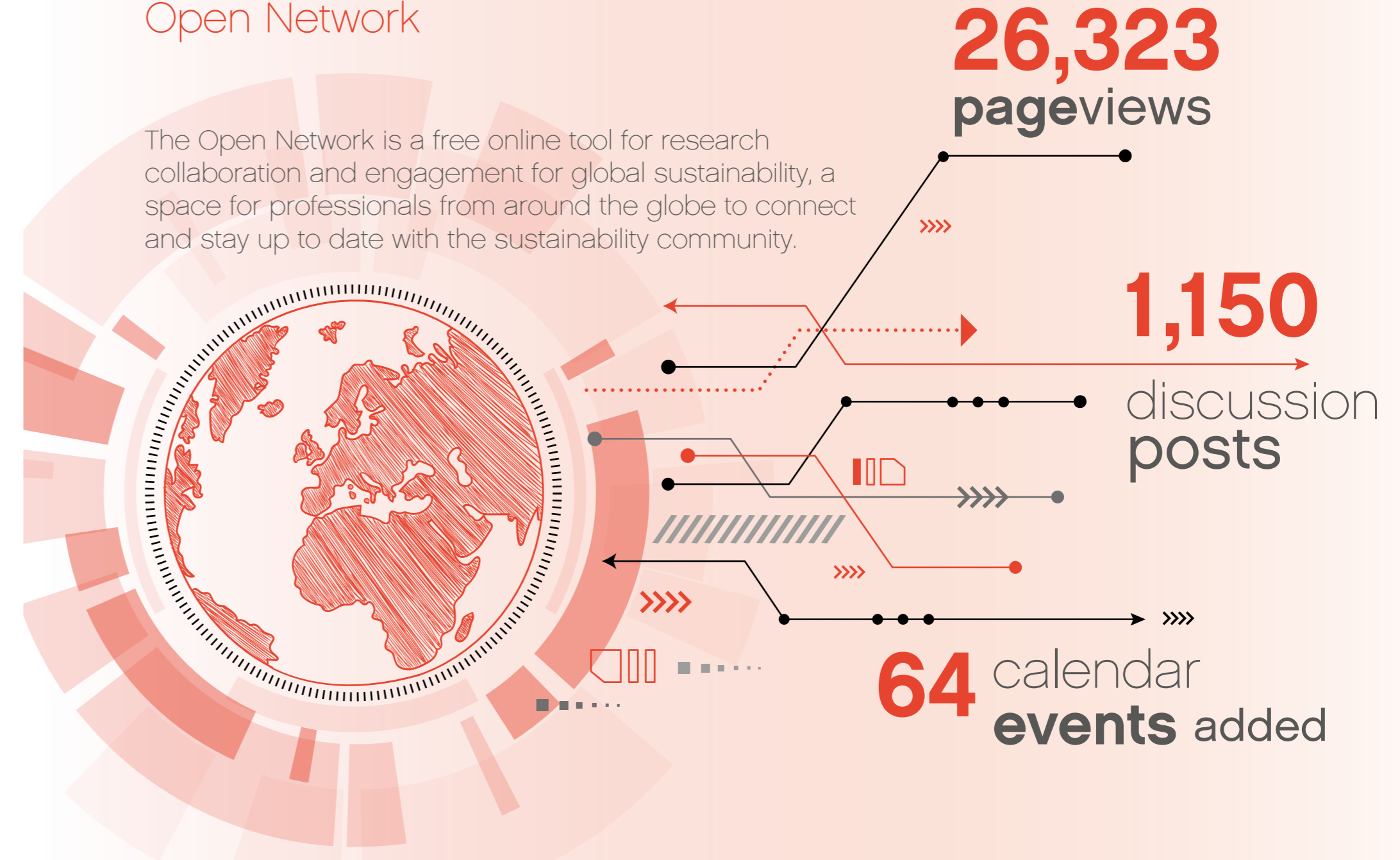
Future Earth works collaboratively with the Belmont Forum to help scope and shape its Collaborative Research Actions (CRAs), which are major funding opportunities for multinational, interdisciplinary research teams to address the world's greatest sustainability challenges. Future Earth is the only institutional entity invited to directly propose new topics annually.

This year two global scoping processes were held, seeking input from the scientific community on future CRAs. The first scoping call was focused on Systems of Sustainable Consumption and Production. It built on a joint Future Earth-Belmont Forum white paper outlining knowledge gaps and research priorities within the context that the global population is expected to reach 9.6 billion by 2050, and in view of finite resource availability and current unsustainable patterns of global development. The second was a scoping process inviting research priorities under the theme of Human Migration and Global Change. As we enter the Anthropocene Era, emerging drivers of migration such as climate change, unprecedented inequality, and modern forms of conflict are leading to new patterns and scales of human migration across the globe. Thus the topic of migration provides a strong anchor for social and natural sciences and presents excellent potential for transdisciplinary teams to address research questions related to this increasingly important field of study.



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 globe to connect and stay up to date with the sustainability community.



26,323
pageviews

1,150

discussion
posts

64 calendar
events added



Shape the narrative

Quality research can catalyze effective societal action, but it takes a dedicated push to get the latest scientific findings into the policy arena. Future Earth works to be that mechanism, incorporating the latest sustainability science into global decision-making and fostering public discourse grounded in research.

This year, in addition to publishing our regular Insights in Climate Science and Anthropocene Magazine, the Future Earth community contributed to the landmark United in Science report, a synthesis of the latest climate science compiled by the World Meteorological Organization for the Science Advisory Group of the UN Climate Action Summit 2019. We also launched a redesigned website with a more contemporary design, and our reach on Twitter exceeded 18K followers in 2019, as we aim to become a go-to place for sustainability knowledge.

Looking forward, Future Earth will continue to expand its communications efforts – including a strong digital media presence – to elevate the increasing scope and variety of products created by our research and innovation networks.

Anthropocene Magazine

Anthropocene, Future Earth's flagship independent magazine, continues to be an outstanding showcase for on-the-ground solutions to sustainability. With the widest reach of Future Earth's publications, its digital audience has grown to more than 50,000 visitors per month from more than 200 countries. Articles have been syndicated to Quartz (US), Le Monde (France), El Pais (Spain), Scroll (India), and Guokr (China). In the two years since its inception, Anthropocene has won three journalistic awards – including the 2019 Folio Eddie Award for editorial and design excellence across a full issue – and amassed more than \$200,000 in membership donations. The fifth print edition is due out in 2020.

Anthropocene is close to formalizing a partnership with The Atlantic to scale up the visibility of select articles, as well as Stanford University to help launch a special event series bringing together leading voices in science and policy to better understand how humanity is reshaping vital planetary systems. These strategic partnerships will help Anthropocene expand its reach even further and solidify its role as a thought leader in the sustainability space.



10 New Insights in Climate Science

The 10 New Insights in Climate Science series aims to synthesize and communicate the latest and most essential scientific findings on climate change published each year—a kind of climate science year-in-review for journalists, policy makers, and the general public.

The latest iteration, 10 New Insights in Climate Science 2019, was launched at the 25th Conference of the Parties (COP25) of the United Nations Framework Convention on Climate Change (UNFCCC) in a press conference with UNFCCC Executive Secretary Patricia Espinosa. The report summarizes recent advances in climate research across disciplines and draws on the scientific advances of many of our GRPs, KANs, and beyond. Major contributions from the

Future Earth community include efforts from the Global Carbon Project, GMBA, the Health KAN, and strategic partner Mountain Research Initiative. The Future Earth National Committees helped distribute the report to national delegations, while the UNFCCC distributed it electronically to negotiators at the conference. This year's list focuses on equity and equality, nutrition, impacts on the most vulnerable, and social tipping points.

A sign of the report's growing importance within the policy community, the launch event was also attended by the Chilean Science, Technology, Knowledge and Innovation Minister Andrés Couve from the COP25 presidential council, as well as news agencies like Reuters. The 2019 report marks the third annual edition of the series, and was prepared in collaboration with The Earth League.



United in Science

In company with the world's leading climate science organizations, Future Earth was asked to contribute to the landmark United in Science report, a high-level climate science synthesis for the United Nations 2019 Climate Action Summit. The report provided official scientific input to the Summit and presented a unified assessment of the state of our Earth system under the increasing influence of anthropogenic climate change, of humanity's response thus far and of the far-reaching changes that science projects for our global climate in the future. It was coordinated by the World Meteorological Organization (WMO) and compiled under the auspices of a Science Advisory Group co-chaired by Leena Srivastava and Petteri Taalas.

Future Earth's specific contribution to the report was a Summary of climate insights (2017-2019), prepared in collaboration with the Earth League, Global Fossil Fuel Emissions, and presented during the Summit by Johan Rockström and Rob Jackson (Global Carbon Project). Key messages of our summary were: Growing climate impacts increase the risk of crossing critical tipping points; There is a growing recognition that climate impacts are hitting harder and sooner than climate assessments indicated even a

decade ago; Meeting the Paris Agreement requires immediate and all-inclusive action encompassing deep decarbonization complemented by ambitious policy measures, protection and enhancement of carbon sinks and biodiversity, and effort to remove CO₂ from the atmosphere.

Other key report contributors included the Intergovernmental Panel on Climate Change, and UN Environment (UNEP).



Our Future on Earth

The Our Future on Earth series aims to synthesize the year's most newsworthy trends and top research from experts in the social, natural, and political sciences.

Our Future on Earth 2020, the inaugural report of the series, launched in February 2020 with a dozen chapters reflecting on timely topics like climate strikes, the rise of right-wing politics, and the changing media landscape. Creating the report was a global effort. Contributions were made by at least 14 of Future Earth's GRPs and KANs, while the author team and Editorial Board represented over 20 different countries from the Global North and South. The report was translated into French, Spanish and Mandarin. Following the report's release, nearly a dozen regional launch events and/or regional opinion pieces followed throughout the month of February, including events in South Africa, India, Asia, Senegal, and Europe. The report featured a special foreword from Gro Harlem Brundtland, reflecting the progress made on our common sustainable development path first introduced by the Brundtland Commission over 30 years ago. The report was covered by more than 200 international media outlets across 60 countries. Coverage included articles by The Guardian and Thomson Reuters, as well as op-eds published by Project Syndicate and The Conversation.



Global Risks Perceptions Initiative

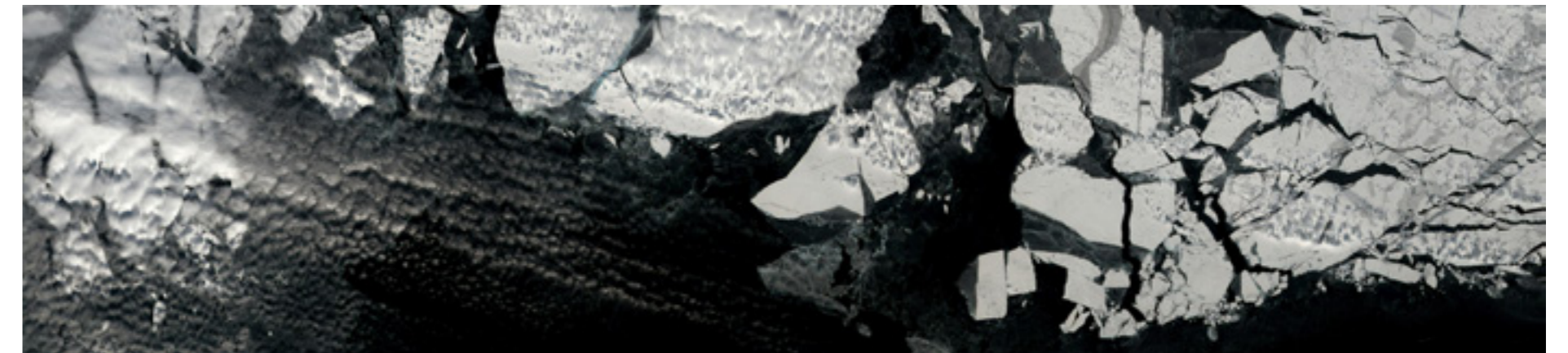
Over the past 15 years, the framing of global risks has been strongly shaped by the World Economic Forum's annual Global Risks Report, which surveys the perceptions of world leaders from business, academic, and policy spheres.

Yet, as global risks become increasingly complex and interrelated, our ability to accurately and legitimately appraise these risks requires a broadening of the communities assessing them. Future Earth's Global Risks Perceptions Initiative strives to capture perceptions on risk from different scientific communities. By bringing together multiple viewpoints, this initiative aims to spark and inform a pluralistic dialogue around risks

that draws on a diversity of experience and knowledge.

The first edition of an annual report, the Risks Perceptions Report 2020, was officially launched on February 12, 2020, based on a survey of the global change science community. The perceptions of more than 200 scientists from 52 countries – with more than 50% of respondents from the Future Earth community – were

captured in the report. When juxtaposed with results from the World Economic Forum's 2020 Global Risks Report released in January, both rank environmental risks amongst the top risks in the coming 10 years. However, scientists perceive these risks as more urgent than the business community. Survey results and implications were published in Our Future on Earth 2020 and in a commentary in the AGU's journal, Earth's Future.





About Future Earth

Future Earth's mission is to accelerate transformations to global sustainability through research and innovation. By harnessing the experience and reach of thousands of scientists and innovators from around the world, Future Earth is working towards a deeper understanding of complex Earth systems—such as climate, water, land, ocean, urban, economic, energy, health, biodiversity, and governance systems—as well as the development of evidence-based strategies for global sustainable development.

Who we are

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Fanny Boudet, Science Office

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Juichi Yamagiwa and Kazuhiko Takeuchi, Science Council of Japan, Japan

Shamila Nair-Bedouelle and Meriem Bouamrane, UNESCO, France

Pavel Kabat, World Meteorological Organization (WMO), Switzerland

Rémi Quirion, Fonds de recherche du Québec (FRQ), Canada

Stefan Claesson, Royal Swedish Academy of Sciences, Sweden

Advisory Committee Members

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Leena Srivastava, International Institute for Applied Systems Analysis (IIASA) (Co-Chair), India

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Braulio Ferreira de Souza Dias, University of Brasilia, Brazil

Fatima Denton, United Nations Economic Commission for Africa, Ethiopia

Jim Balsillie, Research In Motion (BlackBerry), Canada

Joy Shumake-Guillemot, WHO/WMO Climate and Health Office, Switzerland

Naoko Ishii, Global Environment Facility (GEF), Japan

Oyun Sanjaasuren, Green Climate Fund, Mongolia

Pamela Matson, Stanford University, USA

Peng Gong, Tsinghua University, China

Tetsuzo Yasunari, Research Institute for Humanity and Nature (RIHN), Japan

Tolullah Oni, University of Cape Town, University of Cambridge, South Africa



Our Future on Earth Launch Event, South Africa, January 2020

Events

2019

May

13-15
UN Decade of Ocean
Science planning
meeting
Copenhagen, Denmark
Meeting

20-23
Health KAN Launch
Taipei
Launch

21
Sustainability in the
Digital Age I: Resilience
facing Global Changes
Workshop
Montreal, Canada

24
Sustainability
Science 2.0
Denver, USA
Launch

28
SOLAS IMBER Ocean
Acidification
Working Group and
OA-ICC Expert Group
Monaco

June

7
'Earth System
tipping points' at
the Ecosperity
conference
Singapore
Dialogue

13-14
iLEAPS sponsored
Workshop - Modelling
and Observing Urban
Fluxes
Amsterdam,
Netherlands
Workshop

17-21
Future Oceans2
IMBeR Open Science
Conference
Brest, France
Conference

21
Sustainability
Science 2.0
Arlington, USA
Dialogue

July

6-8
International Union of
Geodesy and
Geophysics General
(IUGG) Assembly
Montreal, Canada
Meeting

8-18
27th IUGG General
Assembly
Montreal, Canada
Meeting

11
IRGP SSC Meeting
Xi'ning, China

September

4-6
Shipping & the
Environment II
Gothenburg, Sweden
Conference

9-13
European Space
Agency's '0-Week'
Rome, Italy
Conference

September

12
Energy Transition
Conference 2019
Oslo, Norway
Conference

10-13
Biodiversity Revisited
Symposium
Vienna, Austria
Forum

18-20
CIFAR AI & Society
Workshop: Sustainability
in the Digital Age
Montreal, Canada
Workshop

16-20
OceanObs'19 –
An Ocean of Opportunity
Honolulu, USA
Conference

20
Earth Commission
Launch
Washington DC, USA
Launch

September

20-23
IPCC Special Report
on the Ocean and
Cryosphere in a Chan-
ging Climate meeting
Monaco
Meeting

23-25
UN Climate Action
Summit
NYC, USA
Forum

23-25
2019 SCOR annual
meeting
Toyama, Japan
Meeting

24-25
High-level Political
Forum (SDG Summit)
NYC, USA
Forum

24-27
Water Future Conference
Bangalore, India
Conference

October

3-4
Science-Based
Pathways initiative-
French workshop on
biodiversity
Tours, France
Workshop

7
STS forum 2019 - 16th
Annual Meeting Program
Kyoto, Japan
Forum

14-15
iLEAPS Science Steering
Committee (SSC) Meeting
Boulder, Colorado
Meeting

16-17
iLEAPS and NCAR
Early-Career Scientist
Workshop
Boulder, Colorado
Workshop

16-18
Transformations 2019
Santiago, Chile
Conference

October

21-25
10th Anniversary and
Plenary Meeting
Taipei
Meeting

28-30
Integrated Ocean Carbon
Research project
(IOC-UNESCO Carbon
Think Tank) meeting
Paris, France
Meeting

29-31
34th IGAC SSC Meeting
Mexico City, Mexico
Meeting

November

4-9
Group on Earth Observa-
tions (GEO) Week
Canberra, Australia
Conference

6-8
2019 Mexico Conference
on Earth System Governance
Oaxaca, Mexico
Conference

13-15
Canadian Science Policy
Conference
Ottawa, Canada
Conference

18-23
Earth Commission
meeting
Washington DC, USA
Meeting

19-20
Science-Based Pathways
initiative - French work-
shop on freshwater
Rennes, France
Workshop

20-23
World Science Forum
(WFS)
Budapest, Hungary
Forum

December

2-13
COP25
Madrid, Spain
Conference

4
Global Carbon Budget
Launch
Madrid, Spain
Launch

6
10 Insights on Climate
Science 2019
Madrid, Spain
Launch

9-13
AGU 2019 Fall Meeting
San Francisco, USA
Meeting

8-13
WCRP Climate Science
Week: WCRP 40th
Anniversary Symposium
San Francisco, USA
Meeting

19
Future Earth Japan
Summit
Saitama, Japan
Forum

2020

January 21-24
50th World Economic
Forum (WEF)
Davos, Switzerland
Forum

February 8-March 2
2020 Earth Commission
Meeting on Biodiversity
Davos, Switzerland

February 13-16
2020 Annual Meeting of
the American Association
for the Advancement of
Science (AAAS)
Seattle, USA
Dialogue

February 13
Our Future On Earth 2020
Report Global Launch
Bengaluru, India &
Pretoria, South Africa
Launch

February 19
Our Future On Earth 2020
Report Global Launch
Hamburg, Germany &
Taipei
Launch

March 20
Earth Leadership
Program
Launch
Boulder, USA
Launch

February 21
Our Future On Earth
2020 Report Global
Launch
Bucharest, Romania
Launch

February 22
Our Future On Earth 2020
Report Global Launch
Sikkim, India
Launch

February 27
Our Future On Earth
2020 Report Global
Launch
Dakar, Senegal
Launch

February 16-21
Ocean Sciences Meeting
San Diego, USA
Meeting

February 23-28
World Biodiversity
Forum
Davos, Switzerland
Forum

Financial summary

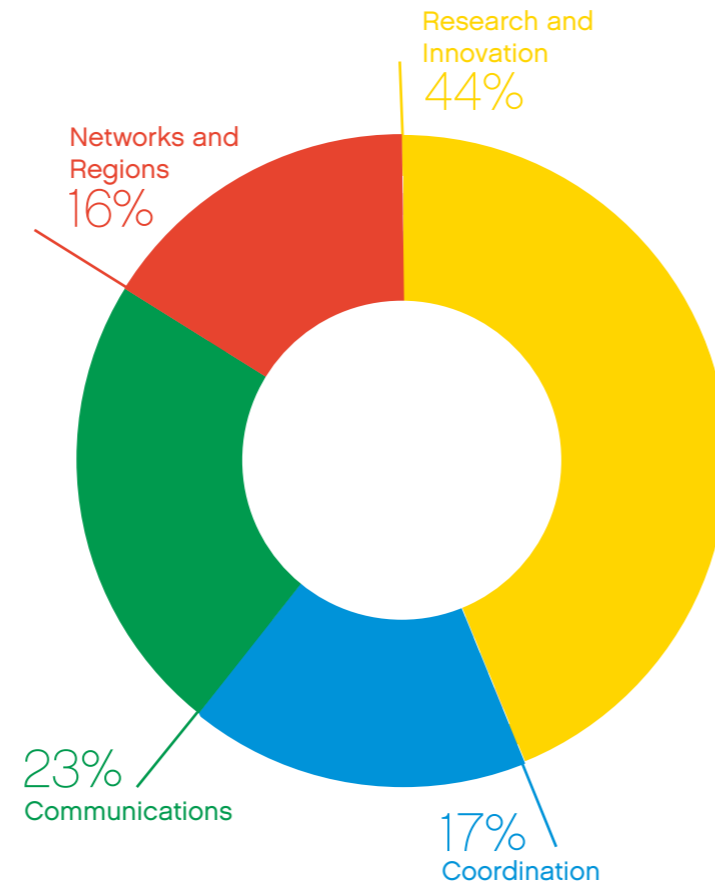
During financial year April 2019 - March 2020, the consolidated revenue of Future Earth's Global Hubs consisted of 80% public sourced funds, including national contributions, and 20% private-sector funding.



Global Hub expenses in percent (%) of total 4.8 million EUR

Expenses by function 2019-2020	million EUR
Research and Innovation	2.1
Networks and Regions	0.8
Communications	1.1
Coordination	0.8
Sum expenses	4.8

Total expenses were 4.8 million EUR. This is a decrease of 0.6 million EUR from last year's 5.4 million EUR. Activity expenses remain stable, with cost reductions occurring in the coordination function (which includes finance and operations).



Funders

The following funders are thanked for their contributions to Future Earth and its activities. Funders of both earmarked projects as well as core funders for the Future Earth secretariat are listed under the global hub receiving the funding.

National and local contributors

- ♦ Austria (Federal Ministry for Science, Research & Economy)
- ♦ Taipei (Academia Sinica)
- ♦ Finland (Council of Finnish Academies)
- ♦ Germany (German Research Foundation)
- ♦ India (Indian National Science Academy)
- ♦ Israel Academy of Sciences and Humanities
- ♦ Japan (Ministry of Education, Culture, Sports, Science and Technology, MEXT)
- ♦ Philippines (Philippine Council for Industry, Energy and Emerging Technology Research and Development)

U.S. Global Hub

- ♦ Belmont Forum
- ♦ Colorado State University
- ♦ George Mason University
- ♦ Gordon and Betty Moore Foundation
- ♦ Leonardo DiCaprio Foundation
- ♦ NASA
- ♦ NOMIS Foundation
- ♦ University of Colorado Boulder
- ♦ US Global Change Research Program
- ♦ US National Academies of Sciences, Engineering and Medicine
- ♦ US National Science Foundation

Japan Global Hub

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- ♦ Hiroshima University
- ♦ Japan Science and Technology Agency/ Research Institute of Science and Technology for Society
- ♦ KAO Corporation
- ♦ Keio University
- ♦ Kyushu University
- ♦ Nagoya City University
- ♦ National Institute for Environmental Studies
- ♦ Remote Sensing Technology Center of Japan
- ♦ Research Institute for Humanity and Nature
- ♦ Science Council of Japan
- ♦ The University of Tokyo/Institute for Future Initiatives
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- ♦ Laval University

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- ♦ ClimateWorks Foundation
- ♦ Mitacs
- ♦ College and Institutes Canada

France Global Hub

- ♦ Alliance Nationale pour la Recherche en Environnement (AllEnvi)
- ♦ Agence Nationale de la Recherche (ANR)
- ♦ Centre National de la Recherche Scientifique (CNRS)
- ♦ Ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation (MESRI)
- ♦ Sorbonne Université

Sweden Global Hub

- ♦ European Space Agency
- ♦ Mava Foundation
- ♦ Oak Foundation
- ♦ Porticus Foundation
- ♦ The Global Environment Facility
- ♦ The Swedish Ministry of Environment (via Swedish Research Council, FORMAS)
- ♦ The Swedish Ministry of Higher Education and Research (via the Swedish Research Council, Vetenskapsrådet)

Regional and National Structures

Building transformations to a more sustainable world is a task that falls to the entire planet. Future Earth, however, also recognizes that each region of the globe faces unique challenges, so in addition to our global hubs we also have regional and national structures that propel research toward unique solutions to make progress on sustainability.

Regional Centers and Offices:

Asia Regional Center
Middle Eastern & North Africa Regional Center
North Africa Regional Office
South Africa Regional Office
South Asia Regional Office

National and Local Organizations:

1. Australia	10. Philippines
2. China	11. Republic of Korea
3. Finland	12. Romania
4. France	13. Russia
5. Germany	14. Spain
6. India	15. Sweden
7. Ireland	16. Switzerland
8. Japan	17. Taipei
9. Mongolia	18. United Kingdom

Selected publications

April 2019- March 31 2020

This year our Global Research Projects and Knowledge-Action Networks collectively produced hundreds of scientific publications. This included peer-reviewed papers, book chapters and major reports. Many of these were published in very highly-cited scientific journals like Nature, Science, the Lancet, and Proceedings of the National Academy of Sciences among others. Our publications this year covered a wide scope of topics, with a majority focusing on climate, ocean, and land research. Other focus areas included health, governance, food, and more. The following is a selection of publications provided by our research networks, showcasing some of their key work as part of the Future Earth community this year.

Earth System Governance

Park, S., Kramarz, T. (Eds.). (2019). Global environmental governance and the accountability trap. The MIT Press.

Biermann, F., Lövbrand, E. (Eds.). (2019). Anthropocene encounters: New directions in green political thinking. Cambridge University Press.

van der Heijden, J., Bulkeley, H., Certomà, C. (Eds.). (2019). Urban Climate Politics: Agency and empowerment. Cambridge University Press. DOI: 10.1017/9781108632157.014.

Dryzek, J., Bowman, Q., Kuiper, J., Pickering, J., et al. (2019). Deliberative global governance (Elements in earth system governance). Cambridge: Cambridge University Press. doi:10.1017/9781108762922.

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Persson, Å. and Dzebo, A. (2019). Exploring global and transnational governance of climate change adaptation. International Environmental

Agreements: Politics, Law and Economics. Doi: <https://doi.org/10.1007/s10784-019-09440-z>.

Biermann, F., Betsill, M. M., Burch, S., Dryzek, J., et al. (2019). The Earth System Governance Project as a network organization: a critical assessment after ten years. Current Opinion in Environmental Sustainability, 39. Doi: <https://doi.org/10.1016/j.cosust.2019.04.004>.

Linnér, B.-O., Wibeck, V. (2019). Sustainability transformations: Agents and drivers across societies, 256. Cambridge University Press.

Emergent Risks and Extreme Events KAN

Alwis, D.D., Noy, I. (2019) The cost of being under the weather: Droughts, floods, and health care costs in Sri Lanka. *Asian Development Review*, 36(2), 185–214.

Mahecha, M.D., Gans, F., Brandt, G., Christiansen, R., et al. (2019). Earth system data cubes unravel global multivariate dynamics. *Earth System Dynamics*, 11, 201-234. Doi: <https://doi.org/10.5194/esd-11-201-2020>.

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Besnard, S., Carvalhais, N., Arain, M.A., Black, A., et al. (2019). Memory effects of climate and vegetation affecting net ecosystem CO2 fluxes in global forests. *PLoS One*, 14(0211510). Doi: <https://doi.org/10.1371/journal.pone.0211510>.

Flach, M., Brenning, A., Gans, F., Reichstein, M., et al. (2020). Vegetation modulates the impact of climate extremes on gross primary production. *Biogeosciences Discussions*. Doi: <https://doi.org/10.5194/bg-2020-80>.

Hoang, T., Noy, I. (2020). Wellbeing after a managed retreat: Observations from a large New Zealand program. *International Journal of Disaster Risk Reduction*, 48. Doi: <https://doi.org/10.1016/j.ijdr.2020.101589>.

Kagami, M., Nishihiro, J., Yoshida, T. (2019). Ecological and limnological bases for management of overgrown macrophytes: Introduction to a special feature. *Limnology*, 20, 1-2. Doi: <https://doi.org/10.1007/s10201-018-0565-z>.

Karim, A., Noy, I. (2020). Risk, poverty or politics? The determinants of subnational public spending allocation for adaptive disaster risk reduction in Bangladesh. *World Development*, 129. Doi: <https://doi.org/10.1016/j.worlddev.2020.104901>.

Kraemer, G., Camps-Valls, G., Reichstein, M., Mahecha, M.D. (2020). Summarizing the state of the terrestrial biosphere in few dimensions. *Biogeosciences*, 17, 2397-2424. Doi: <https://doi.org/10.5194/bg-17-2397-2020>.

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Baptista, V., Leitão, F., Morais, P., Teodósio, M.A., et al. (2020). Modelling the ingress of a temperate fish larva into a nursery coastal lagoon. *Estuarine, Coastal & Shelf Science*, 235, 106601. doi: 10.1016/j.ecss.2020.106601.

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Finance and Economics KAN

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