



futurearth

Research. Innovation. Sustainability.



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Directors' Note

Change and adaptation defined 2021 for much of the world. Emerging COVID variants and mixed responses to the pandemic created new tensions for public and mental health, strained economies, and interrupted education systems. But the world adapted in unprecedented ways, forging a deep and rapid connection between science and policy and showing that transformation at scale is possible, based on science. If there is a positive take away from the pandemic, it is that we can unite toward a common goal, and that gives us hope for sustainability action and climate change mitigation.

In 2021, Future Earth took a step toward expanding its global reach to include new hubs in Asia and Africa, bringing strong Global South voices into the Secretariat. A new governance structure was also put into place, with representation for all Future Earth communities in its new Assembly, expanding the Governing Council to reflect that diversity.

Future Earth also embraced digital and hybrid solutions for engagement in 2021, kicking off the Sustainability Research and Innovation Congress with a program that blended online, hybrid and in-person participation. The event hosted more than 100

action-forward sessions and an African satellite event with a global audience of more than 2,000 participants. Our Australian hosts and partners in Brisbane engaged local scientists, decision-makers, and the public for training, innovation demonstrations, and knowledge sharing with digital connectivity to the attendees online.

The pandemic shifted how many of our Global Research Networks convened and engaged stakeholders. Networks such as the Global Land Programme (GLP), Integrated Marine Biosphere Research (IMBeR), and Past Global Changes (PAGES) developed new impactful products for policymakers and other stakeholders. In addition, experts from across the network contributed to developing input to shaping the Belmont Forum Collaborative Research Action on Systems of Sustainable Consumption and Production.

Future Earth continues to develop knowledge products for society, such as technical papers submitted to the Convention on Biological Diversity and the delivery of 10 New Insights in Climate Science to the United Nations Framework Convention on Climate Change (UNFCCC) at COP26 in Glasgow. The Earth Commission continued to advance on its assessment of tipping points in the Earth system to define safe and just Earth system boundaries to underpin science-based targets for businesses and cities. Sustainability in the Digital Age also launched a Digital Climate Projects Database focused on climate governance strategies. Each of these products translates the most recent scientific understanding into a use-oriented frame for greater relevance and uptake to communities at the forefront of change.

We recognize that change – climate, social, or otherwise – is a constant and what shapes and propels our future. Despite the challenges of the pandemic, Future Earth finalized its new structure which has engaged a broader community into our networks and governance. This provides a strong foundation to continue to develop and share knowledge to support transformations to global sustainability.

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A GLOBAL NETWORK

of researchers and innovators

09

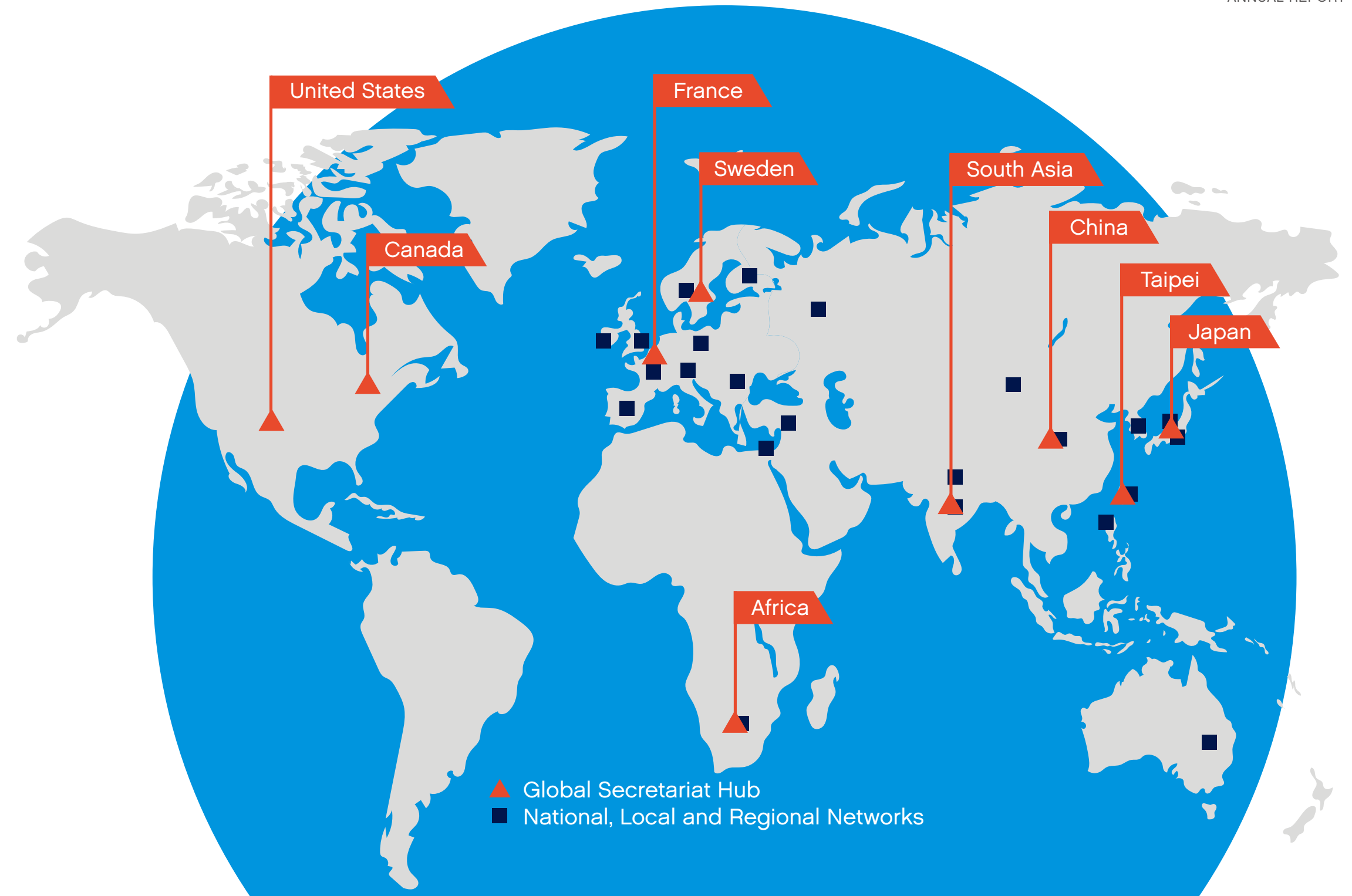
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NATIONAL, LOCAL AND REGIONAL NETWORKS



Future Earth TRANSITION

Governance New Global Secretariat Hubs

Following an external review of Future Earth in 2019, an implementation team recommended changes to the governance structure, which were carried out in 2021. Future Earth underwent a governance transition throughout 2021-2022.

The new governance structure is composed of an Assembly, and of a Governing Council. The Assembly is representative of all entities of the community, and provides a platform for broad consultation and enables the full community to participate in the development of Future Earth core agenda, strategies, activities and structures. The Governing Council is made up of 17 members who are representative of the same community groups and are elected by the Assembly. It prioritizes ideas and activities and enables the Global Secretariat to serve the community and carry out actions to help Future Earth reach its goals and fulfill its mission.

The first Future Earth Assembly was held online on 29 and 30 September 2021 with 139 representatives from the community in

attendance. The main objectives of the meeting were to build a common understanding of the various aspects of the Future Earth transition, including our mission and objectives, governance and Secretariat organization, and to elect representatives from the various assembly groups on the Governing Council.

Both entities, the Assembly and the Governing Council, elected their co-chairs shortly after that meeting. Dr. Kristie L. Ebi and Dr. Cornelia B. Krug were elected as the Assembly co-chairs, and Dr. Sirkku Juhola and Dr. Maria Uhle as Governing Council co-chairs.

Future Assembly meetings, held annually, will focus on the scientific strategic directions of Future Earth and topical contributions.



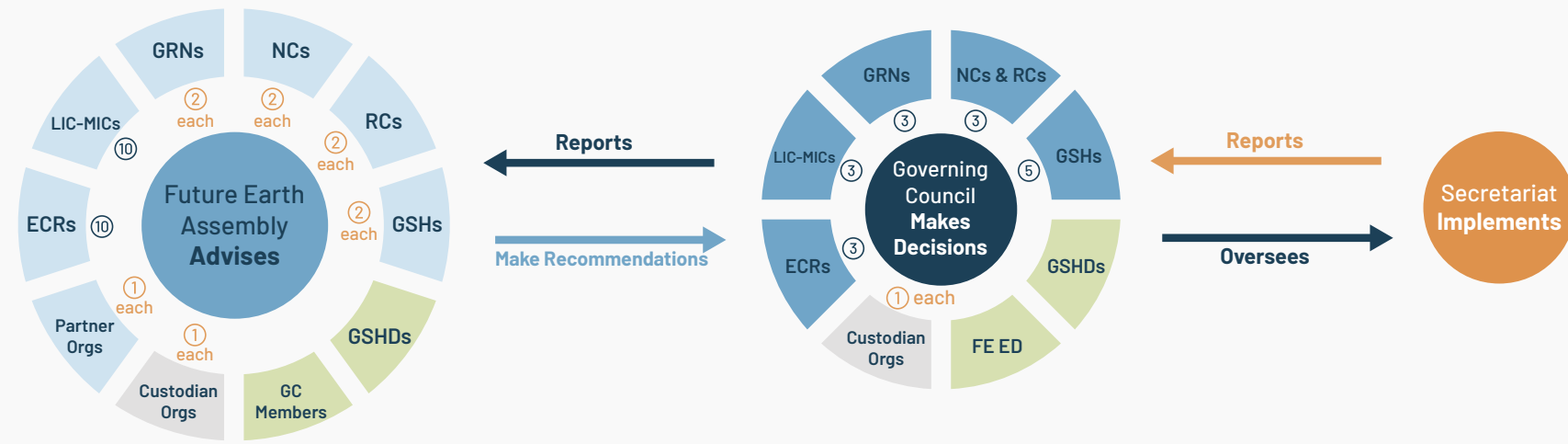
Dr. Kristie L. Ebi

Dr. Cornelia B. Krug

Dr. Maria Uhle

Dr. Sirkku Juhola

Future Earth Governance Structure



Legend

ECR: Early Career Researchers
FE ED: Future Earth Executive Director
GC: Governing Council
GRN: Global Research Network

GSH: Global Secretariat Hub
GSHD: Global Secretariat Hub Director
LIC-MIC: Lower and Middle Income Countries
NC: National and Subnational Committee/Entity
RC: Regional Committee/Entity



② Number of seats per entity within the group
⑤ Number of seats per group

We would like to thank the following members of the Future Earth Transition Implementation Team for their commitment to helping move our organization forward:

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New Global Secretariat Hubs

In addition to transformation of the governance and management structures of Future Earth has made a bold change in its Secretariat structure to provide more efficient, innovative, and inclusive facilitation to Future Earth community and external audience corresponding to transformations of the governance and management structures following its 5th year external review. This shift aims to promote sustainability science across local, national, and global levels and to pursue Future Earth's mission and functions more powerfully.

Early in 2021, Future Earth opened a call for expressions of interest to host Global Secretariat Hubs and a Global Coordination Hub. After a rigorous review process, Future Earth was pleased to make an announcement on its eight Global Secretariat Hubs in August, 2021: Canada, China, France, Japan, South Asia, Sweden, Taipei, and USA. Then in March, 2022 Global Secretariat Hub Africa joined the other hubs.

Although they are globally distributed, the 9 Global Secretariat Hubs work as a single Secretariat team by sharing a common mission and vision, operational ideas, and practical tools, and are promoting shared secretariat functions. This united Secretariat aligns with Future Earth's commitment to greater inclusion of the Global South, and will bring critical sustainability science perspectives from these geographies to Future Earth's core programs. Each Hub is characterized with its strengths and focus, which in the end will empower and enrich the entire team. By covering numerous regions and time zones, the Future Earth Global Secretariat can operate 24 hours a day to ensure this important work is not only planetary in scope, but also grounded in distinct regional, national, and local contexts.

A call for a Global Coordination Hub remains open.

Future Earth COMMUNITY

The strength of Future Earth lies within the work of the community comprising 27 Global Research Networks (formerly referred to as 8 Knowledge Action Networks and 19 Global Research Projects), and National and Regional Networks (National Committees and Structures, Regional Committees and Offices), as well as the Early Career Network. These networks represent academics, policy-makers, independent scholars, and students, all working across sectors and disciplines. They play a critical role in defining and advancing research and solutions in Earth system science and its component sub-systems and their nexus (land, ocean, food, energy, water, etc.), including

human societies and health. The secretariat works to connect the networks and drives synthesis and engagement across the different networks, including communications products and links to policy communities at a global level.

In 2021, under continued challenging conditions due to the COVID-19 pandemic, the Future Earth community produced world-class research. It strengthened research and innovation communities through international open science conferences, technical workshops, training programs, and early career events, and many other activities. Some of these were held in-person, but most were primarily held virtually.

Global Research Networks

Each year, Future Earth's Global Research Networks advance cutting-edge Earth systems science. These networks have a history of generating research at the forefront of sustainability science, in some cases stretching back decades. Our Global Research Networks build on the power of networks (linking science, policy, business, and civil leaders) to bring about collaborative solutions for complex problems. They are composed of what were formerly known as Global Research Projects and Knowledge Action Networks. While the purpose of the latter group was originally to have a stronger focus on transdisciplinary sciences, both entity groups over the years have come to contribute science, innovation, and policy. The Global Research Networks focus on advancing science through the power of networks (linking science, policy, business, and civil leaders) to bring about collaborative solutions for complex problems. Below is a description of each network's activities and achievements in the fiscal year.



AIMES

The Analysis, Integration, and Modelling of the Earth System (AIMES) is an international network of Earth system scientists. In the past year under continued COVID-19 restrictions, AIMES organized virtual workshops, webinar series, and conference sessions through its working groups. In the inaugural workshop of the Land Data Assimilation working group, over 100 land surface modelers from the Numerical Weather Prediction and Earth System modeling communities came together to tackle technical challenges and reduce uncertainty in model projections. The Modeling Earth System and Human Interactions (MESH) working group organized a virtual workshop that brought together a diverse range of Earth and human system modelers to address feedback, uncertainties

and scenario development in coupled modeling systems. The AIMES/GLP working group on Large-Scale Behavioural Modelling of Land Use Change organized an online symposium to advance the development of global scale agent-based land-use change models. The Tipping Elements in the Earth System working group organized a series of webinars in collaboration with the Earth Commission and WCRP on tipping elements, irreversibility, and abrupt changes in the Earth system. AIMES also supported research infrastructure through the development of working group websites, a new AIMES member database, and the promotion of open modeling practices led by the Open Modeling Foundation working group.



bioDISCOVERY

bioDISCOVERY is a network for international and cross-disciplinary collaboration to advance research on monitoring, observation, and modeling of biodiversity and ecosystems to improve our understanding of how biodiversity and ecosystems respond to environmental change, and to overcome the barriers that impede the use of observations and modeling in management and decision-making. bioDISCOVERY liaises with the Convention on Biological Diversity (CBD) and the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), and experts from its network contribute to assessments and task forces. In 2021, bioDISCOVERY hosted, together with the University of Zurich Research Priority Program Global Change and Biodiversity, the Virtual World Biodiversity Forum. The events in this series were intended as calls to action, offering inspiration and positive examples for solutions to create an impact action agenda for biodiversity. Participants shared case studies and told success stories and highlighted synergies. Themes covered governance, restoration of ecosystems, finance and economics and biodiversity futures. Jointly with GEO BON, bioDISCOVERY convened a group of more than 50 experts to provide an updated synthesis and assessment of how actions in the twenty-one targets of the first draft of the post-2020 global biodiversity framework (GBF) and a comprehensive monitoring framework could contribute to achieving the biodiversity milestones and goals (Goal A) of the GBF. At SRI 2021, bioDISCOVERY, jointly with ESA, convened a session on Advances in Earth Observation for Biodiversity and Ecosystem Monitoring, and contributed to the session, “Science-based Pathways for Sustainability: Towards a

Community of Practice”. bioDISCOVERY co-leads the Pathways to Sustainability initiative, and co-chaired the Future Earth Transition Team.




Earth System Governance

The Earth System Governance Project is a long-standing global, interdisciplinary research network that connects and mobilizes social science scholars at the interface between global environmental change and governance. In September 2021, the network’s annual conference in Bratislava, Slovakia convened the community around the timely theme:



Earth system governance in turbulent times: prospects for political and behavioral responses. It included a full program of over 90 sessions, with 350 papers presented virtually and in-person. Notably for the year, the network initiated several new research groups. Two Taskforces are aimed toward large systemic challenges: Climate Governance and the Governance of Nature and Biodiversity, whereas the Taskforce on SDGs aims to examine the effectiveness of steering through goals and the Taskforce on Knowledge Cumulation on how to structurally accumulate research. For early career researchers, the year included a two-day virtual workshop with 40 participants, as well as a yearlong Mentoring Initiative programme. Five well attended webinars known as the ESG Speaker Series were led by distinguished scholars from across the globe on diverse themes. Lastly, the flagship publications released in 2021 contributed to advance research in our field, with four new issues from the Earth System Governance Journal, three books in our various book series and two elements.



Emergent Risks and Extreme Events Knowledge-Action Network

Extreme climate and weather events as well as associated disasters and systemic risks are becoming increasingly critical in the context of global environmental change. They are an important threat to reaching the SDGs and one of the most pressing challenges for future human well-being. The Risk KAN, a joint initiative of Future Earth, IRDR, WCRP and WRRP, provides an open platform for scientific communities from multiple disciplines working on extreme events, systemic risks, disaster risk reduction and governance

to exchange information, knowledge and data and engage in collaborative research activities. Working Groups (WGs) are a core element of the Risk KAN. They span a wide range of topics such as Compound Events, Critical infrastructures, Early Warning, Learning from the past, Metabolic Risks on Islands and Modelling and Insurance. New WGs can be proposed at any time and we welcome new members! Key highlights in 2021-2022 include the formation of a new Steering Committee, a joint ERL Focus Issue on Earth System Resilience and Tipping Behavior, the ISC-UNDRR-RISK KAN Briefing note on systemic risk, and a Nature commentary. The WGs organized a series of high-level webinars, a virtual workshop on Understanding and Modeling Complex Risks in Coupled Human-Environment Systems and multiple sessions at SRI, EGU, AGU, German Sustainability Science Summit and other congresses.



EvolvES

EvolvES connects evolutionary biology and diversity to human well-being, promotes the development of new strategies and tools for documenting biodiversity and studies the causes and consequences of diversification. From the network strategic planning evolved five clusters: Agro-Biodiversity, One Health, Conservation Genetics, Urban Evolution and Phylogenetic Diversity. The leaders are developing targets in accordance with other GRNs like GEO BON and are creating working groups with wide geographical distribution. More than 200 scientists all over the world have been involved in a multi-site research approach. It draws evidence that evolution due to urbanization leads to adaptation simultaneously at a global scale. Sequencing of 2074 white clover

plant genomes from 26 cities revealed that the evolution of urban-rural clines was best explained by adaptive evolution and the degree of parallel adaptation varied among environmental changes in drought stress and vegetation cover that varied among cities. EvolvES members have contributed to the preparation of policy briefs addressed to the post-2020 Global Biodiversity Framework at the COP-15 Geneva Meeting.

Finance and Economics Knowledge-Action Network

The Finance and Economics (F&E) KAN has in its first year of existence taken steps to develop a baseline of members who are to explore ways to align global financial and economic systems, business models, consumption, and production patterns towards sustainability, both conceptually and in practice. This must be through considering the financial and economic system as part of a larger complex socio-ecological system. Within this framework, the F&E KAN has taken steps towards setting the groundwork for its activities in testing an internal round of webinars on the topics of sustainable finance, exploring the potential for developing on online educational materials on complexity economics, as well as contributing to the Sustainability Research & Innovation (SRI) Congress, and the Global Platform for Disaster Risk Reduction in Bali. We have also contributed to Future Earth's Global Risk Perception Initiative as part of its advisory group. We plan to move forward with Working Groups based on: Sustainable finance, agent-based macroeconomics, complexity, economics and global change, and natural resources and local sustainable development.

Future Earth Coasts

Future Earth Coasts is an interdisciplinary program promoting sustainable development in coastal zones. At the end of 2021, Leibniz Zentrum für Marine Tropenforschung (ZMT) (Germany) ended their term as the host organization for FEC (Lead International Project Office / IPO) and was replaced by a co-hosted arrangement, comprised of Southern Cross University (SCU) (Australia), State Key Laboratory of Estuarine and Coastal Research (SKLEC, East China Normal University) and Yantai Institute of Coastal Zone Research (YIC, Chinese Academy of Sciences) (China). Virginia Tech ended their term as a FEC IPO and was replaced with two new IPOs, including the Centre for Coastal Management - Africa Centre of Excellence in Coastal Resilience (CCM-ACECoR, University of Cape Coast) (Ghana) and Instituto Argentino de Oceanografía (IADO-CONICET-UNS) (Argentina). In addition, University of Maryland Center for Environmental Science (UMCES) (USA) renewed its term as an IPO. The FEC IPOs are complemented with Regional Engagement Partners in seven countries. FEC expanded the Academy (37 world-leading scholars from 25 countries), Fellows (15 early and mid-career researchers from 9 countries), and Affiliated Projects (7 major global initiatives), including hosting a series of capacity-building events for the FEC Fellows. In June 2021, the Mega-Delta Working Group led by FEC was successfully endorsed as part of the UN Decade of Ocean Science for Sustainable Development. In October 2021, FEC contributed to the 7th International Conference on Estuaries and Coasts as a sponsor held in Shanghai, China.

Global Carbon Project

The Global Carbon Project (GCP) is an international research project that aims to develop a complete picture of the global carbon cycle. In the reporting period, the GCP produced a 2021 update to its Global carbon dioxide budget, which was released at a COP26 side event in Glasgow on Nov 4th, 2022. A key finding is that Global carbon emissions in 2021 are set to rebound close to pre-Covid levels, which highlights the scale of the actions required by the global community. Other key publications include Ecosystem Collapse and Climate Change which documents cases of ecosystem collapse around the world to raise awareness of the transitions already occurring through climate change today. Another scientific article reviews Global and Regional Trends and Drivers of Fire Under Climate Change. The GCP is also continuing its efforts in raising public awareness on the subjects through its public forums. Two online webinars were organized: "Ten new insights in climate science and its implications to Japanese's decarbonization" with the Future Earth Global Secretariat Hub Japan on 9 June 2021 and "Forefront of Greenhouse Gas Research-Toward Achieving the Goals of the Paris Agreement" on 10 February 2022.



Global Land Programme

The Global Land Programme is an interdisciplinary community of science and practice fostering the study of land systems and the co-design of solutions for sustainability. As a global network of over 2,200 members, guided by a Scientific Steering Committee and coordinated by the International Programme Office, GLP's mission entails bridging scientific innovation with societal relevance and employs place-based research to feed synthesis-understandings of the patterns and processes of global change and land-related debates in global policy settings. In 2021, a group of 50 GLP



community members from over 20 countries published a paper in Proceedings of the National Academies of Science (PNAS) on "10 Facts on Land Systems for Sustainability", including related challenges and implications for governance and decision-making. The paper is accompanied by a report for policy and practice offering specific examples to support policymakers and societal partners craft effective solutions to more just and sustainable outcomes for people and our planet.

10 FACTS ABOUT LAND SYSTEMS FOR SUSTAINABILITY



A REPORT FOR POLICY AND PRACTICE

Global Mountain Biodiversity Assessment

The Global Mountain Biodiversity Assessment provides a platform for international, trans- and cross-disciplinary collaboration on mountain biodiversity research, assessment, conservation, and sustainable management. GMBA pursues the objectives of: connecting mountain biodiversity knowledge holders, producers, and users across scales; providing tools and data infrastructures in support of mountain biodiversity science; facilitating processes of mountain biodiversity knowledge creation; building capacity for sustainable mountain biodiversity conservation and management; and transferring and disseminating mountain biodiversity knowledge. A highlight was the convening of a very well-attended special session and workshop on mountain biodiversity data at the first Southern African Mountain Conference (SAMC2022), held in the Drakensberg mountains in March 2022. The gathering, co-convened with GMBA scientific steering committee member Dr. Ralph Clark (Afromontane Research Unit, University of the Free State), served to kick-start a collaborative effort between GMBA and Southern African mountain biodiversity scientists and data users toward: The synthesis of current data and knowledge on mountain biodiversity in Southern Africa; a gap analysis; the formulation of a roadmap of research priorities. This effort sets the stage for a new collaboration between the IPO and its partner regions that will develop further starting in Q3 2022.



Health Knowledge-Action Network

Health Knowledge-Action Network members developed boundary-spanning work. Several core members published a Lancet Series on Heat and health and developed a Webinar on its recently published research agenda on health for the community and prospective funders. Scientific presentations were made at SRI2021, the Adaptation Futures Conference on “Adapting for health”, and at the “2021 SDU International Symposium on Climate Change and Health”. Members contributed to IPCC’s AR6 Working Group 2 - Impacts, Adaptation, and Vulnerability, especially on Chapter 7: “Health, wellbeing and the changing structure of communities”. They further contributed to the “10 New Insights in Climate Science” report on “how costs of climate change mitigation can be justified by the multiple immediate benefits to the health of humans and nature” and later developed an outreach flier on health co-benefits from mitigation by sector. Further, on the Science Policy work, an important contribution was made to the Future Earth statement for CBD-SBSTTA-24, item 9 - biodiversity and health. On the action side, an action plan was developed and presented at the Virtual SciDatCon 2021 focused on how to link knowledge and action based on the data-knowledge-action system approach. To demonstrate this approach, a workshop on “Health Co-Benefits of Urban Green Space in Guangzhou, China” was organized with an array of stakeholders and the results were published. Furthermore, two demonstration projects (City Explorer and PODCAST-Demo) funded by the ESA-Future Earth Joint Program were concluded.

The Health KAN has also been active in supporting Future Earth at large. Members actively contributed to the Cross-Global Research Network meetings to empower other GRNs to work on health benefits and establish new collaborative projects, such as one on governance and health.



IGAC

The International Global Atmospheric Chemistry Project seeks to advance atmospheric chemistry towards a sustainable world by providing a framework for international networking and collaboration between atmospheric chemists. The atmosphere is the integrator of the earth: Anthropogenic and biogenic emissions are transported, react, and mix together over international boundaries and these transformed emissions affect the earth in myriad ways (e.g., human health, climate change, snow albedo effects). Guided by an international scientific steering committee, IGAC supports the advancement of atmospheric chemistry knowledge by sponsoring activities, fosters community by hosting a bi-annual scientific conference, builds capacity by sponsoring regional working groups, summer schools, and workshops, and strives to engage society. The IGAC Project held its first virtual conference in September 2021, with over 900 registrants from more than 50 countries. The IGAC virtual conference focused on our activities and our regional working groups. IGAC also hosted a virtual early career short course, with a focus on career development and networking.




IHOPE

The Integrated History and Future Of People on Earth 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. IHOPE’s SSC had three SSC meetings during the year – all organized digitally, a practice which we will continue post-pandemic. Over the past accounting year, IHOPE’s SSC has published 118 articles and chapters and 21 books/book chapters. New PhD training projects were affiliated to IHOPE in 2021, which include a number of young early career scholars which will significantly increase the spread of new collaboration. IHOPE also participated in a number of workshops and conference sessions. Since 2022, we have a new function on our webpage which gathers links to recorded workshops and seminars within the interest sphere of IHOPE. We have also started to develop a student opportunity page for younger colleagues.



iLEAPS

The Integrated Land Ecosystem Atmosphere Processes Study (iLEAPS) coordinates and promotes world-wide scientific research in the field of ecosystem-atmosphere exchanges and their impact on society. iLEAPS promotes scientific activities at the land-atmosphere interface and its impact on society, and provides essential science that links biological, chemical and physical processes from local to global scales in the changing Earth system. We accomplish this through capacity building globally and preparing the next generation of leadership through Early Career Science networks. iLEAPS hosted several webinars organized by Latin America Early Career Earth System Scientists Network (ECSN) and the South Asian Chapter. In August 2021, ECSN started a podcast series and broadcast 6 episodes, and also organized a Twitter poster competition in collaboration with FLUXNET. At SRI2021, iLEAPS co-convened the session “The Changing Face of Wildfire and Effects on Human Health” in collaboration with AIMES, IGAC and PAGES. Dr. Semeena Valiyaveetil Shamsudheen of iLEAPS IPO won a microgrant by Adaptation Research Alliance partnering with African Centre of Meteorological Application for Development (ACMAD). iLEAPS-Japan approved three research projects, contributing to iLEAPS and Future Earth. In terms of governance, four members of the iLEAPS community were appointed/elected to the Future Earth General Assembly (Benjamin Poulter and Semeena Valiyaveetil Shamsudheen) and Governing Council (Sirku Juhola and Gemma Purser).



IMBeR

Integrated Marine Biosphere Research (IMBeR) is a large global research project that focuses on ocean sustainability for the benefit of society in the context of global change. IMBeR held three large events in 2021: the IMBIZO6 Conference – “Marine Biosphere Research: Buoyant Solutions for Ocean Sustainability”; the IMBeR West Pacific Symposium – “Changing West Pacific Ocean: Science and Sustainability”; and the ClimEco7 Summer School – “Interdisciplinary Ocean Science for Sustainable Development”. These events were endorsed by the UN Decade of Ocean Science for Sustainable Development 2021-2030 (‘Ocean Decade’) and collectively convened more than 1,000 participants from over 80 countries. The “Southern Ocean Action Plan 2021-2030”, also a contribution to the Ocean Decade, was co-authored by Integrating Climate and Ecosystem Dynamics in the Southern Ocean (an IMBeR Regional Programme) and developed through a stakeholder-oriented process. Murphy et al. published “The Global Pandemic Has Shown We Need an Action Plan for the Ocean”, outlining how lessons from COVID-19 pandemic can inform sustainable ocean governance and how IMBeR along with the Ocean Decade can serve as platforms to help achieve this. IMBeR’s Interdisciplinary Marine Early Career Network completed a 42-article special issue “Solving Complex Ocean Challenges Through Interdisciplinary Research: Advances from Early Career Marine Scientists”.



Integrated Risk Governance

Integrated Risk Governance Project (IRGP) has been focusing on coordinating global risk science and technology community groups to better understand adverse impacts of extreme natural events in order to safely protect human society and to achieve the UN Sustainable Development Goals. Due to the impacts of COVID-19 in the past three years, IRGP has transferred most of its activities to online but still works closely with other international research communities, such as IRDR and Risk KAN/Future Earth Program, to explore the impacts and possible solutions to deal with COVID-19 for the whole human society. IRGP has coordinated with scientists to conduct research on understanding systematic risks in the Anthropocene where elements accelerate but with higher complexity and interconnection and more irreversible processes. Research themes include better understanding systemic risks from the following issues: Creeping environmental problems, catastrophic disasters, technological innovation and green development. As one example of our advancements, working with universities in China, a training program of Ecosystem-based disaster risk reduction (Eco-DRR) has been developed, which consists of sustainable management, conservation and restoration of ecosystems to reduce disaster risk, with the aim to achieve sustainable and resilient development. Based on the philosophy of “learning by doing”, the course combines theory with practice, with case study examples from all over the world.



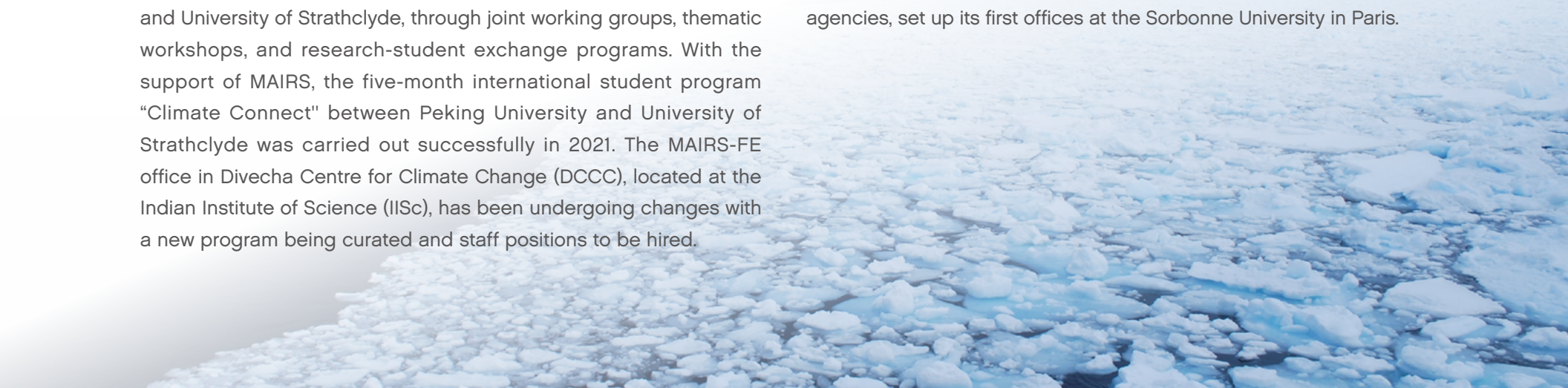
MAIRS

Monsoon Asia Integrated Research for Sustainability (MAIRS) supported the implementation of AiR-Climate-Health (ARCH) Integrated Study and Exchange Platform with a seminar themed on environmental health strategy and an inception meeting on “Development of health-oriented standards of ambient air quality in China” held in Beijing in September 2021. ARCH provides demonstration for transferring science to support local key-policy making and opportunity for scaling-up in Asia. Collaborating with the provincial government agency in China, MAIRS jointly held a workshop on One Health back-to-back with Promoting Carbon Peak and Neutrality in May 2021, aiming to build a bridge between science and decision-making to promote healthy and low-carbon development in Hainan Province. MAIRS, together with iCACGP, IGAC, SOLAS, and The Global Atmosphere Watch (GAW) Programme of WMO, co-organized a session on Air Quality and Human Health at the SRI 2021 to discuss how to translate the fundamental science of atmospheric chemistry to improve air quality to protect global human health. MAIRS deepened collaborations with WCRP-CORDEX and University of Strathclyde, through joint working groups, thematic workshops, and research-student exchange programs. With the support of MAIRS, the five-month international student program “Climate Connect” between Peking University and University of Strathclyde was carried out successfully in 2021. The MAIRS-FE office in Divecha Centre for Climate Change (DCCC), located at the Indian Institute of Science (IISc), has been undergoing changes with a new program being curated and staff positions to be hired.



Ocean Knowledge-Action Network

The Ocean Knowledge Action Network works to find better ways of bringing networks together to support the co-design of ocean knowledge for sustainable development. Over the last year, the Ocean KAN installed its first steering committee, and has grown its Inner Circle of close collaborators to include partners in the USA, Canada, Brazil, Ghana, South Africa, Seychelles, France, and Taipei as well as five UN Ocean Decade-endorsed programs; ten international ocean science, social science, and political science networks; eight universities; and two private sector partners. The Ocean KAN hosted a half-day innovative session on the co-design of science at the Ocean Sciences Meeting 2022 that included hybrid meetings in California and São Paulo, and a plenary session with all of our stakeholder partners. The Ocean KAN works directly with the Future Earth Global Hub in Paris to convene regular meetings with all of the ocean-oriented networks at Future Earth. The Ocean KAN has been co-designing a network-of-networks digital platform called the Ocean KANopy that is built on Acter.global technology. The Ocean KAN IPO, hosted by CNRS and funded by a consortium of French science agencies, set up its first offices at the Sorbonne University in Paris.





oneHEALTH explores links between global environmental change and health for the planet and society. This year, we focused our attention on scientific priorities and policy options toward upstream prevention of health crises, including pandemics. Through work with technical and development agencies, we helped identify entry points for veterinary and environmental services in multi-sectoral preparedness for health security, informing COVID-19 recovery investments. In preparation for COP26, we co-led a white paper on the impacts of climate change and health, targeting actions that also benefit other sustainable development goals. Global work was paired with national efforts; in partnership with the University of Ghana, EcoHealth Alliance, and UK Animal and Plant Health Agency, we organized a workshop in Accra on operationalizing One Health to address climate change and emerging infectious disease risks. oneHEALTH led a review of nature-based solutions for health and presented in a session on Disaster Risk Reduction and Climate Change Adaptation at the 2021 UN Humanitarian Networks and Partnership Week. Our scientists were appointed to expert bodies, including a IPBES Nexus assessment, a GEF Technical Advisory Group and the One Health High-Level Expert Panel – supporting development of an inclusive definition of One Health now endorsed by FAO, OIE, UNEP, and WHO.



PAGES' mandate remains to facilitate international collaboration and interdisciplinary paleoscience on past climatic and environmental changes to allow for reliable future climate projections and raise awareness about the relevance of long-term changes to understanding present and future Earth system processes and trajectories. In 2021 PAGES launched two Mobility Research Fellowship Programs for early-career researchers in Africa and in Latin America and the Caribbean. The program aims to contribute to the development of collaborative research and the promotion of paleoscience networks in these two regions. The first issue of a new publication, Past Global Changes Horizons, designed for teenagers and young adults who are interested in learning more about paleoscience, past global changes, and science in general, was published in 2021. A new initiative, the Data Stewardship Scholarship program, was developed specifically to support the PAGES working groups' efforts in making data collected as part of the groups' activities findable, accessible, interoperable, and reusable, and in safely storing the data. Three new working groups were launched during the reporting period. They focus on the understanding of past ecological trends, on the Pliocene and Miocene climate variability over glacial-interglacial timescales, and on disentangling human impacts on marine ecosystems. The Carbon in Peat on Earth



<https://doi.org/10.22498/pages.horiz.1>
Illustration by Jérémie Moreau

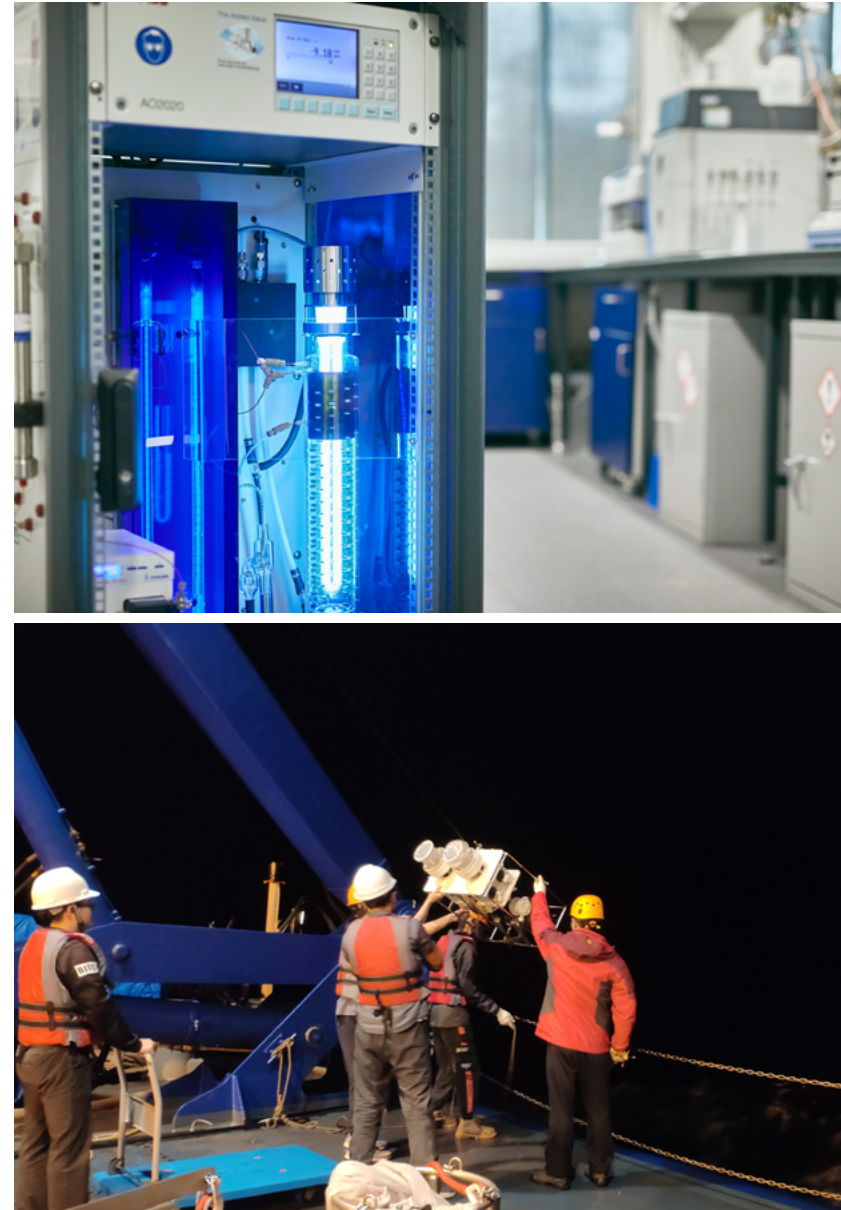
through Time working group, in collaboration with PAGES and Future Earth, took part in the United Nations' Framework Convention on Climate Change (COP26). The C-PEAT team present at the Peatland Pavilion, organized by the Global Peatlands Initiative, presented an Interactive Peatland Map and an artistic rendition of peatland landscapes.



Over the past year, PECS put out a call for new working groups to apply with topics linked to four new adopted themes: Dynamics of the Anthropocene; Fostering Stewardship in Diverse Contexts; Transformations to Sustainable Futures; and Mainstreaming Knowledge Co-production. We have received and accepted applications from 14 working groups, which were launched on 3 June 2022. PECS has also adopted a regional network model, which aims to increase participation at the regional level. Currently there are three regional networks in Southern Africa, North America, and a newly launched regional network in Latin America. We will be working closely with the working groups over the next few months, and are planning an in-person meeting in Cape Town in Spring 2023.

SOLAS

Surface Ocean-Lower Atmosphere Study is dedicated to achieving quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and atmosphere, and how this coupled system affects and is affected by climate and environmental change. SOLAS was given a very positive response to its 2015-2025 mid-term review, conducted by the Scientific Committee on Oceanic Research and Future Earth. SOLAS has recently been devoted to ensuring effective implementation of science in policy and decision-making on climate and environmental health by engaging in COP26 and other activities of the United Nations Framework Convention on Climate Change. The report on Integrated Ocean Carbon Research (IOC-R) released in May 2021 and co-sponsored by SOLAS, was developed as part of the United Nations Decade of Ocean Science for Sustainable Development (the Ocean Decade). SOLAS is also partnering with 3 Decade programs/projects to co-design and co-implement SOLAS-relevant activities of societal impacts. The SOLAS community is made up of 1,075 people from 32 countries, 36 National/Regional Representatives, 4 Sponsored Projects, 14 Endorsed Projects and 3 Endorsed Time Series Stations. SOLAS activities in 2021-2022 included: 12 sponsored and co-sponsored events, 18 National/Regional Reports, 4 Event Reports, a monthly newsletter, 59 announcements via mailing list, and 392 tweets.



Systems of Sustainable Consumption and Production Knowledge-Action Network

The SSCP KAN emphasizes 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. In 2021, the New Steering Committee, elected Co-chairs and Management Team facilitated internal discussions and agenda setting activities, to create a forward looking plan and activity-wheel for the KAN and its working groups. A proposal for the special issue of the journal *Global Sustainability* has been pitched. Working Groups organized more than 15 webinars on various themes such as Sustainable Consumption in the Global South (Political Economy WG), Imagined Futures of Consumption and Social Practice Theory for co-design (Social Change WG); engaged in publication projects on narratives and gendered sustainable consumption communication (Communications WG), initiated development of case study protocols for SCP in city planning (Cities WG) and have created spaces for exchanging pitches for circular economy/circular society projects (Circular Economy WG). A Sustainability Action Platform Initiative has also been developed. Matchmaking efforts and working group interactions have brought together KAN members who are forming consortia and collaborating on transdisciplinary project proposals for the Belmont Forum Collaborative Research Action on SSCP. Preparations are underway for hosting a Future Earth Systems of Sustainable Consumption and Production Online Conference in November 2022.

Urban Knowledge-Action Network

Urban Knowledge-Action Network Steering Committee members contributed to urban sustainability through high-level scientific publications and science-policy activities. Significant contributions were made to the highly influential IPBES-IPCC Co-Sponsored Workshop Report on Biodiversity and Climate Change. Several Urban KAN Steering Committee members contributed to the Sixth Assessment Report (AR6) IPCC on both Working Groups II and III, directly supporting the advancement of integrated policies for Impacts, Adaptation, and Vulnerability (with the strongest presence in the urban systems chapter) as well as to Mitigation of Climate Change. Several core Urban KAN Steering Committee members also contributed to a milestone paper on “Integrating solutions to adapt cities for climate change” in the *Lancet Planetary Health* journal, cutting across disciplines. Further, a highly relevant paper for urban systems was published in *Nature Climate Change* on how demand-side solutions show the high potential of climate mitigation while enhancing human wellbeing. The committee members also published books addressing how cities develop anticipatorily and long-range planning capacities and mitigate for more resilient futures toward climate and socioeconomic change. As part of the Urban Knowledge-Action Network, “The Nature-based Solutions for Urban Resilience in the Anthropocene (NATURA)” project developed several major outputs with a focus on Nature-based Solutions. Several Urban Knowledge-Action Network members were invited to the Science and Innovation Steering Committee

of the Innovate4Cities 2021 conference that attracted nearly 7000 participants, which was convened by UN-Habitat, the Global Covenant of Mayors for Climate & Energy, and co-sponsored by The Intergovernmental Panel on Climate Change, World Meteorological Organization, and United Nations Environment Programme alongside a wider network of partners.

Water Future

The Sustainable Water Future Programme of Future Earth is a global platform facilitating international scientific collaboration to drive solutions to the world's water problems. Consistent with the broad objectives of the Sustainable Development Goal for Water, research conducted through Water Future seeks to ensure a balance between the needs of humankind and nature, and to offer real solutions, underpinned by interdisciplinary science, to deliver a sustainable 'Water World'. The Sustainable Water Future Programme

(Water Future) and the Intergovernmental Hydrological Programme (IHP) of UNESCO are developing a joint action plan, "Science for SDG6: Science to accelerate the implementation of SDG6", focusing on the role that 21st Century Science can play in addressing the gaps in SDG monitoring, assessment, and implementation. The outcome of this initiative will be a water science research agenda which will be one of the key guiding documents to be presented and discussed with different stakeholders at the UN 2023 Water Conference to be held in March 2023. The agenda will provide the foundation and basis for discussions and further engagement with UN member countries, Intergovernmental agencies, civil society and funding bodies. The science research agenda will also be a contribution to the 9th Phase of IHP (IHP IX 2022-2029) "Science for a Water Secure World in a Changing Environment". Water Future and UNESCO is jointly organizing a high-level conference to be held in November 2022 in Paris where the draft water science agenda will be discussed. It will contribute to the Water Future Strategic Research Agenda (2022-2025).



Water-Food-Energy Nexus Knowledge-Action Network

In the framework of Future Earth, Knowledge-Action Networks (KANs) are networks of people and organizations, collaborating to build the knowledge and tools needed to tackle the greatest sustainability challenges of our time. The Nexus KAN does so in the context of sustainably and equitably delivering water, energy and food for all. This is achieved through better understanding the interactions between water, energy and food systems and managing their trade-offs and synergies. The Nexus KAN acts as a liaison between Earth system science, social science, humanities, and society to explore and promote science-based solutions to address pressing water, energy and food system challenges. The Nexus KAN facilitates collaboration between existing projects, networks and individuals involved with nexus issues and builds on their knowledge, expertise and experience. The Future Earth Nexus KAN steering committee was established in 2018 and has eight members chaired by Prof. Jiaguo Qi. The Steering Committee initiates and stimulates activities in the Nexus Knowledge-Action Network. These activities aim to enhance collaboration and interaction among the research and practice communities working on nexus issues, spurring the co-creation of new knowledge and the application of knowledge in practice.



National and Regional Networks: Updates from around the Globe

Future Earth Local, National and Regional Structures forge a bridge between local, national and regional sustainability science and research and the global sustainability community, aggregating knowledge and inspiration from the ground to the global and back. In 2021, with the Future Earth transition and as a part of an effort to streamline the Future Earth structure, several local and national committees and regional offices and centers became Global Secretariat Hubs (China, Taipei, South Asia) or merged with the existing Hubs (Asia). Regional work is now primarily managed through the Global Secretariat Hubs, which allows stronger support from the Future Earth Secretariat. Below are examples of this critical work:



Asia

During Future Earth's transition period, the Asia Regional Center, hosted in Kyoto merged with the Tokyo Hub to form the Future Earth Japan Global Secretariat Hub, with most of its regional functions absorbed by the new structure. For the past few years, the Asia Regional Center has supported the thriving Future Earth Community in Asia, with three new Global Secretariat Hubs set up in China, Taipei and South Asia in 2021. Each of these secretariat hubs have resources and initiatives that have a regional scope and are coordinating activities across the region. Some cross-hub working groups are being created to better support and strengthen the research and networking capacities in the region.

The Chinese National Committee for Future Earth, together with China Global Secretariat Hub and other institutions, organized a side event and an exhibit at COP26 entitled "The Path to Regional

and Global Carbon Neutrality". During this period, the CNC-FE has launched Future Earth Early-Career Research Program, and organized "The Future Earth Virtual Symposium" a series of webinars aimed at promoting sustainability research among young scholars and students. In April 2021, CNC-FE organized the "Regional Climate Simulation and Prediction Frontier Forum".



The National Committee in India has appointed a nine member team of scientists and researchers from various backgrounds, including climate, water, rural management, wildlife and palaeosciences for the years 2020-2025 and many are lead authors for the IPCC Working Group Reports. The pandemic affected activities of the national committee but a webinar to discuss the latest IPCC Assessment reports with an Indian perspective is planned for May 2022. A Sustainability Seminar Series is also targeted to start from August 2022, initially with a theme on "Food System Challenges" by a leading global expert from Canada.

The leadership of the Future Earth Japan National Committee was renewed in July 2021 to a four-member structure, including a Co-chair from the private sector. The total number of participating institutions as of March 2022 is 40, consisting of 20 universities and

research institutes and 20 stakeholders in society, including the private sector, government, and NPOs. The Committee organized the second Future Earth Japan Summit in March 2021 to discuss how Future Earth should address the Anthropocene, with a diverse group of more than 200 participants.

The Korean National Committee hosted a session at SRI2021 entitled, "Building Asia-Pacific Regional Hub for Ecological-Societal Health: Visioning the Doughnut Trilemma". Workshops in September 2021 and Jan 2022 for a learning exchange on controlling COVID-19 outbreaks between Korea and Mekong Countries led to proposals for a special forum in Geographical Review and a session for SRI2022. The committee has been active: in publishing a special issue for a paradigm shift to sustainability science in the Korean Journal of Agricultural and Forest



Meteorology; organizing an international symposium on Climate Change and its effects; and submission of a 5-year collaboration proposal for networking climate change research hubs in Northeast Asia among the the Ministries of Science and Technology in China, Japan, and Korea and provided guidance for the establishment of a new Asia-Africa Center at Seoul National University Asia Center.



was restructured in September 2021 and now consists of 20 members from 16 organizations with 25% policy makers, 45% scientists and 30% practitioners. NCFEM co-organized the International Conference on Environmental Science and Technology (EST2021) in September 2021 with more than 200 participants. Discussions and implementation steps towards Science Policy Pathways in Mongolia have been organized and 3 MOUs with 3 provinces in Mongolia have been signed during the period January to April 2022.

Future Earth Taipei and its 11 working groups organized 57 events, including a Master Forum in Sustainability Science featuring Dr. Klaus Hasselmann, the annual symposium of Future Earth Taipei, scientific conferences, and capacity-building workshops. More

than 1,000 participants from 20+ countries joined these virtual and hybrid events. Future Earth Taipei supported a regional Health Investigation and Air Sensing for Asian Pollution (Hi-ASAP) Initiative; the program's science plan was published in the International Journal of Environmental Research and Public Health, 2022. In addition, Future Earth Taipei organized three sessions and



supported 70 Asian researchers and stakeholders to join the 2021 SRI online congress.

In Oceania and the Pacific, Future Earth Australia hosted the inaugural Sustainability Research and Innovation (SRI) Congress in July 2021 as a hybrid event with 2009 registered attendees, and 150 onsite delegates in Brisbane. An Oceans and Coasts Decadal Strategy was launched. Future Earth Australia is also producing a National Strategy for Just Adaptation, drawing from a series of events..

The Future Earth Philippines (FEP) Program was active in harnessing partnerships with universities to build capacity for local governments and communities to attain SDGs through workshops and dialogues. By February 2022, an MOU was signed between

3 universities, the national academy of science, national research council and an NGO establishing a Universities SDG Action Network (USAN) with the aim of aligning university services to the SDGs. FEP has partnered with a Department of Science and Technology Provincial office in Pampanga province to pilot a local SDG Action Network bringing together local governments, academia, business sector and civil society in Central Luzon.

Europe

In Europe, an online hackathon was organized by Future Earth Finland (Future Earth Suomi-FES) in November 2021 challenging students to provide ideas to solve Planetary Health topics. Mentors provided expert guidance in the fields of climate, environment, biodiversity and human health.

The Sustainability Research Initiative (SRI) at the Swiss Academy of Sciences, that hosts Future Earth Switzerland initiated a series of Sustainability Science Dialogue events on thematic priorities for research. A Sustainability Science Forum brought together an interdisciplinary community of professionals around the question of how science can more strongly support the acceleration of greater sustainability transformations and focused on addressing the open questions identified in the white paper "Priority Topics for Swiss Sustainability Research" by the Swiss Academies of Arts and Sciences. Likewise, the German Committee Future Earth (DKN) hosted the German Sustainability Science Summit in July 2021, with 500+ international participants. A position paper "Research priorities for sustainability science" (Jacob et al. 2022) was

published by DKN outlining a programmatic framework that will form the basis of the future work program of the committee itself. The DKN has also published a call for new working groups to strengthen sustainability research in Germany and to support scientists in the development of relevant research activities within sustainability science. The new working groups are expected to start in fall 2022.

The Romanian National Committee is affiliated to the Romanian Academy, and promotes and enables research networking related to environmental change and sustainability in the country. Tasked with organizing scientific events, facilitating connection and discussions with national and local decision makers and stakeholders, this committee co-organized an annual workshop for master and doctoral students on Integrated Environmental Research and Sustainable Development, held at the Institute of Geography in Bucharest in December 2021, and participated in the organization of the national meeting for the Integrated Evaluation of Natural Risks in Romania, held at the Romanian Academy on 4 March 2022.

In Russia, members of the National Committee continue to engage young scientists in global change research through initiatives like the Meridian Youth School-Conference "Geographic Research in the Period of Global Change", held at the Kursk Biosphere Station of the Institute of Geography RAS. Special sessions "Future of the Earth" and the initiative "Future of Northern Eurasia" were organized alongside the CITES and ENVIROMIS youth conference held in Moscow on 22-27 November 2021. The committee also organized a series of online lectures by leading RAS scientists, the first of which focused on the socio-economic consequences of COVID 19 in February 2021.



In Spring 2021, Future Earth Ireland hosted an online webinar series entitled “BuildingForward Better” which focused on the crucial role that Higher Education has to play in the transition to a sustainable future. The webinars brought together a wide range of speakers from higher education, policymakers and civil society and were split into three different topics; teaching and learning, research and innovation, and engaging with society. The sessions attracted a wide and varied audience and are now available to watch online.

The French Future Earth National Committee exists with a broader mission as the “French National Committee for Global Change”. Throughout the pandemic and also this reporting period, the Committee has had regular meetings and exchanges on issues of national importance. It also has heard and debated, updates about the restructuring of Future Earth, the establishment of the Future Earth Assembly, and the operation of the Paris Global Hub. The French National Committee is in active exchange with the national institutions (the Ministry of Science and Education and the CNRS) about the continued support of Future Earth and notably the Paris Global Hub.

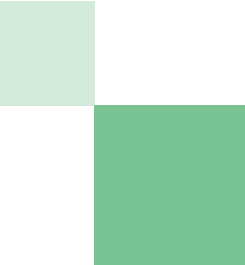
South Asia

The Future Earth Community in South Asia includes a South Asia Regional Office, South Asia Global Secretariat Hub governed by the South Asia Governing Council, and a National Committee-India which is hosted by the Indian National Science Academy. The Future Earth South Asia Regional Office was established at the Divecha Centre for Climate Change in 2016 and continues to function along with the Future Earth Global Secretariat Hub South Asia which was announced in 2021 and is being established at the Indian Institute of Science, Bengaluru. The South Asia Office engages with stakeholders from SAARC countries, Myanmar, and the two Indian Ocean Island Countries of Mauritius and Maldives. It functions to generate “Science for the People” and develop knowledge required for societies in the region to face challenges posed by global environmental change in the area of – Water, Air, Food, Sustainable Communities and Health (WAFH).

Southern Africa

On 23 March 2021, the Future Earth Regional Office of South Africa (FEROSA) hosted the 2nd FEROSA stakeholder platform. More than 60 delegates from 10 African countries attended the virtual stakeholder platform, along with participants from the United States and France. Participants included representatives from national governments, regional organizations, universities, private sector, non-profit organizations, the Africa SDG Labs and the Future Earth Global Secretariat. The outcomes of the stakeholder platform included the validation of the FEROSA situational and needs analysis report, the unanimous support for FEROSA to consider bidding for the Future Earth Global Secretariat Hub. The draft FEROSA strategic plan was also endorsed.

All National Committees and Regional entities also engage collaboratively and with the Future Earth Secretariat to connect local, national and regional work globally.



Future Earth Programs and Initiatives

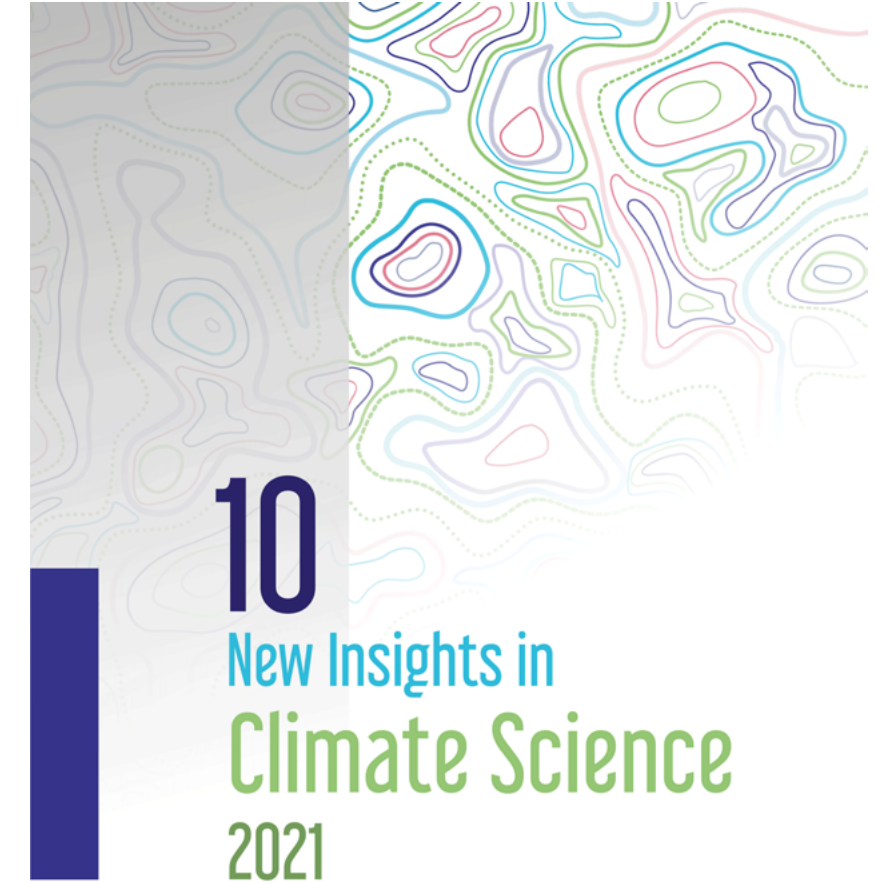
The Future Earth secretariat develops and runs several cross-cutting initiatives that support specific objectives of the Future Earth mission and vision. They engage experts from across the network and focus on synthesis, science-policy, communications, funding, and early career development.

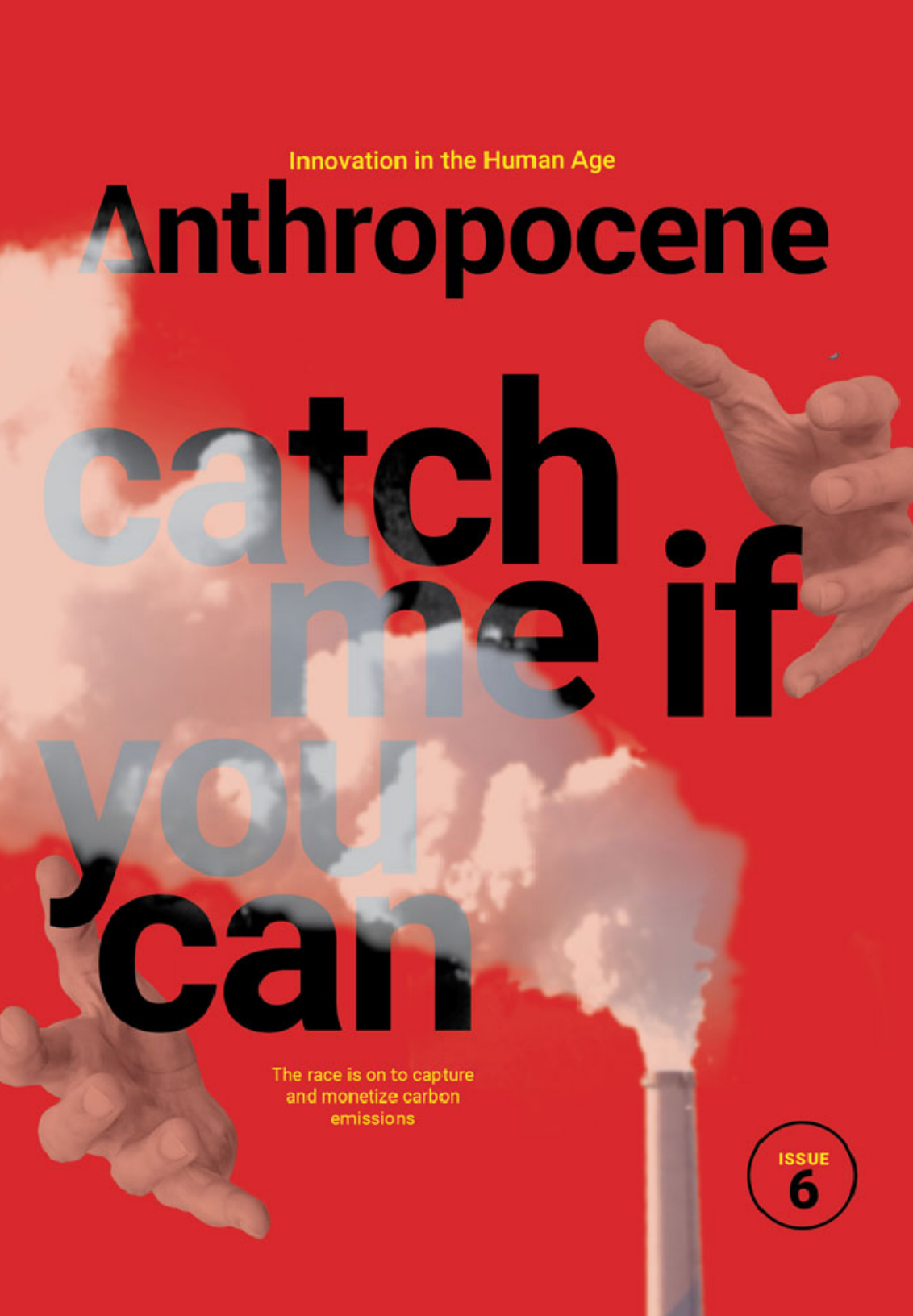
The 10 New Insights in Climate Science series is an annual synthesis of essential, recent advances from climate change science distilled for policymakers and underpinned by a peer-reviewed article published in the journal Global Sustainability. The academic synthesis provides a solid foundation for the increasingly well-recognised “10 New Insights in Climate Science” policy report, targeted to an audience of negotiators, policy makers, and journalists covering the UN Climate Change COP. Since its first installment in 2017, the report has been launched every year at the UN Climate Change COP in collaboration with the UNFCCC Executive Secretary, Patricia Espinosa.



The 2021 edition included topics ranging from extreme fires and rising non-carbon GHG emissions, to the need for justice-oriented climate action and the political barriers to effective carbon pricing, reflecting an intentional balance of insights from natural and social sciences.

The 10 New Insights in Climate Science is a collaboration between Future Earth, the Earth League and the World Climate Research Programme.





Anthropocene Magazine

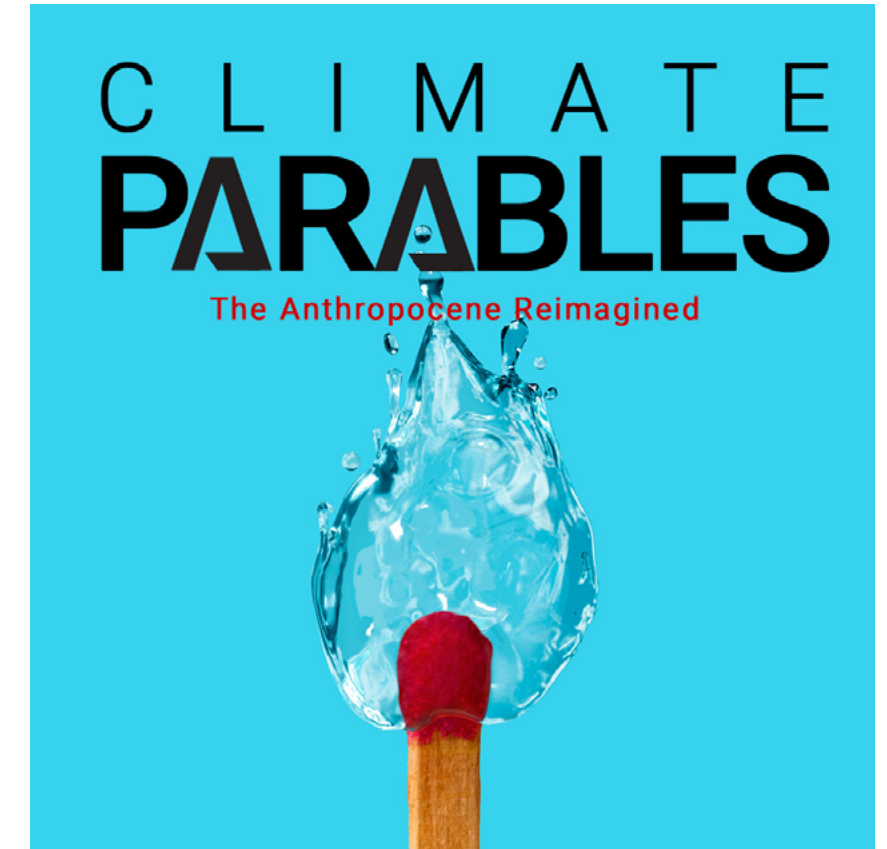
Anthropocene, Future Earth’s premier independent magazine, continues to grow at an impressive pace. Anthropocene reaches more than 1 million web users annually, with the largest readership in North America, Europe, Mexico, India, and Australia. In addition, Anthropocene has 35,000+ subscribers to our Weekly Science Dispatch newsletter.

Anthropocene’s mission is simple and powerful: to gather the worlds’ best minds to create a Human Age that we actually want to live in. In a world that seems destined to zoom past 2 degrees of warming, what exactly does that look like? We have three outstanding editorial projects—all launching in 2022—to tackle that very question.

The Climate Parables is our newest and boldest project. Think of it as climate reporting from the future. It is a series of short, speculative stories from some of the world’s most talented climate-fiction writers—we’ve already signed up Kim Stanley Robinson, Annalee Newitz, Neil Stephenson, and Ferris Jabr. We ask them what life could be like after technological and societal shifts have diminished climate change—and we’ve adapted to chronic environmental stresses. We’ll produce these tales online, in print, and notably on-stage as live, performed journalism.

Fixing Carbon: Dispatches from An Emerging Future (a new twice-a-month newsletter) is a smart guide for the road to decarbonization. Each issue zeros in on a provocative question (e.g., Is now the moment for wartime-level investment in direct-air capture? Are Climate Deadlines Dangerous?) and then explores the question from different angles, in a point-counterpoint format. We’ve already produced several prototypes and successfully tested it on our current audience.

Every year, we produce a beautifully-crafted 112-page print issue around a theme. The theme that we’re working on in 2022 is “What does machine learning applied to sustainability look like?” It will include a thought-provoking mix of reporting, essays, and art on topics ranging from reducing food waste to new materials development to reinventing electricity grids.



Finally, Anthropocene is funded through a combination of public and private philanthropy and a successful membership program. As a core program of Future Earth, we receive base funding from the US National Science Foundation. We’ve also received project grants from the MacArthur Foundation, Moore Foundation, and the V. Kann Rasmussen Foundation. Recognizing that people pay for what they value is the third leg of our business model. Our base of donating members is international, robust, and growing. In 2020, we raised \$97k; in 2021, we raised over \$120k from 1,640 individuals from 72 nations. The target for 2022 is \$170k.

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, transdisciplinary research teams to address the world's greatest sustainability challenges. Future Earth is the only institutional entity invited to directly propose new topics annually.

During 2021-2022, two new collaborative research actions were launched: 1) On Systems of Sustainable Consumption and Production, scoped by the SSCP Knowledge Action Network, and 2) Human Migration and Global Change. Furthermore, Future Earth also continued the scoping process for a new opportunity under the Climate, Environment and Health program. During the 2021 Belmont Forum plenary Future Earth also committed to continue scoping a new Pathways to Sustainability CRA and the Future Leaders program to align priorities among researchers and funders around the world.



Early Career Researchers (ECRs)

Future Earth seeks to engage diverse early career researchers from all regions in order to strengthen global environmental change and sustainability science. Future Earth is supporting and encouraging innovative and influential ECRs to undertake inter- and transdisciplinary research addressing the physical, biogeochemical and human dimensions of global environmental change. The growing Future Earth ECR Network entails numerous benefits, such as funding opportunities and relevant vacancies, call for papers, dissemination of events, capacity building events, conferences and workshops etc. The continuous support of Future Earth to the ECR community is pivotal for the long term advancement of the organization's goal and mission.

In 2021, Future Earth supported around 38 ECRs to attend and present the outcomes of their research at the Sustainability Research and Innovation Congress (SRI2021). The ECR Champion programme was also organized, where 11 excellent ECRs were selected to attend the Congress and represent each of its themes at the closing plenary. The objective of the programme was to present the highlights of the themes and synthesize the main messages at the closing plenary alongside the co-chairs of GSDR. A video was created to portray the experience of the ECRs, and ECRs engaged at SRI2022.



In December 2021 and February 2022, Future Earth organized two webinars for graduate students working on the Pathways Collaborative Research Action of the Belmont Forum. The objective of these webinars was to create an instance where young researchers can exchange on the opportunities, highlights and challenges of inter- and transdisciplinary research for ECRs.

Future Earth Global Secretariat Hubs in Asia also conducted various capacity building programs for early careers in the Asia regions. Future Earth Japan Global Secretariat Hub, in collaboration with the Research Institute for Humanities and Nature, organized another virtual TERRA School, a capacity-building short course on Transdisciplinarity for ECRs in Asia during the period 16 February to 4 March 2022. Despite being online, 16 participants from 8 countries engaged in interactive workshops, dynamic discussions and were able to interact with stakeholders from a project in Zambia. In March 2022, Future Earth Global Secretariat Hub China, in collaboration with Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai) and Key Laboratory of Tropical Atmosphere-

Ocean System, launched an Early-Career Fellowship (ECF) to provide a forum in which early-career researchers from various disciplines (e.g., natural, social, and human sciences) can share their interdisciplinary research and pursue unique collaborations. Future Earth South Asia Global Secretariat Hub organized a Young Scientists Meeting between 25 and 27 October 2021 on 'Air Quality, Water Resources, Energy and Climate Change' along with The World Academy of Sciences, Central and South Asia Region Partner (TWAS CASAREP). The event included 70 early career researchers belonging to various countries in Central and South Asia across three days. Global Secretariat Hub Taipei organized "ECRs in Sustainability Science" talk series (including hub to hub ECR collaboration), a regular virtual event to set a platform for ECRs to get to know each other and to share research activities/outcomes. It not only facilitates mutual learning and provides opportunities to find potential collaborators for transdisciplinary research, but also draws attention from international audiences and makes connections between domestic and overseas researchers.

Earth Commission



In the Anthropocene we need to redefine our relationship with the Global Commons - the Earth system and critical biomes that underpin a stable and resilient planet. Future Earth hosts the Earth Commission, an international team of leading natural and social scientists working collaboratively to provide an independent assessment to define Earth system boundaries for these essential planetary systems, as a "safe and just corridor for people and planet".

Established in 2019, the Earth Commission forms the scientific foundation of the Global Commons Alliance (GCA), a unique coalition with the mission to empower citizens, cities, companies and countries to become effective stewards of the global commons. The GCA will promote the implementation of the Commission's peer-reviewed findings through its network of organizations, including the Science Based Targets Network (SBTN) that develops methods by which companies and cities can set science based targets.

Five working groups (WGs) with experts from the broader Future Earth network have undertaken specific analyses contributing to the assessment:

- WG1 takes a modeling approach with a focus on avoiding tipping points in the Earth system to set boundaries for climate and air pollution.
- WG2 sets boundaries to protect the biosphere, with a focus on functional integrity and Nature's Contributions to People, as well as areas of natural ecosystems.
- WG3 develops boundaries for freshwater, nitrogen and phosphorus.
- WG4 has developed a framework for integrating justice in the boundaries, and investigates levers for transformations needed to live within the safe and just corridor.
- WG5 synthesizes the science on cross-scale translation of the boundaries to scales at which key actors, such as cities and companies, operate.

The first Earth Commission assessment is due for publication in early 2023, including two flagship papers and more than ten supporting papers led by the working groups.

During 2021, the Earth Commission published its conceptual framework in *Earth's Future*, a commentary in *One Earth* and a paper outlining its justice framework in the journal *Earth System Governance*. A successful discussion series on tipping elements was launched in collaboration with AIMES and WCRP, featuring leading scientists and attracting audiences of several hundred

participants for each event. A global modeling intercomparison project on Tipping Points has also been initiated.

The Global Commons Alliance is a sponsored project of Rockefeller Philanthropy Advisors, with support from the Oak Foundation, MAVA Foundation, Porticus, Gordon and Betty Moore Foundation, Tiina and Antti Herlin Foundation and the Global Environment Facility. The Earth Commission is also supported by the Global Challenges Foundation.



Earth Leadership Program

The Earth Leadership Program focuses on training mid-career academic researchers based in Canada, Mexico, and the US in building the skills, concepts, and tools to successfully lead transdisciplinary research projects for sustainability. The 2022-2023 cohort of 22 fellows was selected in 2020, but the training

was postponed to June 2022 due to COVID-19. The 6-day core training program was held from June 12-18, 2022 at the Wingspread Conference Center in Racine, Wisconsin, USA and was funded by the Packard and Moore foundations as well as contributions from fellows' universities. The training was facilitated by staff from Inclusive Innovation and included experiential learning exercises that focused on co-design and the creative problem solving process, creative collaboration, collective leadership, visioning, reflective listening, visioning, network mapping, and reciprocity.

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, along with Program Designer Margaret Krebs, based at Stanford University, and is supported by staff in the Future Earth US hub. The program is guided by an international advisory board of 15 members, chaired by Dr. Chris Field of Stanford University. Conversations are underway regarding the structure of the Earth Leadership Program and the opportunity to expand the reach of the program to professional development programs for US federal employees, training programs based at universities, and extension of the cohort-based model to other regions, such as Latin America. The 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.

European Space Agency Partnership Program

Future Earth partners with the European Space Agency (ESA) to facilitate links between Future Earth's projects and ESA programs, helping to guide ESA's strategic direction and support the networks. There is a seed fund to foster innovative use of Earth observation in the research activities of the Global Research Networks, which supports collaboration.

In 2021 the partnership program funded four small research demonstration projects to show the use of Earth observations in tools to tackle the threats posed by increasingly frequent storm damage, coastal hazards, cholera outbreaks, and to improve urban planning. The projects were displayed in the UNFCCC COP26

public exhibit zone as part of ESA's interactive displays. Events were held in the Sierra Leone and Cote d'Ivoire pavilions to engage with stakeholders, and an invited keynote presentation was given at the COP26 'Earth Information Day' plenary.

The partnership program hosted a 3-day workshop in January 2021 on remote sensing for climate tipping points, organized jointly between ESA, AIMES and the International Space Science Institute in Bern, Switzerland. The meeting aimed to clarify the satellite data requirements to better monitor resilience to tipping points, constrain models, and discuss systems for early warning of abrupt change taking place in the climate system.



Future of Washing Initiative

The Future of Washing Initiative was launched in December 2018 together with Future Earth, Kao Corporation, and The University of Tokyo Integrated Research System for Sustainability Science (now renamed as the Institute for Future Initiatives). The Initiative aims to create a discussion platform where various stakeholders from the private, academic and public sectors collaboratively explore innovative and sustainable ways of washing. Since its launch, the Initiative has been organizing six events and workshops to foster discussions on the impacts of washing on the environment, and to facilitate a mind shift and a behavioral transformation in society towards sustainable washing.

During this reporting period, the Initiative organized 3 online events and addressed topics, including: 1) detergents, covering its history, sustainable sourcing, and new cleaning method using fine bubbles; 2) detergent containers, covering the concept of circular

economy, the efforts of a corporate alliance to reduce plastic waste, and the current development of paper containers; and 3) hygiene and sanitation, covering issues and challenges around the world such as access to safe water, hand washing, and toilets. More than 500 people from various sectors attended these events. The Initiative has also been disseminating blog posts regarding the environmental impacts of washing. In 2021, the blog series started to introduce the Japanese translation of the Daily Science articles from the Anthropocene Magazine, and it has disseminated 20 articles on topics including new technologies related to renewable energy, the environmental impacts of plastic waste, and the developments of sustainable fibers. The Initiative also plans to broaden the scope of discussion, and to explore how cultural and religious diversity can impact washing methods based upon habits and local knowledge. It also plans to discuss further on the importance of a circular economy.





Global Risks Perceptions Initiative

Global risks – like climate change, public health threats, and social inequity – are increasingly complex, systemic, and dynamic. To tackle global risks effectively, we need multilateral cooperation and a stronger understanding of the likelihood, impact, and linkages between risks. The Global Risks Perceptions Report 2021 shares the findings of the second iteration of the Global Risks Scientists' Perceptions survey, conducted by Future Earth and Sustainability in the Digital Age, in collaboration with the International Science Council. It was designed to complement the World Economic Forum's annual Global Risks Report, which analyzes risk perceptions of leaders from business, economics, and government. Our report contributes to this discourse with an international analysis of scientists' perceptions of global risks. We surveyed over 200 scientists in 65 countries in collaboration with a global advisory committee. Among the six key findings, our surveyed science community and the WEF's business respondents both rated environmental risks among the most urgent that humanity faces today. However, scientists systematically ranked likelihood and impact of global risks higher than members of business and economic communities. This highlights a need to work together to build common perceptions of urgent priorities, and to bring new communities into the dialogue. The English version of the report was translated into French, Spanish, and Japanese.



Grants for Collaborative Sustainability Research Projects

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 research program grants aim to generate self-sustaining research projects that have real impacts on the health and well-being of human societies and the natural world.

This year, two programs finished their projects. PEGASuS II: Ocean Sustainability, a partnership between Future Earth and the National Center for Ecological Analysis and Synthesis (NCEAS) launched in early 2019 and finished in 2021. The two NCEAS working groups focused on ocean-related sustainability challenges: establishing and monitoring the Palau National Marine Sanctuary, and facilitating the implementation of a globally coordinated and sustained ocean observing system to assess the status and trends in ocean biodiversity around the world. In the last year of the grant the program developed a self-guided data visualization training that was shared widely online. PEGASuS III launched in 2020, with four new transdisciplinary research teams funded for delivering and implementing new innovative ideas that increase the impact of

international research projects funded through the Belmont Forum Sustainable Urban Global Initiative Food-Water-Energy Nexus program.

In the active PEGASuS IV program, Future Earth partnered with FEROSA and the Belmont Forum to support integrated research focused on establishing international transdisciplinary research teams focused on the development of new networks and communities of practice addressing multiple sustainable development goals and pathways. PEGASuS IV provided funding for African researchers to participate in the collaborative research actions. Their work kicked off in March 2021 and will continue through 2022.



Science-Based Pathways for Sustainability

The Science-based Pathways for Sustainability Initiative, also known as the Pathways Initiative, aims to serve as an “incubator for engagement” to build understanding of: a) how complex human-environment systems produce trade-offs or synergies within a context of competing development agendas and claims on resources; b) how transformations can be mobilized to enable expansion of integrated pathways to sustainability in diverse concrete contexts; and c) how pathways and processes of transformation interact across locations and scales, and ‘add up’ to outcomes at the regional and global levels. To play this role of incubator, the initiative supports the development of an open Community of Practice (CoP) convening researchers from diverse disciplines who engage with societal actors (e.g. civil society, governments, private sector) in processes of adaptive learning to design, implement, and evaluate pathways to sustainability. Such processes are key to meeting the pressing challenges of advancing Agenda 2030 and better understanding the diversity of values that shape visions for desirable futures in different places, the processes that lead to transformations, as well as the uncertainties, trade-offs and co-benefits that can emerge from the interconnections between sustainable development goals at various scales. The development of the Pathways CoP relies on a series of collaborative activities (networking, capacity building, reflective practice, synthesis events and tools) targeted at fostering and supporting these learning processes. A number of such activities took place over the past year:

Pathways Forum: The Forum was launched in September 2021. It is a webinar series with bi-monthly online events that provides a space for researchers to collectively reflect on concepts and theories of change, and discuss the practical implications of sustainability science and transdisciplinarity for research practices. Through this webinar series, the Pathways Initiative not only aims to federate a community of researchers engaging in the development of pathways to sustainability, but also to develop and support agenda-setting, synthesis and capacity building around pathways approaches.

The Pathways Communication Grant Program, which opened in November 2021, is an ongoing call (1 year) that seeks to promote wider uptake and understanding of pathways for sustainability within non-expert audiences through the dissemination of inter-and/or transdisciplinary research findings via innovative formats and practices. One third of the funding prioritizes projects led by researchers from and working in low and middle income countries, while another third prioritizes projects led by early career researchers. The first round closed on January 31, 2022, with a total of 31 submissions from across the globe on a wide range of sustainability topics proposing a variety of communication products. Three projects were selected for funding in round one and submissions are being accepted for the second round of funding until October 31, 2022.

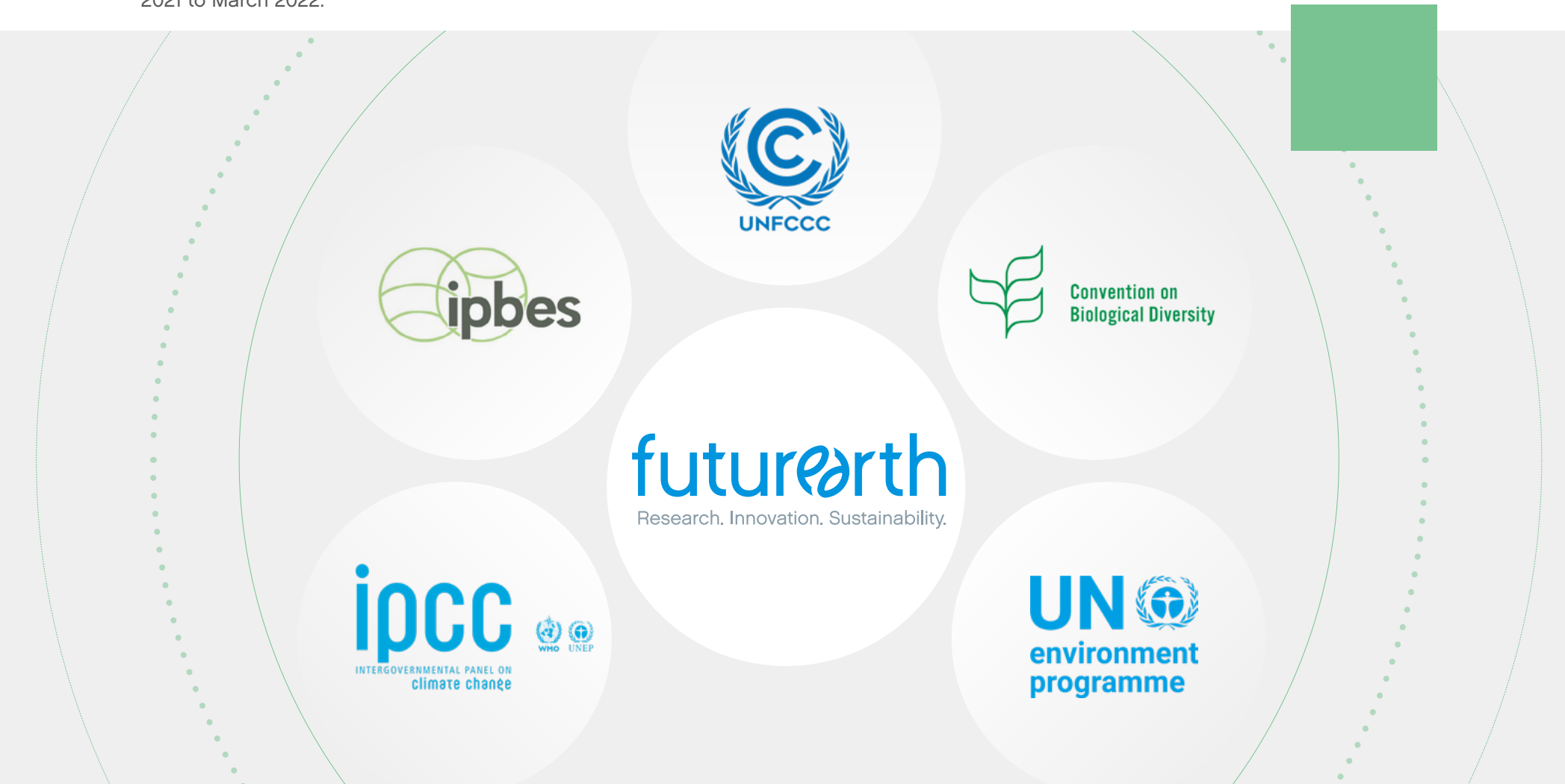
As a result of the collaboration between Future Earth and the Belmont Forum on the joint CRA Pathways 2020, the Pathways Initiative also provides coordination support for collective activities involving the 13 funded projects. This included a capacity-building

event on transdisciplinarity involving all project partners, as well as a series of webinars designed to support the work of graduate students involved in the various CRA projects.



Science-Policy

Future Earth is an accredited observer organization in various international science policy interface processes. Through its extensive scientific community, Future Earth participates in framing sustainability research, research agendas, advising decision makers and more. By engaging its community into opportunities from international processes, Future Earth participated in the following events / reports from April 2021 to March 2022:



- The UNFCCC SBSTA in June 2021 where Future Earth presented two posters (“Improved modeling of permafrost thaw strengthens case for more ambitious emission cuts to meet Paris targets” and “State and future of boreal forest natural climate solutions”)
- The UNFCCC Earth Information Day in November 2021 at which we presented one poster (“Evidence for Abrupt Changes, Tipping Points & Cascading Impacts in the Earth System”)
- UNFCCC COP26 in November 2021, during which Future Earth participated with a delegation of 16 representatives. Future Earth organized 1 official side event (“Carbon Conservation and Sequestration in Ocean Nature-Based and Technology Solutions”) and participated in many talks and pavilion events.
- Future Earth successfully nominated 5 experts to participate in the IPBES coming assessment:
 - Nexus assessment (2 lead authors, 1 coordinating lead author, 1 review editor)
 - Transformative change assessment (1 lead author)
 - scoping of the methodological assessment of business and biodiversity (1 advisor)
- The 10 New Insights in Climate Science report in which experts carried out a horizon scan in fields related to climate change on what the latest findings and most important new emerging

fields are. We summarize this in 10 important scientific insights published as an academic paper and policy report and launched at an official UNFCCC press conference with Ms. Patricia Espinosa, UNFCCC Executive Secretary, during COP26. By the end of March 2022, the press conference had been watched over 65,000 times.

- Since January, the Earth Commission has co-lead a novel tipping elements discussion series in co-partnership with AIMES, Future Earth secretariat and World Climate Research Programme. The events support efforts to develop a joint research agenda, design joint experiments and ideas for a unique Tipping Elements Modeling Intercomparison Project amongst the scientific community.
- In March, the Earth Commission held a science update, where multiple Earth Commissioners presented emerging science to partner organizations across the Global Commons Alliance - a unique network of organizations working together to ensure that societies and the global economy thrive, sustained by healthy global commons, on a stable planet.
- In advance of the Stockholm+50 conference hosted by Kenya and Sweden in collaboration with UNEP, Future Earth convened an expert group with the International Science Council and Stockholm Environment Institute to write a letter echoing the Menton statement issued 50 years ago.

- Future Earth delegates participated in most CBD meetings, especially concerning the post-2020 Global Biodiversity Framework.
- The Earth Commission, in collaboration with the global research networks BioDISCOVERY and Global Mountain Biodiversity Assessment, and representatives of the UN Convention of Biological Diversity (CBD) convened a workshop in Davos to synthesize the science informing biodiversity goals. A report was submitted to the CBD and was reflected in the draft goals prepared for COP15.
- Future Earth experts contributed to a Science-Policy Report called “10 Must Knows from Biodiversity Science” developed by the Leibniz Research Network Biodiversity on the preservation of nature as the basis of human life. The report, which was published in German and English, served to invite dialogue in the run-up to the UN Biodiversity Conference and parallel to the preparatory meetings 14-29 March 2022 during the resumed sessions of SBSTTA-24, SBI-3 and WG2020-3 in Geneva, Switzerland. The report received strong online attention through forty different organizations and also informed a media quiz to raise the public’s awareness around biodiversity.

Alongside these efforts, the Future Earth Secretariat worked with representatives from all these international processes to ensure visibility of the community, and participation in future activities, such as the UN Decade on Ocean Science, the Convention on Biological Diversity COP15 and UNFCCC COP27.

Sustainability in the Digital Age

Humanity is interconnected through and dependent on the digital and natural worlds. Tackling the UN Sustainable Development Goals, while working towards a just digital future, are intertwined ventures. Sustainability in the Digital Age works to build a global network of collaborators at this nexus, to drive the transformative systems changes needed to build a sustainable, climate-safe, and equitable world. Key highlights in 2021-2022 include the following:

- Reimagining Climate Governance in the Digital Age: Sustainability in the Digital Age and Future Earth in partnership with ClimateWorks Foundation developed a Digital Climate Projects Database of over 200 examples of digitally-empowered climate governance strategies in action. An analysis of the database examples, along with a series of expert consultations and a literature review, resulted in the creation of a strategic framework to help guide philanthropic investments in climate governance, based on a central element of “fail forward and share.”
- Coalition for Digital Environmental Sustainability (CODES): CODES is a multi-stakeholder community of change makers and practitioners that seek to collaborate in accelerating a digital planet for sustainability. It is co-championed by UNEP, UNDP, the International Science Council, the German Environment Agency, the Kenyan Ministry of Environment and Forestry, Future Earth,

and Sustainability in the Digital Age. In June 2021 the CODES co-champions organized a Global Virtual Conference (>100 international participants) to gather input for a new Action Plan for a Sustainable Planet in the Digital Age.

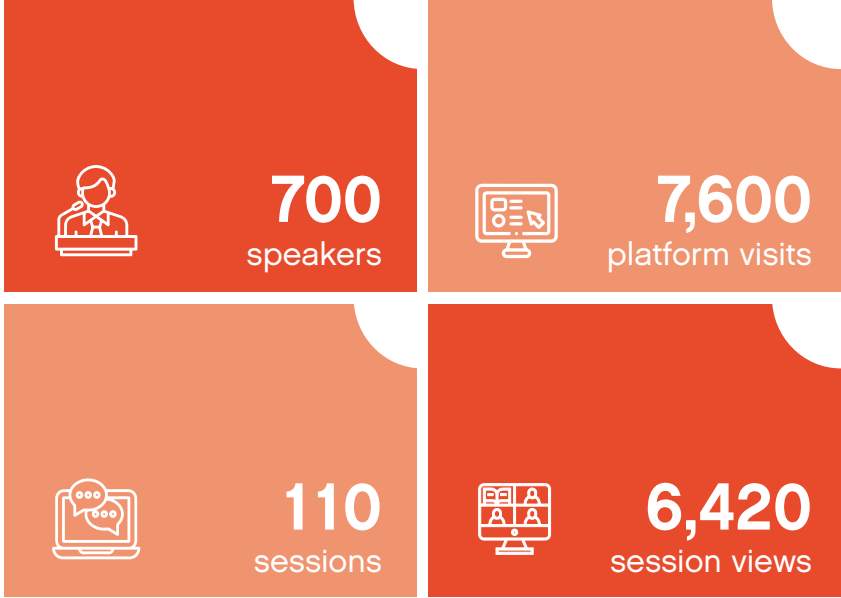
- Canada’s Sustainable Future: Creating a Digital Action Plan: We held a series of virtual town halls, and invited consultations, in partnership with the Canadian Science Policy Centre, in sum reaching over 375 Canadians, to raise awareness on the topic of sustainability and digitization. Policy actions in a forthcoming report will focus on three themes: 1) Digital Transformation to Scale Public Awareness for Sustainability, 2) Enabling cross-sectoral partnerships to drive sustainable innovation 3) Indigenous Science and Knowledge Driving Transformative Solutions.

- Sustainability in the Digital Age (SDA) continues to participate in the Leadership in Environmental and Digital innovation for Sustainability (LEADS) graduate training program, in partnership with several Quebec Universities. Several LEADS interns were hosted by SDA and the Future Earth Canada Hub over the reporting period, along with leadership and summer school activities.

- Nature-based solutions in Canada: In the autumn of 2021, Sustainability in the Digital Age hosted three participatory workshops and a half-day seminar with more than 100 participants on the theme of Nature-based Solutions in Canada. Activities included Indigenous participation and the exploration of opportunities for big-data driven approaches.



Sustainability Research and Innovation Congress

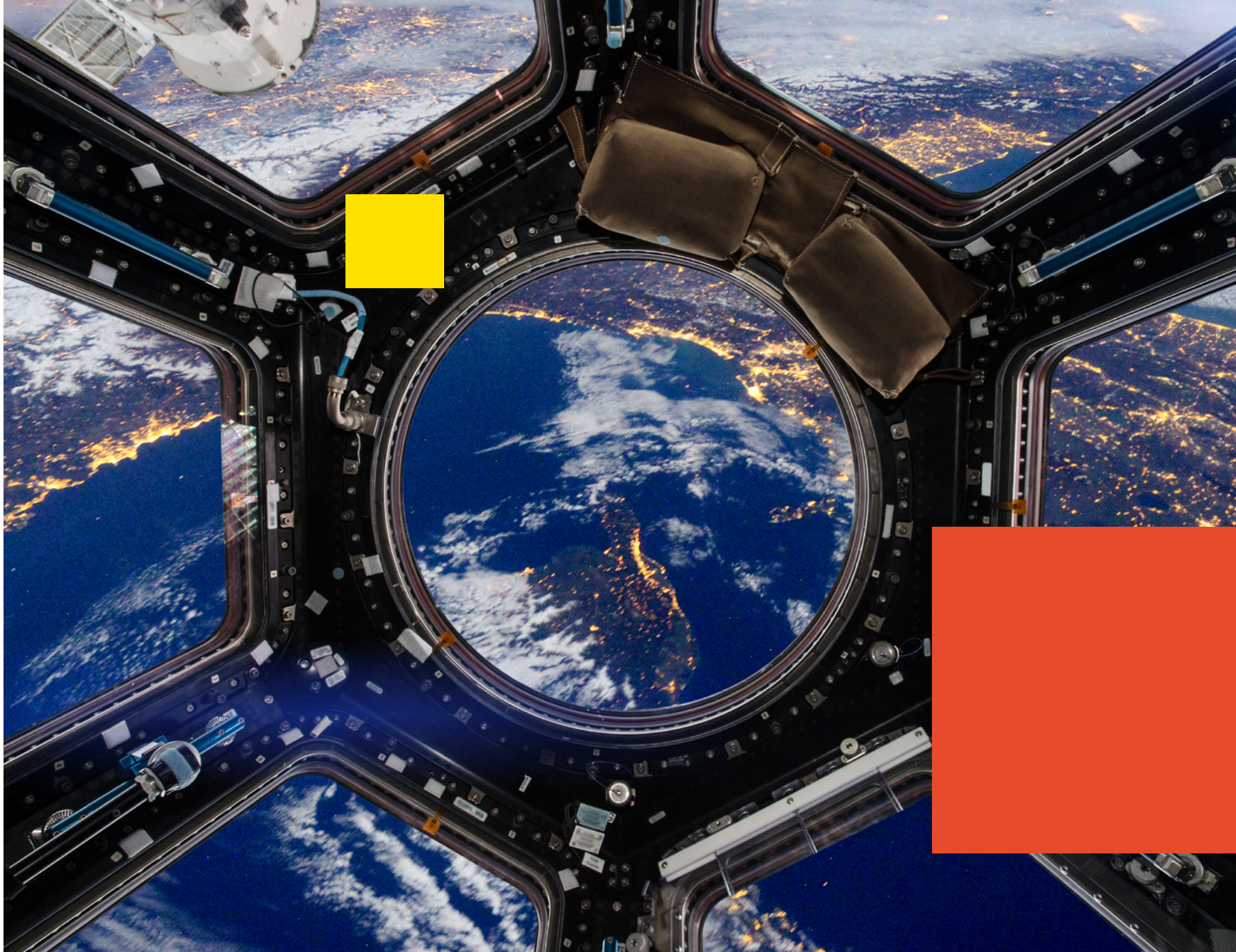


The Sustainability Research and Innovation (SRI) Congress, a collaboration between Future Earth and the Belmont Forum, has continued its steady growth and has rapidly been established as a major global convening platform for the sustainability science community. The first SRI Congress, SRI2021, was held in Brisbane, Australia, and online, in June 2021, and it brought together over 2000 participants from more than 100 countries to attend over 100 peer-reviewed, transdisciplinary sessions, trainings, workshops and networking events. The Congress further featured popular open access, pre-Congress events, such as the SRI Talks series with

high-level conversations on sustainability. A hybrid Africa Satellite Event, organized by Future Africa at the University of Pretoria, and a virtual Transformations Community Partner Event, expanded the scope of the Congress, effectively bringing in new communities and perspectives. All SRI2021 sessions were recorded and made open access after the Congress, and 94% of the post-Congress survey respondents said they would return in 2022.

SRI2021 kicked off the SRI series, which brings together global sustainability research leaders, government and civil society experts, funders and innovators to inspire action and promote a sustainability transformation. This annual event sparks meaningful conversations, provides a platform to share innovative ideas, and creates an inspiring and inclusive space for collaboration and action.

By March 2022, the preparations for the second SRI Congress, SRI2022, held in Pretoria, South Africa, were in full swing, and the Congress program had already doubled in size from the first year, now consisting of over 200 international sessions, workshops, and events - including a virtual Spotlight Event in Asia and an onsite Satellite Event in Oceania. The rapid growth of SRI demonstrates a strong demand for inclusive global convening platforms for sustainability research and innovation.

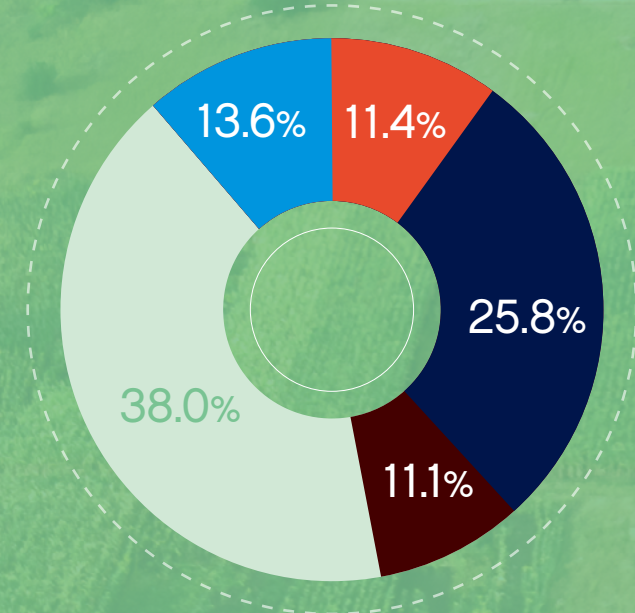


Operations and Governance

Financial Summary

During the fiscal year April 2021 - March 2022, Future Earth's expenditures increased by 25% primarily as a result of additional hubs joining the Secretariat midway through the year. As global secretariat hubs further operationalize their functions, expenditures are expected to increase in the upcoming year.

Function Expenditures	kEur
■ Communications	802
■ Coordination	1,812
■ Networks	778
■ Research & Innovation	2,667
■ Strategy, Advancement, & Partnerships	956
Grand Total	7,015



Governing Council (until July, 2021)

- Dirk Messner, United Nations University (UNU) (Co-Chair), Germany
- Maria Uhle, Belmont Forum (Co-Chair), USA
- Kanji Fujiki, STS Forum, Japan
- Hartwig Kremer, United Nations Environment Programme, Denmark
- Heide Hackmann, International Science Council, France
- Jean-Marie Flaud, Ministère de l'enseignement supérieur, de la recherche et de l'innovation, France
- Takaaki Kajita and Yukari Takamura, Science Council of Japan, Japan
- Shamila Nair-Bedouelle and Meriem Bouamrane, UNESCO, France
- Rémi Quirion, Fonds de recherche du Québec (FRQ), Canada
- Stefan Claesson, Royal Swedish Academy of Sciences, Sweden

Governing Council (from October, 2021)

Name	Surname	Group they represent	Location
Sirkku	Juhola	Global Research Networks, co-chair of the GC	Finland
Maria	Uhle	Global Secretariat Hubs Boards and Funders, co-chair of the GC	USA
Gaby	Langendijk	Early Career Researchers	Germany
Arijit	Paul		Austria
Gemma	Purser	Experts from Low and Middle Income Countries	United Kingdom
Kalpana	Chaudhari		India
Lucas	Enrico	Global Research Networks	Argentina
Gete	Zelege		Ethiopia
Faten	Attig Bahar	Global Secretariat Hubs Boards and Funders	Tunisia
Lisa	Miller		Canada
Deliang	Chen	Regional, National, Subnational Committees / Structures / Entities	Sweden
Jean-Marie	Flaud		France
Yukari	Takamura	Regional, National, Subnational Committees / Structures / Entities	Japan
Stephanie	Burton		South Africa
Hanna	Lappalainen	Regional, National, Subnational Committees / Structures / Entities	Finland
Taikan	Oki		Japan



Future Earth Assembly (from August, 2021)

Future Earth entity	Name	Surname	Location
EARLY CAREER RESEARCHERS			
Early Career Network of Networks	Glenn	Fernandez	China
	Meng	WANG	China
	Jay	Dean Pocklington	USA
	Giovanni	Avila-Flores	Mexico
	Sally	Torres	Peru
	Erna	Karalija	Bosnia and Herzegovina
	Ajibola	Akanji	Nigeria
	Rachel	Kelly	Australia
	Kabir	Rasouli	Canada
	Mais	Aljunaidy	Turkey
REGIONS			
Future Earth Regional Office for Southern Africa (FEROSA)	Jane	Olwoch	Namibia
	Belinda	Reyers	South Africa
Future Earth MENA Regional Center	Manfred	Lange	Cyprus
	Riyad Y.	Hamzah	Bahrain
Africa Future Earth Committee	Chrispin	Kowenje	Kenya
	Allali	Abdelkader	Moroccan
South Asia Regional Office	Jaanaki	Gooneratne	Sri Lanka
	Kanupriya	Harish	India
Asia Region	Mohd Nordin Bin	Hassan	Malaysia
	Hein	Mallee	Japan
NATIONAL, LOCAL COMMITTEES / STRUCTURES			
Future Earth National Committee for Mongolia	Battogtok	Dorjgotov	Mongolia
	Suvdantsetseg	Balt	Mongolia
Future Earth Ireland	Diarmuid	Torney	Ireland
	Mary	Dobbs	Ireland
Comité National Français des Changements Globaux	Wolfgang	Cramer	France
	Thierry	Lebel	France
Future Earth National Committee India	Sandeep	Tambe	India
	Vandana	Prasad	India
Future Earth Philippines	Lourdes J.	Cruz	Philippines
	Rico C.	Ancog	Philippines
UK Future Earth	Philip	Lewis	England

UK Future Earth	Melissa	Leach	England
National Committee Spain	Luis	Santamaria	Spain
	Emilio	Casamayor	Spain
German Committee Future Earth	Daniela	Jacob	Germany
	Sebastian	Sonntag	Germany
Future Earth Japan National Committee	Taro	Yamauchi	Japan
	Nobuko	Saigusa	Japan
Future Earth Taipei	Yue-Gau	Chen	Taipei
	Chia-Hsing Jeffery	Lee	Taipei
Chinese National Committee for Future Earth	Wenjie	Dong	China
	Bojie	Fu	China
Russian National Committee for Future Earth	Vladimir	Kolosov	Russia
	Evgeny	Gordov	Russia
Australia	Petra	Lundgren	Australia
	Juan	Salazar	Australia
Sustainability Research Initiative (Future Earth Switzerland)	Janet	Hering	Switzerland
	Peter	Edwards	Switzerland
Future Earth Finland National Committee	Stephany	Mazon	Finland
	Eeva	Furman	Finland
National Committee for Future Earth - Korea	Soonchang	Yoon	South Korea
	Joon	Kim	South Korea
National Committee for Global Change Austria	Margreth	Keiler	Austria
South African National Committee	Coleen	Vogel	South Africa
	Neville	Sweijd	South Africa
GLOBAL SECRETARIAT HUBS BOARDS & FUNDERS			
Canada	Rémi	Quirion	Canada
	Gordon	McBeak	Canada
France	Olivier	Dangles	France
	Stéphane	Blanc	France
Sweden	Stefan	Claesson	Sweden
USA	Lisa	Vaughan	United States
Japan	Makoto	Taniguchi	Japan
	Chiho	Watanabe	Japan
China	Lin	Yin	China
	Tianjun	Zhou	China
Taipei	Chao-Han	Liu	Taipei
	Tzu-Ching	Meng	Taipei

GLOBAL RESEARCH NETWORKS			
Analysis, Integration & Modelling of the Earth System (AIMES)	Hannah	Liddy	USA
	Mark	Rounsevell	Germany / Scotland
bioDISCOVERY	Cornelia	Krug	Switzerland
	Lynne	Shannon	South Africa
Earth System Governance (ESG)	Gustav	Thungren	Netherlands
EvolvES	Ella	Vázquez-Domínguez	Mexico
	Sibylle	Schroer	Germany
Finance and Economics KAN	Paul	Hudson	UK
	Masachika	Suzuki	Japan
Future Earth Coasts	Tim	Smith	Australia
	Xiuzhen	Li	China
Global Land Programme (GLP)	Ariane	de Bremond	Switzerland
	Sharachchandra	Lele	India
Global Mountain Biodiversity Assessment (GMBA)	Davnah	Urbach	Switzerland
	Eva	Spehn	Switzerland
Health KAN	Kristie	Ebi	USA
	Anthony	Capon	Australia
International Global Atmospheric Chemistry (IGAC)	Clare	Murphy	Australia
	Langley	DeWitt	United States
Integrated History and Future of People on Earth (IHOPE)	Ruth	Morgan	Australia
	Thomas	McGovern	USA
Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS)	Dr. Benjamin	Poulter	US
	Dr. Semeena	Valiyaveetil Shamsudheen	United Kingdom
Integrated Marine Biosphere Research (IMBeR)	Diana	Ruiz Pino	France
	John	Claydon	Canada
Integrated Risk Governance Project (IRG)	Qian	Ye	China
	Peijun	Shi	China
Monsoon Asia Integrated Research for Sustainability (MAIRS-FE)	Jayes	Srinivasan	India
	Jiaguo	Qi	USA
Natural Assets KAN	Unai	Pascual	Spain
	Maria Jose	Martinez-Harms	Chile
Ocean KAN	Anna	Zivian	USA
	Linwood	Pendleton	France
oneHEALTH	Peter	Daszak	USA
	Catherine	Machalaba	USA
Past Global Changes (PAGES)	Marie-France	Loutre	Switzerland
	Michael N.	Evans	USA

Programme on Ecosystem Change and Society (PECS)	Maike	Hamann	South Africa
	Dr Odirilwe	Selomane	South Africa
Risk KAN	Jo-Ting	Huang-Lachman	Germany
	Jana	Sillmann	Germany
Surface Ocean-Lower Atmosphere Study (SOLAS)	Jessica	Gier	Germany
	Minhan	Dai	China
Sustainable Water Future Programme (Water Future)	Anik	Bhaduri	Australia
	Rabi	Mohtar	Lebanon and USA
Systems of Sustainable Consumption and Production (SSCP) KAN	Maurie	Cohen	USA
	Charlotte	Jensen	Denmark
Urban KAN	Kensuke	Fukushi	Japan
	Shuaib	Lwasa	Netherlands
Water-Energy-Food Nexus KAN	Chrisy	Laspidou	Greece
	Marja	Spierenburg	The Netherlands

RESEARCHERS FROM LOW AND MIDDLE INCOME COUNTRIES (LICMIC)

Researchers from Low and Middle Income Countries (LICMIC)	Najet	Aroua	Algiers
	Jurgenne H.	Primavera	Iloilo City
	Filipo	Zulu	Lusaka
	Yulia	Sugandi	Jakarta
	Sylvia	Mitchell	Kingston
	Eduardo	Erazo Acosta	Pasto city
	Leopoldo Cavaleri	Gerhardinger	Brasilia
	Joeli	Veitayaki	Suva

PARTNER ORGANIZATIONS

START International	Jon	Padgham	United States
Mountain Research Initiative	Carolina	Adler	Switzerland
WCRP	Detlef	Stammer	Switzerland
ESA	Susanne	Mecklenburg	UK
STS Forum	Kanji	Fujiki	Japan
UNU	Shen	Xiaomeng	Germany
IPCC	Abdalah	Mokssit	Switzerland

CUSTODIAN ORGANIZATIONS

ISC	Mathieu	Denis	France
BELMONT FORUM	Nicole	Arbour	Uruguay
UNESCO	Meriem	Bouamrane	France
UNEP	Hartwig	Kremer	Germany
UNEP	Andrea	Hinwood	Australia



Global Secretariat Staff

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- Eliane Ubalijoro, Global Hub Director
- Marie d'Acremont, Hub Coordinator
- Rachelle Fox, Digital Content and Communications Officer
- Jennifer Garard, Research Manager
- Nilushi Kumarasinghe, Project Manager
- Wendy Kuo, Project Manager
- Santiago Ramírez Said, Research Associate
- Jordan Rosencranz, Postdoctoral researcher
- Nilufar Sabet-Kassouf, Strategic Programs Manager
- Alyson Surveyer, Hub Manager and Head of Global Operations
- Andréa Ventimiglia, Advancements Manager

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- Zhangcai Qin, Deputy Director
- Debashis Nath, Deputy Director
- Biqi Ao, Communications Officer
- Han Chen, Science Officer
- Shu Dong, Administrative Officer
- Yaxing Du, Science Officer
- Zhongming Gao, Science Officer
- Jing Wei, Science Officer
- Fei Zheng, Science Officer
- Xin Zhou, Communications Officer

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- Gilles Marciniak, Deputy Director
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- Clément Brousse, Science Officer
- Claire Fréour, Science Officer
- Natalie Chong, Science Officer
- Xavier Peres, Coordinator

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- Hein Mallee, Deputy Director
- Yuko Fujita, Science Officer
- Marcin Jarzebski, Science Officer
- Noriko Kawata, Communications Officer
- Yuri Kojina, Communications Officer
- Ria Lambino, Science Officer
- Xianping Luo, Science Officer
- Sikopo Nyambe, Science Officer
- Masami Oka, Communications Officer
- Takako Okamoto, Administration Officer
- Yuko Onishi, Science Officer
- Akira Sai, Science Officer
- Giles Sioen, Research & Innovation Co-Lead
- Sunhee Suk, Science Officer
- Junya Tani, Senior Adviser
- Kyoko Shiota MacAulay, Program Manager (until Feb. 2022)

South Asia

- Satheesh SK, Global Hub Director
- Basnett Smriti, Deputy Director
- Nair Anupama, Program Coordinator
- Rana Gargi, Program Associate
- Ajay Ishaan, Program Associate (until Dec. 2021)
- Maria Sojan Jency, Project Associate
- Sankam Joshitha, Project Associate
- Murali Maitreyi, Project Associate
- Devendran Sruti, Project Associate (until Jan. 2022)
- Adheesh, Research Associate
- Mamatha G, Accounts

Sweden

- Wendy Broadgate, Global Hub Director
- Jakob Lundberg, Deputy Director
- Cecilia Andersson, Administrative Officer (from March 2022)
- Susanna Dobrota, Coordinator & Administrative Officer
- Sophie Hebden, Science Officer
- Lisa Jacobson, Science Officer
- Steven Lade, Research Scientist
- Victoria Li, Finance Officer (until March 2022)
- Therese Öreteg, Finance and Administrative Officer
- Daniel Ospina, Science Officer
- Maya Rebermark, Communications Director for the Earth Commission
- Juan Rocha, Research Scientist

Taipei

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- Shih-Yu Lee, Deputy Director
- Tzu-Hsun Anny Chang, Program Assistant, Communication
- Yu-Chun Dolly Chung, Science Officer, Networking
- Chia-Hsing Jeffery Lee, Science Officer, Networking
- Shih-Yun Sherry Kuo, Science Office, Administration Head

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- Erica Key, Global Hub Director
- Veera Mitzner, Associate Director
- Sharon Collinge, Executive Director, Earth Leadership Program
- Margaret Krebs, Program Director, Earth Leadership Program
- Maria Fernanda Enriquez, Administration
- Kathy Kohm, Editor-In-Chief, Anthropocene Magazine
- Laurel Milliken, Director of Operations
- Jon Walton, Communications Lead (Until November 2021)
- Kyoko Shiota MacAulay, Network Manager
- Judit Ungvari, Research & Innovation Co-Lead





Funders

Canada

- Canadian Institutes of Health Research
- ClimateWorks Foundation
- Employment and Social Development Canada (ESDC)
- Fonds de Recherche du Québec (FRQ)
- Microsoft
- Montréal International
- Quebec's Ministry of International Relations
- Social Sciences and Humanities Research Council
- United Nations Environment Programme

China

- China Association for Science and Technology
- Sun Yat-sen University
- Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai)
- Key Laboratory of Tropical Atmosphere-Ocean System, Ministry of Education
- The ISC Urban Health & Wellbeing programme

France

- 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)
- Institut de Recherche pour le Développement (IRD)
- Sorbonne Université

Japan

- AEON Environmental Foundation
- Hokkaido University
- KAO Corporation
- Keio Research Institute at SFC
- Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- Nagasaki University
- National Institute for Environmental Studies
- Remote Sensing Technology Center of Japan
- Research Institute for Humanity and Nature
- Saraya Co., Ltd.
- Science Council of Japan
- The University of Tokyo/Institute for Future Initiatives

South Asia

- Divecha Centre for Climate Change (DCCC)
- Ministry of Earth Sciences, Govt. of India

Sweden

- European Space Agency
- MAVA
- Oak Foundation
- Porticus Foundation
- The Global Environment Facility
- Herlin Foundation
- Gordon and Betty Moore Foundation
- Global Challenges Foundation
- Swedish Research Council, FORMAS

Taipei

- Academia Sinica

USA

- Belmont Forum
- Cynthia and George Mitchell Foundation
- George Mason University
- Gordon and Betty Moore Foundation
- NASA
- University of Colorado Boulder
- US Global Change Research Program
- US National Science Foundation
- V Kann Rasmussen Foundation

National and Local Contributors

- Austria (Federal Ministry for Science, Research & Economy)
- Taipei (Academia Sinica)
- Finland (Council of Finnish Academies)
- India (Indian National Science Academy)
- Japan (Ministry of Education, Culture, Sports, Science and Technology, MEXT)



Partner and Custodian Organizations

Custodian Organizations and their contributions to Future Earth

United Nations Educational, Cultural and Scientific Organization (UNESCO)

UNESCO contributed to the first edition of the Sustainability Research and Innovation (SRI) Congress as a hybrid event from 12-15 June 2021, in Australia. The support was by a) serving on the program committee of SRI 2021; b) organizing an online session: "How do UNESCO's Biosphere Reserves increase biodiversity and resilience to climate change?" and sponsored nine participants to join the meeting. Around 30 participants attended the session.

UN Environment Programme (UNEP)

UNEP is participating as custodian on the Governing Council of Future Earth and provides guidance and shares science technology needs and aspirations by Member States. The key for UNEP is maintaining a strong engagement to help build visible bridges between science, data, and observations, modeling, and scenario foresight to community level engagement and action. UNEP's focus is on climate change, biodiversity degradation and ecosystems, and on pollution. This is embedded in the UNEA mandate on UNEP's new Medium Term Strategy 2022-2025. The Future Earth Collaboration shall be a key contribution also in finding solutions in the framing of the three main UN Decades, the one on Ocean Science, on Water Action and the one of Ecosystem Restoration, those are important platforms and feed directly into the MEAs and

the COPs UNEP is engaging in or leading. As such, Future Earth is one center piece of engagement towards evidence-based solutions. Practically, UNEP is engaging in the SRI Conference platform to enable partnership building with the science community and the data providers towards a readiness and upgrading of the Global Environment Monitoring Services in UNEP, notably focusing on Air Quality, on Ocean and Coasts and on Water. This is a continued process and will be followed up in years to come. Next to this, UNEP also engages with the other custodians, like ISC, on urgently needed scientific areas such as behavioral science and data uptake in decision processes.

International Science Council (ISC)

The ISC and Future Earth together responded to crucial concerns for policy-makers and societies on the understanding of and managing risk, furthering implementation of the Sustainable Development Goals, and identifying sustainable, equitable pathways out of the COVID-19 pandemic.

Future Earth contributed to Bouncing Forward Sustainably – Pathways to a post-COVID world, and to the Global Forum of Funders' Unleashing Science report. The Transformations to Sustainability and LIRA 2030 programmes took part in the Sustainability Research & Innovation Congress, at which the

ISC supported the attendance of early-career researchers and professionals from the Asia-Pacific region. Future Earth and ISC collaborated on Transform21, a portal developed by the ISC with the UK Presidency of COP26 to curate material from the scientific community, and co-published the Global Risks Perceptions Report in collaboration with Sustainability in the Digital Age.

2021 was a pivotal year for the ISC, with the publication of a new Action Plan for 2022-2024 Science and Society in Transition. All the highlights of 2021 can be found in the ISC's Annual Report.

Belmont Forum

Belmont Forum and Future Earth have a close knit relationship. Together in 2021, we delivered the first Sustainability, Research and Innovation Congress (SRI Congress), an annual collaborative event for the global transdisciplinary community to convene. Belmont Forum supports the broader Future Earth community through its role as a custodian organization; supporting and enabling shared visions and goals. As members of the same global sustainability

community, Future Earth is tightly engaged in Belmont Forum processes, acting as experts in scoping for the development of Collaborative Research Actions (CRAs), supporting the coordination of active CRAs, and also as stakeholders eligible for funding through open CRA processes. Future Earth also enjoys the privilege of being able to contribute directly to the Belmont Forum through the submission of CRAs for consideration by Members, to be taken forward as co-branded CRAs as was the case with "On Systems of Sustainable Consumption and Production", scoped by the SSCP Knowledge-Action Network.

Partner Organizations and their contributions to Future Earth

START International

START is a contributing partner to the US National Science Foundation funded project called the Transdisciplinary Training Collaboratory: Building Common Ground, led by the Earth Leadership Program. The project is intended to identify the knowledge and approaches that researchers and practitioners engaging in transdisciplinary research need to know to be effective, and to develop training materials that are credible and useful for imparting this information to as broad an audience as possible.

Mountain Research Initiative (MRI)

In 2021, the Mountain Research Initiative (MRI) Coordination Office celebrated its 20th anniversary. The milestone is testament to the efforts of a dynamic global community of researchers. Together, they have added to a growing body of important scientific knowledge, synthesized research results to identify further research priorities and inform policy and practice, and raised the profile of mountains on the international stage. To celebrate the collective effort that has made the MRI what it is today, the MRI Coordination Office has published Mountain Research Initiative: 20 Years of Making Connections for Our Changing Mountains. This publication showcases just a few of the many key contributions made by the MRI community, and invites those who have been part of its 20-year history to share their reflections on the past, present, and future of the network. Dr Carolina Adler, Executive Director of Mountain Research Initiative, said: "Being part of the Future Earth means

being part of a broader community with whom we share a common history and continue to expand on our scientific knowledge, joining forces for a more sustainable planet."

World Climate Research Programme (WCRP)

The World Climate Research Programme (WCRP) works in close partnership with Future Earth to improve our understanding of the climate system, climate change and the interactions between climate, society, and the environment. A high-level joint statement was signed in 2020 reflecting these common goals so that we can collectively deliver more relevant, timely and integrated products and outcomes. WCRP works with many of Future Earth's Global Networks and other activities at many levels to address climate problems together in an interdisciplinary way. For example, WCRP collaborates with PAGES, AICES, SOLAS, IMBER, ILEAPS, IGAC and GCP and is involved in both the Risk and Ocean Knowledge-Action Networks. We regularly carry out joint activities, such as the 10 New Insights in Climate Science (10NICS) and the discussion series on "Tipping elements, irreversibility, and abrupt change in the Earth system" and plan many more in the future.

Science and Technology in Society (STS) Forum

Science and technology provides us with great benefits such as economic growth and better quality of life, but, in parallel, it produces concerns and challenges, such as global climate change, and ethical problems in life sciences. STS forum is an international

platform to discuss these "Lights and Shadows of Science and Technology" from a long-term perspective for the future of humankind among not only scientists but also policymakers and business leaders from all around the world. Many themes relevant to Future Earth such as sustainability, climate change, net-zero emissions, biodiversity, food and water security have been discussed there. In addition, as an important adjunct meeting, the Regional Action on Climate Change (RACC) symposium is held annually. We sincerely appreciate many members of Future Earth for their participation and great contribution to STS forum and RACC. STS forum will make continuous efforts to collaborate with Future Earth.

United Nations University (UNU)

To ensure human survival and development is the mission of the United Nations University. Our work contributes to tackling the challenges of climate change and biodiversity loss with research on nature-based solutions and human wellbeing within planetary boundaries, in line with Future Earth's ambition. In the coming years, we aim to synergize research and community-based activities with Future Earth in order to create a future which serves all humans on earth.

European Space Agency (ESA)

Find details about the European Space Agency's contributions to Future Earth on page 42.

Select publications

Future Earth-wide integrative publications

■ 10 New Insights in Climate Science

- Future Earth, The Earth League, & WCRP. (2021). 10 New Insights in Climate Science 2021. Zenodo. doi: 10.5281/zenodo.5639539
- Martin, M. A., et al. (2021). Ten new insights in climate science 2021: a horizon scan. *Global Sustainability*, 4.

■ Earth Commission

- Rockström, J. et al. 2021. Identifying a Safe and Just Corridor for People and the Planet. *Earth's Future* 9(4): e2020EF001866.
- Rockström, J. et al, 2021. Stockholm to Stockholm: Achieving a safe Earth requires goals that incorporate a just approach, *One Earth*, Volume 4, Issue 9: 1209-1211.
- Gupta, J. et al. 2021. Reconciling safe planetary targets and planetary justice: Why should social scientists engage with planetary targets? *Earth System Governance* 10:100122.

For a full list of Future Earth community-led publications, visit:
<https://futureearth.org/annual-report-selected-publications-2021-2022>



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