Survey Synthesis: Shaping Global Systemic Challenges

For information

PURPOSE

This document summarizes the results of an online survey, asking three questions to gather feedback on Global Systemic Challenges, conducted between July 18th and August 14th, 2018. The survey was sent to all members of the Future Earth Global Research Projects (GRP) and Knowledge-Action Networks (KAN) and responses were received from 28 individuals.

QUESTION 1 - WITHIN THE SCOPE OF YOUR GRP/KAN, WHAT IS THE SINGLE MOST IMPORTANT BARRIER OR CHALLENGE (E.G. A KNOWLEDGE GAP, A SECTORAL CHALLENGE, ETC.) TO ACHIEVING THE SDGS?

Four main challenges to achieving the SDGs were identified by survey respondents.

1. **It is difficult to operationalize the multi, inter and/or transdisciplinarity work needed to advance the SDGs.** The task of bridging the physical and social sciences was considered most challenging yet crucial to better understand our complex human-natural systems, which may in turn highlight interactions between various SDGs.
2. **There is a need to improve understanding of how various SDGs interact.** Survey respondents agreed this major task should be collectively undertaken by the Future Earth community. Models and frameworks to characterize such interactions must be tested and applied to specific contexts in order to prove useful. Once tested, another challenge is to prioritize which interactions between the SDGs are most important based on context, and in turn, which societal actors to engage with.
3. **We must improve our means to communicate and connect the results of our research to the wider non-science community.** This implies finding ways to apply sustainability science to policy and decision-making, as well as to disseminate science findings more broadly. Respondents discussed the difficulty they experience connecting with users of our research as well as having effective conversations with non-scientists, even though many opportunities exist (see Survey Q2 below).
4. **It is difficult to obtaining funding** for activities that our community is working on to help address the SDGs (e.g. funding working sessions to advance a specific theme).

Aside from these four key challenges, several scientific knowledge gaps were named by respondents (see appendix for a non-exhaustive list).

QUESTION 2 - CONSIDERING THE HUMAN-NATURAL SYSTEMS OF YOUR SPECIFIC GRP/KAN WORK, WHAT ARE THE BEST OPPORTUNITIES FOR IMPACT WITHIN THE POLICY, PRIVATE, OR CIVIL SOCIETY SPHERES?

Survey respondents emphasised that the Future Earth community is well-positioned (through its existing networks) to produce and promote the science and tools needed to address complex sustainability issues. This is critical given that such issues are often misunderstood by the policy, private and civil society spheres. Some respondents suggested that the production of flagship products, policy briefs and other informative materials are effective ways of impacting potential global and sub-global policy paths (e.g. geoengineering, inclusion of biodiversity, promotion of technology advancement, etc.).

A large portion of respondents underlined the continued importance of participating in global assessments and science-policy dialogues. The Future Earth community can have an influential impact on these dialogues, as members aim to produce relevant expertise to inform global assessments (e.g. IPBES, IPCC), in turn influencing major science-policy events (e.g. CBD, UNFCCC). According to the survey, finding the right entry points into relevant policy frameworks can improve impact. Respondents also stressed that impact can also be made at the sub-global level (e.g. regional or local policy-making initiatives and networks such as Regional Seas), and this should not be underestimated.

To further engage with business and civil society, Future Earth can seek to provide these groups with relevant knowledge to improve their practices (i.e. targeting professional practitioners and managers like urban planners, architects, engineers) or to co-produce sustainability knowledge with them. More specifically, building capacities and place-based research projects (e.g. a regional thematic research project with co-design workshops) that connect stakeholders with one another is seen by some respondents as a great avenue for impact. Respondents also suggest that our community could be more impactful by engaging in NGO campaigns and other social movements at various levels, which hold great potential for raising public

awareness on sustainability issues.

QUESTION 3 - GIVEN THE OPPORTUNITIES AND CHALLENGES YOU LISTED ABOVE, PLEASE LIST UP TO THREE CONTRIBUTIONS THAT THE FUTURE EARTH COMMUNITY CAN BRING COLLECTIVELY, TO HELP SOCIETY RAPIDLY ADVANCE THE SDGS IN THE NEXT FIVE YEARS.

The Future Earth community has major potential to build a movement and a common narrative around innovation and sustainability, through the creation of new knowledge and the co-design of sustainable and holistic development pathways. According to survey respondents, collaboration in building that narrative, both within the community and beyond, could reveal "how our science can link to changes in behaviour and minds."

Future Earth has an opportunity to further break down disciplinary barriers by encouraging the collaboration of Global Research Projects and Knowledge Action Networks, in order to advance progress on meeting the SDGs. A first step would be to map the Future Earth ecosystem onto SDG interactions. Such a mapping exercise would help clarify the role of the Future Earth community in contributing to the advancement of the SDGs, and would expose various existing capabilities and possible future collaborations. This would help build even stronger bridges across different perspectives, and between the biophysical and the socio-economic sciences (see Question 1).

Further it was suggested that a strong Future Earth platform for GRP-KAN collaborations could produce and funnel research, using "Futures" and "Foresight" approaches to find sustainable trajectories for society. This could mean identifying key areas of cross-sectoral interactions (e.g. conservation and food production; bio-energy and climate change mitigation). For many, this also means collaboratively finding innovative funding sources to mobilize working groups, synthesize relevant research, and participate in science-policy work. By joining this platform, the community hopes to produce high-quality products that enhance science literacy and to reinvigorate the dialogue with users of science on diverse topics (e.g. the importance of genetic diversity for the protection of ecosystem services while integrating it into Earth models; the interconnections between the SDGs; the importance of evolutionary dynamics within sustainability science). Finally, engagement with stakeholders at all levels (including local actors like systemic change activists, financial institutions and progressive businesses) is seen as vital to allow our community to investigate the root causes of unsustainability (e.g. questioning economic and social paradigms) and to subsequently co-design proposals for systemic change.

APPENDIX

1. List of commonly cited scientific knowledge gaps to achieving the SDGs

- Impact of human-mediated environmental changes on health of animals, humans and plants
- Contribution of evolutionary dynamics on sustainability topics such as biodiversity and health
- Contribution of atmospheric science to achieving the SDGs
- Complete picture of the carbon cycle (i.e. that includes biophysical and human dimensions)
- Contribution of biodiversity to achieving the SDGs
- Steering mechanisms and governance of the SDGs and understanding the underlying complex landscapes of stakeholders
- Highlighting multi-scale interactions and spatio-temporal complexities
- Understanding and framing SDG interactions, tradeoffs and synergies
- Issues of equity in access to nature's benefits
- Understanding how climate change and extremes affect societies
- Questioning our economic models (e.g. Does consumption-driven behaviour go against ecologically sustainable and socially inclusive development?)
- Solving issues of air pollution, drinking water and disaster-ready infrastructure

2. List of survey respondents

Faten Attig-Bahar, Nexus KAN

Victoria Barlow, iLEAPS (GRP)

Georgia Bayliss-Brown, Ocean KAN

Magnus Bengtsson, SSCP KAN
John Claydon, IMBeR (GRP)
Wolfgang Cramer, ecoSERVICES (GRP)
Roger Cremades, Finance and Economics KAN
Carole Crumley, IHOPE (GRP), recently Risks KAN
Valerie Cummins, Future Earth Coasts (GRP)
Ariane de Bremond, Global Land Programme (GRP)
Luc De Meester, bioGENESIS (GRP)
Sabine Fuss, Global Carbon Project (GRP)
Cornelia Krug, bioDISCOVERY (GRP)
Mark Lawrence, IGAC (GRP)
Martin Le Tissier, Future Earth Coasts (GRP)
Miguel Mahecha, iLEAPS (GRP)
Maria José Martinez-Harms, Natural Assets KAN
Megan Melamed, IGAC (GRP)
Lisa Miller, SOLAS (GRP)
Davnah Payne, Global Mountain Biodiversity Assessment (GRP) & Natural Assets KAN
Åsa Persson, Earth System Governance (GRP)
Ye Qian, Integrated Risk Governance Project (GRP)
Lynne Shannon, BioDiscovery (GRP)
Caroline Souffreau, bioGENESIS (GRP)
Marja Spierenburg, PECS (GRP, and Nexus KAN
Wei Wan, MAIRS-FE (GRP)
Chadia Wannous, OneHEALTH (GRP)
Ruben Zondervan, Earth System Governance (GRP)

Science for Integrated Earth's Systems Targets

For discussion

PURPOSE

This concept note outlines an initial sketch for discussion of a vision and rationale for **a global cross-cutting initiative, to co-develop with societal partners, operational targets for Earth's life-support systems that underpin Agenda 2030**. *The goal of this initiative would not be to replace the targets of the Sustainable Development Goals (SDGs), but rather to provide the transdisciplinary science needed to make them actionable.*

This note was developed in response to the mandate of the Future Earth Advisory Committee (AC) and Governing Council (GC) that the Secretariat focus on supporting Future Earth research networks on two or three big initiatives, which were given the label "Global Systemic Challenges." These initiatives should address challenges where Future Earth research networks can collectively have a significant impact on advancing a systems-based approach to the SDGs.

In Montevideo, the AC and GC agreed that an initial Global Systemic Challenge should be defined around the concept of "Earth Targets," in which Future Earth would support the development of science-based targets for resilient coupled human-natural systems. This focus was selected because it can be done in collaboration with an initiative that already has considerable momentum – the Earth Targets Platform – which is being organized by the Global Environmental Facility and others. This concept note outlines a vision for how Future Earth can bring needed global scientific expertise on coupled human-natural systems to support and expand this and related efforts. This note was informed by discussions with researchers across the Future Earth community and with colleagues in civil society and the private sector, and by a review of literature on science for the SDGs.

THE CHALLENGE

It is now recognized that human health, security, and prosperity are inextricably linked to the state of Earth's life-support systems including water, oceans, land, air, and climate.[1] Increasingly, local and global policies are designed to help protect the functioning of these natural systems. However, most policies have been developed in sectoral silos, do not address the planetary context, and do not provide sufficient guidance for what constitutes acceptable risk or for what defines sustainability.

As a result, governments and businesses often lack adequate information to evaluate if their policy decisions or investments are promoting or inhibiting sustainability. Consider, for example, the case of a sustainability manager from a major international corporation, who recently explained to Future Earth Secretariat staff that the company does not have access to the information they need to evaluate the sustainability implications of their business operations. Specifically, they want to evaluate the relative impact of their operations for water security in different regions of the world and determine the best use of resources to mitigate potential impacts. To evaluate these decisions, the sustainability manager needs to know the acceptable risks and what defines sustainability. For water and most of Earth's other natural systems these have not yet been operationally defined, at least not from an integrated and planetary perspective.

The one exception is climate. In 1992, the UN Framework Convention on Climate Change (UNFCCC) set a collective goal "to avoid dangerous anthropogenic interference with the climate system." At that time there was no definition of "dangerous" climate change, but a global research effort and science-policy dialogue was initiated to establish the limits of acceptable risks, which ultimately led to the adoption of the 2°C target in the 2015 Paris agreement. The 2°C warming limit is not perfect. But it has been vital for addressing the climate crisis. It works because it is grounded in science, and because it is quantifiable, simple to communicate, and achievable despite political constraints.

Society needs science-based operational targets for all of Earth's life-support systems, such as water, oceans, land, and air – within a linked human-natural system context. These integrated targets can help governments and businesses evaluate impacts, risks and trade-offs, and provide an agreed-upon context to evaluate the limit of acceptable risks – as the 2°C target now provides for climate.

SUSTAINABLE DEVELOPMENT GOALS: A MANDATE FOR ACTION

The UN Agenda 2030 and its Sustainable Development Goals (SDGs) provide the policy framework for defining operational targets for Earth's systems, just as the UNFCCC did for climate 26 years ago. The SDGs

define the "Future we want" in 17 indivisible goals. Four goals focus directly on Earth's life-support systems: Goal 6-water, Goal 13-climate, Goal 14-oceans, and Goal 15-land. However, only the climate goal has a clear operational target (2°C), which was set up through a separate science-policy process (i.e. UNFCCC). The targets and indicators of the other Earth system SDG goals are more general and aspirational.[2]

Defining operational targets[i] for Earth's other systems, beyond climate, will be more complicated. In the climate case, both the drivers of change, in terms of greenhouse gas emissions, and the impact of the change, in terms of heat energy trapped, are spread globally because the atmosphere is so well mixed. Earth's other natural systems are not so simple. For example, the drivers of change of land cover and water use and the impacts of those changes across the globe are less direct as they are mediated by many other local and regional factors. As a result, to define locally relevant targets for Earth's other systems, such as water, land, air, and oceans, we must consider the interconnections across systems and across scale.

To achieve the SDGs we need transdisciplinary research for integrated and operational targets for Earth's life support systems

The UN Agenda 2030 established 17 "integrated and indivisible" goals that define a broadly-accepted vision for people and planet. To operationalize this vision, much transdisciplinary research is needed to translate the SDGs into operational targets for decision-making. For these to be effective in building global sustainability they must consider both cross-sectoral and cross-scale interlinkages.

Below are six SDGs that together highlight the importance of integrating across sectors and scales. Without integration, progress on one goal, in one place, could undermine progress on other goals, there or elsewhere. For each SDG, illustrative targets and related indicators also show the urgent need for new knowledge to translate these aspirational statements into explicit and actionable targets for decision support.

HUMAN SYSTEMS

Target 1.1
By 2030, eradicate extreme poverty for all people everywhere,

Indicator 1.1.1
Proportion of population below the international poverty line

Target 2.3
By 2030, double the agricultural productivity of small-scale food producers,

Indicator 2.3.1
Volume of production per labour unit

Target 3.3
By 2030, end the epidemics diseases and combat communicable diseases

Indicator 3.3.3
Malaria incidence per 1,000 population

EARTH'S SYSTEMS

Target 6.6
By 2020, protect and restore water-related ecosystems,

Indicator 6.6.1
Change in the extent of water-related ecosystems over time

Target 14.1
By 2025, prevent and significantly reduce marine pollution of all kinds.

Indicator 14.1.1
Index of coastal eutrophication and floating plastic debris density

Target 15.2
By 2020, promote the implementation of sustainable management of forests, halt deforestation and substantially increase afforestation

Indicator 15.2.1
Progress towards sustainable forest management

To translate the underlined statements above about the Earth system SDGs into actionable targets, we must answer questions such as:

- What characterizes "sustainably managed forests," "protected water-related ecosystems" or acceptable water pollution levels, for different locations and for different users, given existing and shifting stresses, thresholds and pressures, *considering both the local and global context*?
- What are the thresholds (in terms of nutrient loading, land development, fisheries use, etc.) at which the resilience of those systems start to break down in ways that undermine social equity, peace, and prosperity?
- How can progress on defining local targets in some regions of the world help to inform an integrated and cross-scale perspective on achieving SDGs on a planetary scale?

Interconnections across human and natural systems

The 17 SDGs and their 169 targets were adopted as an "integrated and indivisible" agenda for global sustainability.[1] Yet in practice, SDG strategies are often pursued in sectoral and disciplinary silos, even though research has demonstrated inherent trade-offs and synergies among SDGs and highlighted the need for 'integrated,' 'systems-based' or 'nexus' approaches to sustainable development.[3-6] The Science for Integrated Earth's Systems Targets initiative will co-develop the acceptable limits of risks and associated sustainability targets for Earth's systems in the context of other human and natural systems. And in doing so, help guide integrated strategies to SDGs.

Interconnections across scales

Research clearly indicates that humanity has entered a new geological Epoch, the Anthropocene, and that modern civilization is imposing unprecedented pressures on the functioning and stability of the coupled human-natural system. The Earth functions as an integrated whole, comprised of smaller coupled systems linked through flows of information, human agency, matter, and energy, which are all evolving.[7] Human decisions and resulting actions from people seeking water, food, and energy security at the local scale today are accumulating as global syndromes and creating unintended trends. Sustaining the whole Earth, as a coupled human-natural system, requires managing the subsystems in an integrated manner that considers the teleconnections and

i The goal of these integrated targets for Earth's systems would not be to replace the SDG targets, but rather to provide science-based operational tools for achieving the SDGs.

spill-over effects across regions and subsystems. As a result, a local company or major city, must now, in the Anthropocene, consider development targets that not only meet local requirements and goals, they must now also contribute to the sustainability of the integrated whole. Frameworks exist to evaluate the cross-sector and cross-scale sustainability implications of development decisions (e.g. ecological footprints[8] and Planetary Boundaries[9]). However, much more work is needed to establish targets at a range of geographic scales — local, regional and planetary—defined by natural phenomena rather than political boundaries.[10]

FUTURE EARTH: A GLOBAL NETWORK TO CONNECT SCIENCE TO ACTION

Below is an outline of **a four-step strategy**[ii] for how the Future Earth community can build on earlier work and on-going programs to help co-develop operational targets for Earth's systems.

(1) **Co-host the Earth Commission to assess the state of the science on planetary scale risks** associated with human impacts on Earth's systems. The Earth Commission is a key component of the Earth Targets Platform,[iii] a new collaboration of a dozen civil society organizations[iv] to translate global targets for the Earth system into operational standards for businesses and governments. Future Earth has been engaged in multi-stakeholder workshops of this new initiative to explore how our research networks could help integrate the best available science in the co-design of these targets. The Future Earth Secretariat has agreed to co-host the Earth Commission with IUCN. The Earth Commission will be an international science panel that will lead a scientific assessment on the state of the science about risks and thresholds from a planetary perspective.

(2) **Lead a global effort to facilitate the co-development of regionally defined and globally linked integrated targets for Earth life-support systems** to guide sustainable and equitable use of water, air, land, and ocean systems. This effort will complement the Earth Commission and help to further empower the Earth Targets Platform by addressing the challenge of integrating across systems and scales by considering regional and local factors. We will facilitate collaborations among Future Earth's regional offices and national committees with the GRPs, KANs, and local stakeholders to co-develop the knowledge needed to define locally-relevant, globally consistent targets in support of ongoing strategies to localize the SDGs. The research from these efforts will help to generate science for the Earth Commission in the future.

(3) **Support the development of data and technology platforms needed to operationalize targets for sustaining Earth's systems.** Future Earth will work with researchers and technology companies to ensure the data is easily accessible for analysis and decision making across scales. This will include exploring the use of Earth observations, citizen science, big data, and artificial intelligence for applying Earth's system targets to policies and strategies for sustainable development.

(4) **Build demand for Earth's systems targets by strengthening public and policy understanding** of the vital role of healthy Earth life-support systems for prosperous, peaceful, and equitable world. Achieving the Agenda 2030 vision will require transformational institutional and social change. The Future Earth community can help drive such changes through targeted engagement in the development of and dialogues around the Earth's systems targets.

The role of the Future Earth Secretariat. Working with national committees, GRPs and KANs, the Secretariat (including the Global Hubs, regional centres and offices) will:

- Coordinate the global effort to help ensure that the Earth's systems targets are locally and regionally "owned" but globally integrated.
- Facilitate collaborations by hosting workshops and coordinating efforts across regions (which could include establishing a standardized or interoperable approach);
- Identify funding sources from philanthropy, private sector and government;
- Help to connect Earth system research to global policy agenda through issue briefs and synthesis

ii This strategy seeks to build on the considerable work the Future Earth community has already led developing science in support of making progress on the SDGs, by both individual GRPs and KANs , and collectively, with partners as reported in the 2016 report on The Contribution of Science for the Sustainable Development Goals.
iii This project emerged out of the Global Commons Initiative. The Earth Targets Platform was launched at the Global Environmental Facility Assembly June 2018 in Vietnam.
iv Organizations involved include: Global Environmental Facility, Stockholm Resilience Center, World Resources Institute, IUCN, CDP, We Mean Business, WWF, IIASA, UN Global Compact, World Economic Forum, and others.

products, such the Earth Commission report (as outlined above), and the annual science report (State of Our Planet) that draws on the research of the GRPs and KANs.

WHAT SUCCESS WOULD LOOK LIKE

Ultimately, success would be achieving the collective vision set out in the 2030 Agenda. Metrics of success would go far beyond the traditional scientific publication citations-based metrics, and will include contributions to outcomes in the world such **the percentage of the world that have**:

- Defined clear science-based, regionally-relevant targets for sustainable and equitable use of the Earth natural resources and systems.
- Identified essential data for operationalizing the use of integrated targets for Earth's systems.
- Governments requesting assistance to identify and implement Earth's systems targets.
- Local and regional governments that are pursuing science-informed systems-based approaches to the SDGs. This might include documentation of programs designed for or assessed through a 'nexus' frame.
- Private companies that are defining their business plans around the regionally-explicit and globally relevant science-based Earth's systems targets for global sustainability and resilience.

FINAL THOUGHTS

It will take many years to fully implement the Science for Integrated Earth's Systems Targets initiative outlined here. However, with a big push, much progress could be made in advance of the critical policy fora converging in 2020, including the High Level Political Forum, the Convention on Biological Diversity and UNFCCC COPs.

This vision is huge. But it is an essential piece of the global sustainability puzzle. Realizing this vision will require partnerships across sectors and disciplines. As a global network of scientists working on human-natural systems, Future Earth is ideally suited to lead it. Together we can make it happen!

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The Earth Commission

For discussion

PURPOSE

This document outlines a vision and rationale for the Earth Commission – an international scientific panel that is to be established to assess the risks stemming from human-induced changes to Earth's life support systems.

This document summarizes the concept for the Earth Commission as co-designed with IUCN and a dozen other civil society partners. It was prepared as background for discussion with Future Earth research networks. The discussion at the Summit will focus on how the Global Research Projects, Knowledge Action Networks, and regional and national entities can participate in and contribute to the Earth Commission.

EARTH COMMISSION

The Earth Commission is to be an international science panel that will assess the risk stemming from human-induced changes to planetary systems, and will develop the quantitative basis for defining targets for a stable and resilient Earth system. It is being established as part a program known as the Earth Targets Platform[i] led by the Global Environmental Facility (GEF) and others. The Future Earth Secretariat has agreed to co-host the Earth Commission with IUCN. Future Earth has been engaged in multi-stakeholder workshops of this new initiative to explore how our research networks could help integrate the best available science in the co-design of these targets.

The results from this scientific assessment will provide the global science foundation for the broader Earth Targets Platform to work with the policy and private sectors to identify targets for the Earth systems. This assessment of planetary-scale risk will be complemented by a globally coordinated set of regional assessments of the acceptable risks and co-developed targets for integrated Earth systems sustainability. The Future Earth Global Research Projects, Knowledge Action Networks, and regional and national networks provide essential research in this area and expertise for synthesis/assessment.

The Earth Commission will consist of a high-level overarching panel and specific working groups on sub-systems (initially freshwater, land, ocean and biodiversity) that will:

- Harness evidence-based natural and social science expertise to publish a peer-reviewed high-level synthesis and assessment of the systems, risks, drivers and processes that regulate the stability of the Earth system;
- Define the relevant geographical scale for each system/process (e.g. global, watershed, biome, etc.);
- Guarantee the peer review of the assessment and synthesis report(s);
- Publish the results of the peer-reviewed process in a publicly accessible format, including in the form of freely available datasets where possible;
- Advise the science-based target network partners on issues related to the development or practical applications of the scientific knowledge related to Earth systems dynamics.

TIMELINE

The high-level panel of the Earth Commission will run for an initial term of 36 months, starting in 2018 (pending funding). The first working groups should complete their assessment by mid-2020, with others to follow in a staggered approach.

CONNECTING THE PIECES

The Earth Commission is being established to support the Earth Targets Platform and will be a core part of Future Earth's Science for Earth's Systems Targets initiative (described in detail here). Below is a brief overview of these two complementary efforts and a diagram illustrating how they are connected.

i This project emerged out of the Global Commons Initiative. The Earth Targets Platform was launched at the Global Environmental Facility Assembly June 2018 in Vietnam.

Earth Targets Platform

A group of partners[ii] has initiated the Earth Targets Platform to define science-based targets for the Earth – that is targets that define the boundaries for a safe operating space for humanity on Earth. A global scale "science-based target" has been established for climate (1.5-2°C). This target is based on science but was defined and selected through an international policy process. In recent years, organizations have been working with cities and companies to translate this planetary target, based on the extent of the contribution of a given entity or sector towards causing a major planetary concern (e.g. CO2 emissions by a given company) and establish sector or company specific "science-based targets." The goal of the Earth Targets Platform is to establish science-based targets for ensuring the stability and resilience of other planetary systems beyond climate.

Science for Integrated Earth's Systems Targets Initiative

The Science for Integrated Earth's Systems Targets is a Future Earth initiative to coordinate researchers from around the world to work with societal partners to co-develop the knowledge needed to establish targets for healthy and resilient coupled human-Earth systems in support of Agenda 2030 and beyond. (See the full concept note here). As part of this initiative Future Earth will co-host the Earth Commission with IUCN. It will also facilitate a complementary process to co-develop the knowledge for regionally defined Earth systems target that are consistent with global targets.

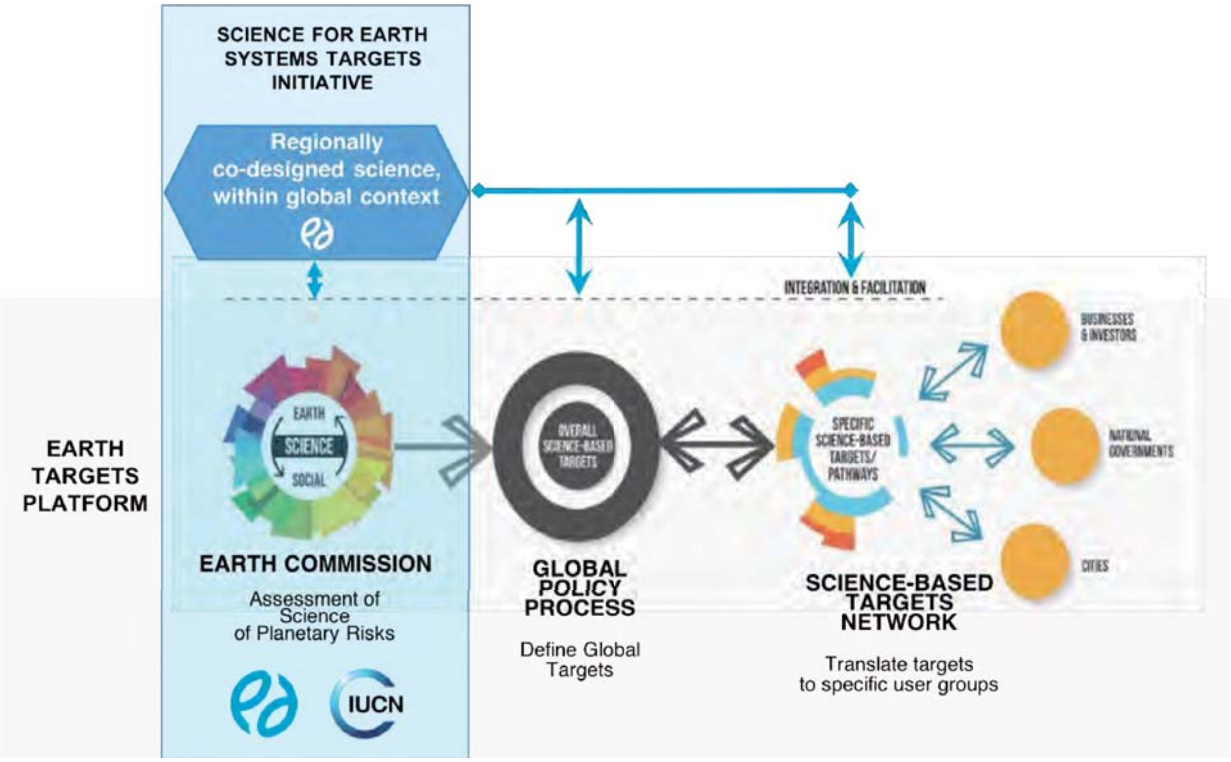

Figure 1. *CONNECTING THE PIECES: Earth Commission, The Earth Targets Platform, and the Science for Integrated Earth's Systems Targets initiative.*

ii The Global Commons Partners are the Global Environmental Facility (GEF); International Union for the Conservation of Nature (IUCN); the Intergovernmental Institute for Applied Systems Analysis (IIASA); Stockholm Resilience Centre (SRC); the World Resources Institute (WRI); and the World Economic Forum (WEF).

Annual Science Publication: State of our Planet[i] Report

For discussion

PURPOSE

This document outlines the vision and rationale for an annual Future Earth science publication, tentatively to be called State of Our Planet.[i] This note provides background for discussion at the Summit, with the aim to gather feedback on potential report content and on the process for effectively engaging the Future Earth community.

OVERVIEW

Future Earth's Advisory Committee and Governing Council have agreed that Future Earth will publish its first State of our Planet report in 2019. The report will synthesize recent, global sustainability research and data of relevance to decision-makers. The Sustainable Development Goals (SDGs) will be an important political compass for the report, but the report will also take a broader view of trends within coupled human-natural systems.

RATIONALE

There is a growing conceptual understanding that the SDGs must be approached from a systems perspective to accelerate achievement of the goals. Although formal processes exist for evaluating the current state of scientific literature on the global environment (such as the IPBES and IPCC assessments) there is currently no regular and frequent (i.e. annual) process for synthesizing and integrating coupled human-natural, systems-based knowledge at a planetary scale, in a widely accessible and easily understandable way.

Specifically, there are four key factors that are not addressed by existing reports.

1) Systems-approach

Although regular synthesis reports do exist, they often focus on singular components of Earth systems and social systems, such the State of the Global Climate report (produced annually by the World Meteorological Organization). The UN Global Sustainable Development Report provides a general update "on the policy-relevant information in the field of sustainable development" in support of the SDGs. None of these, however, provide the whole human-natural systems perspective.

2) Readability

IPBES and IPCC provide comprehensive scientific assessments of the current state of knowledge in timeframes ranging from five to seven years. However, these reports are difficult to read and understand, even by experts. For example, although a Summary for Policy-makers is included in each report, literature illustrates that these summaries are becoming more unreadable with each subsequent assessment.[1] The summaries requiring expertise from social sciences and natural sciences, for example IPCC Working Groups II and III, score exceptionally low in readability assessments.[1]

3) Credibility

Every two years the advocacy organization, World Wildlife Fund (WWF) publishes the Living Planet report. The report focuses largely on biodiversity, provides a comprehensive synthesis of recent knowledge on natural systems, and has a high-profile among policy-makers. Future Earth, as a scientific organization, has the credibility to produce a well-founded and balanced synthesis of the latest scientific findings that can be similarly directed towards a policy audience.

4) Frequency

Major reports of this kind are regularly, but infrequently published. Examples include the IPCC assessments, released in seven-year intervals, WWF's Living Planet report, published every two years, and the UN Global Sustainable Development Report, published every four years. Future Earth is perfectly positioned to fill this gap, in the form of a regular, annual, authoritative scientific report to synthesize the implications of the latest scientific findings on human-natural systems in the Anthropocene.

i Exact title to be determined by the Editorial Board

PROPOSED REPORT CONTENT

Through the lens of systems thinking, the report will outline options for sustainable transformation by capturing and contextualizing key data and knowledge in relation to the long-term evolution of the integrated human-natural system. For example, this could include current trends in economic development, deforestation, ice sheet stability and coral reef die-off and their relationship to governance. Furthermore, the report will explore systemic approaches to societal transformation in critical areas, such as energy, food systems, cities and oceans.

To provide an illustrative, and by no means comprehensive, flavor of report content, the report might summarize the research from the top sustainability papers of the year, or may highlight recent research such as the following:

- Research from the Global Land Programme presents scenarios for feeding nine billion people by 2050 without further deforestation through reduced meat consumption.[2] Combined with other recent scenarios exploring climate and health co-benefits of lowered meat consumption[3] this research puts forward a compelling case for demand-side solutions to food-system transformation. The report may also capture the recent political and academic focus on 1.5°C scenarios and the role of negative emissions.[4]
- The Carbon Budget, from the Global Carbon Project provides an in-depth look at the amount of fossil fuels that nations around the world burn and where it ends up.
- Work from the Past Global Changes (PAGES) project on tipping points using paleo interglacial data, suggests that even if the world meets the 2°C climate target, sea levels may rise six metres or more, large areas of the polar ice caps could collapse and significant changes to ecosystems could see the Sahara Desert become green and the edges of tropical forests turn into fire-dominated savanna.[5]

EDITORIAL BOARD AND DECISION-MAKING

The Editorial Board will make all decisions on the report outline and final content, including the title of the report. The Editorial Board will have a one-year mandate and consist of at least 11 people, including:

- three members from the GRPs and KANs;
- three members of the Advisory Committee;
- three members of other stakeholder groups;
- the Future Earth Executive Director (Amy Luers); and
- the Editor-in-Chief (Owen Gaffney).

Nominations for the Editorial Board will open following the Summit. Interested applicants are welcome to self-nominate as well as nominate others. For the first year, nominations will be reviewed by a Selection Committee consisting of the two co-Chairs of the Advisory Committee, the Future Earth Executive Director, the Editor-in-Chief and the Project Manager. The Editorial Board will be appointed by mid-September 2018. The Project Manager will lead the project management process with consultation as needed from the Editor in Chief and the Future Earth Executive Director. The final report will be open for review by GRPs and other stakeholders (see process below).

AUTHORSHIP

The report will be a Future Earth publication and feature the Future Earth logo. This means that an in-text reference would read “Future Earth, 2019”. The members of the Editorial Board will be listed as editors. The Global Research Projects and Knowledge-Action Networks will have the opportunity to review the report before its publication. Those who do so will have the opportunity, if they so wish, to include their logos on the report.

TIMELINE

The report will be a yearly publication. The Editorial Board will be appointed in September 2018 and work beginning thereafter. First publication is planned for late 2019.

PROPOSED PROCESSES FOR THE SHORT AND LONG TERM

Short-term process

The Editorial Board (appointed as described above) will engage Future Earth's community – the Global Research Projects, Knowledge-Action Networks, Advisory Committee, regional bodies and the Secretariat. Some of the major milestones of the short-term process include:

- Gather feedback from the community through the Future Earth Summit process
- Appoint an Editorial Board drawing from the GRPs, KANs and beyond
- Prepare a first draft in early 2019
- Open the draft to review by GRPs and KANs
- Final approval of the report by the Editorial Board and Advisory Committee
- Publication in late 2019

Long-term process

The long-rerm process will evolve from the first publication and should bring our community together. Namely, in the long term, the Global Research Projects and Knowledge-Action Networks will be invited to write two-page issue briefs on the top science that policy-makers should be aware of in the context of the SDGs. The issue briefs will provide an avenue through which we can continuously connect our research with policy-relevant processes. As well as being stand-alone products, the information communicated in the issue briefs will provide the basis of the annual report content.

After the first year, the Editorial Board will be responsible for reviewing nominations and selecting the Editorial Board members for the following cycle.

DECISION MAKING

- The Editorial Board will decide the final content of the report
- The Project Manager will lead the project management process with consultation as needed from the Editor in Chief (Owen Gaffney) and the Future Earth Executive Director (Amy Luers)
- The final report will be open for review by GRPs and other stakeholders

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Future Earth Society

For discussion

PURPOSE

This concept note outlines *an initial sketch for discussion* around the establishment of a Future Earth professional society to support our structures and communities, and to expand the field of sustainability research and innovation.

The proposed next actions are to work with partners to establish the first convening, and to establish the business model and governance structure for the society

This note was developed in response to the mandate of the Future Earth Advisory Committee (AC) and Governing Council (GC) that the Secretariat explore the development of an individual professional society for sustainability research and innovation. This note was informed by discussion with researchers within and beyond the Future Earth community, as well as conversations with the Future Earth Advisory Committee and Governing Council, and Belmont Forum leaders. The concept has also benefited from input by civil society leaders, and draws on a bibliometric review of the sustainability science literature.

THE CHALLENGE

The increasing pace of global and social change and the urgency of sustainability challenges have created a need for international support for the engagement of transdisciplinary sustainability science and technology communities.[1 - 9] The tools, capacities, evidence, and knowledge needed to support a global transition to sustainability require collaborative team-based science involving a wide range of societal partners and disciplinary experts.[2, 7-9] Closing the gaps between science, technology, social science and the humanities, and linking these to policy research, practice and outreach and extension services[i] is fundamental to all of the major international sustainability frameworks, including the United Nations Sustainable Development Goals, the United Nations Framework Convention on Climate Change and the Convention on Biological Diversity to the New Urban Agenda. And yet the current system of disciplinary-focused support for research and innovation fails to address this type of solution-oriented transdisciplinary research, innovation, and discovery. As a result, scientists and innovators currently attempting interdisciplinary and transdisciplinary research face significant costs, whether measured in terms of citation rates, grant success rates,[10,11] or in the attention that traditional academic, business, and governmental leaders and structures devote to efforts that do not fit easily into existing silos.

The rapidly growing field of sustainability science, when interpreted broadly to include the innovation communities also deeply engaged in sustainability, is well-positioned to change this dynamic.[10,12,13] Sustainability research and innovation is growing at twice the rate of science in general.[10] There are now at least six major journals, journal groups, or sections in key journals focused entirely on sustainability science[ii] and international funding for transdisciplinary sustainability-focused research and innovations is growing rapidly. International structural support for the growth of these communities lags behind the importance and need in these areas.

PROPOSED SOLUTION: A FUTURE EARTH SOCIETY

Future Earth was set up in part to address this challenge, to facilitate transdisciplinary research and innovation to accelerate transformations to global sustainability. To date, we have done this through the creation of the Knowledge Action Networks (KANs), through specific projects and funding opportunities, and through co-designing research calls for the Belmont Forum. While these are all powerful avenues of change, they are not enough. We need to break down barriers, broaden our reach, and create avenues to facilitate, nurture, and reward collaborations across disciplines and sectors.

To meet this challenge, Future Earth proposes establishing an individual membership-based professional society. A professional society for global sustainability scientists and innovators would 1) facilitate

i A key element of many of the most successful and useful societies is the efforts they make to continuously engage academics and researchers, the public sector, and large private sector communities. This keeps research relevant and provides funding for both the research and governance sectors. In fields such as agriculture, livestock, and research/industrial chemistry these linkages have been vital to linking both basic and applied communities through extension officers and services.

ii Nature Sustainability, Global Sustainability, Sustainability, On sustainability, Sustainability Science, PNAS sustainability science

transdisciplinary research and support a growing multidisciplinary and cross-sectoral community focused on solutions to global sustainability; 2) break down existing barriers in academia by elevating the collective voice of this burgeoning sector; and 3) provide a structure through which researchers and innovators across the globe can more rapidly pursue the transdisciplinary action-oriented research needed to accelerate transformations to global sustainability.

WHY FUTURE EARTH

Future Earth is well positioned to build this much needed professional society and doing so would help advance Future Earth's mission. Collectively, we have thousands of scientists distributed across the globe, powering scores of Global Research Projects and Knowledge Action Networks, building national and regional communities, and all working on global change and sustainability research and innovation. Our communities span the full spectrum of sustainability science, we already have a robust digital architecture to support memberships, and our close partner, the Belmont Forum, is willing to co-sponsor the convening function of the society. Future Earth is one of the few networks in the world that could lead the creation of such a professional society.

IMPLICATIONS FOR FUTURE EARTH'S EXISTING PROGRAMS

The membership society would not change the Future Earth Secretariat's core role in facilitating international collaborations of researchers, including the GRPs and KANs, seeking to understand and develop solutions to global sustainability challenges. It would, however, provide a stronger mechanism through which to engage new partners and sponsors, and a scaffold to better support and grow our community. An efficient professional society would provide a parallel, independently funded structure to strengthen Future Earth's existing programs and expand support and rewards for transdisciplinary research and innovation. Specifically, a professional society would help to:

- Provide a single comprehensive membership-based scaffold for KANs and interested GRPs to manage, communicate and mobilize members, through a standard section and chapter model.
- Give KANs and participating GRPs a structured voice in the governance of the society and the organization and content of the regular society convening.
- Provide a conduit for individuals, organizations and research and innovation communities wanting to join and participate in Future Earth, thus expanding the geographical, disciplinary and sectoral scope reach of our community.
- Amplify Future Earth's visibility, credibility and legitimacy among more diverse communities, through a membership society which is a well-recognized structure across sectors and that can facilitate greater cross-sector dialogue.
- Provide a clear engagement mechanism for private sector participation within Future Earth activities.
- Establish a longer-term business model for impact and financial sustainability for the organization and its community.
- Support the development of global mechanisms to breakdown institutional barriers for researchers working across disciplines and with decision-makers.

BENEFITS TO FUTURE EARTH SOCIETY MEMBERS

Members joining Future Earth would likely receive the following benefits (others to be further explored and defined).

1) Convening: We are exploring a collaboration with the Belmont Forum to set up an annual Sustainability Research and Innovation Conference series. Our aim is to make this the annual conference of sustainability research and innovation professionals and ultimately the marquee event for sustainability communities more broadly. Members of the society would get access to these convenings at a steep discount, encouraging society membership.
2) Communications and Publications: The award-winning Anthropocene Magazine would become a benefit of membership upon joining the society. We will also seek to complement this with an online platform for a research and innovation issue brief on a topic relevant to integrated/systems approaches to the SDGs, and eventually a peer-reviewed journal for sustainability research and innovation.

3) Capacity Building: The annual sustainability science and innovation conference will provide a venue and format to explore different transdisciplinary methods from around the world and share experience in curriculum development, while supporting early career professionals in sustainability.

4) Access to a platform of opportunities: Members would be able to access opportunities unique to Future Earth such as research calls, funding and position announcements, expert panels, member networks, transformative research and innovation projects.

HOW THE SOCIETY WOULD BE SET UP

The society will be a project of Future Earth, advanced in close collaboration with the Belmont Forum, and working closely with our partners inside and outside of the Governing Council. Core partners to this venture will include multilateral organizations such as UNEA, UNEP, UNESCO, and UNDP, International unions and networks including ISC, Earth League, SDSN, TDnet and others, major research centers and universities such as UNU and SRC, and regional transdisciplinary capacity building partners such as START, the Leopold Leadership Program, and IAI. Secretariat staff have already had initial discussions with many of these groups who have expressed interest in participating in building this society. The society will not be developed as a new organization parallel to Future Earth but rather an initiative of and entry point to Future Earth. The Future Earth Society will integrate the existing community of KANs, GRPs, Regions and National Structures, provide clear access points to others who want to engage, and provide a venue to increase the reach and diversity of Future Earth work. In turn, this structure should provide new network/partnership opportunities to current Future Earth communities across the research-to-action spectrum.

FINANCE

The Future Earth Society's sources of revenue will include individual membership dues, conference registration fees, institutional sponsors, grants and donations, and revenues from publications. The expectation is that initially, membership fees would only cover society start-up fees but eventually, it could provide some base funding for research collaboration support.

KEY ELEMENTS AND FINAL THOUGHTS

This concept has been refined over the past two years through iterative conversations and the following set of key elements have been identified. We present these as a preliminary set of principles for the establishment of a Future Earth Society that should:

- Be multi-sector, not limited to academia, inclusive to decision communities, innovation communities and boundary organizations from across sectors.
- Respect and amplify existing efforts and conversations
- Create a 'home turf' for the sustainability community and strengthen the sense of identity for sustainability scientists, scholars and practitioners
- Be inclusive of the full range of sustainability challenges (biodiversity, cities, food, energy, climate, oceans, land use, governance etc.), and approaches, disciplines, and sectors needed to address those challenges.
- Support a Knowledge-to-Transformation agenda that speeds the pace of change, and embed a sense of urgency and an impact focus throughout its DNA
- Put diversity (culture, ethnicity, geography, LGBTQ+, as well as sector and discipline) at the heart of the effort, and acknowledge the role and importance of justice, power, and 'sustainability for who' within the effort.
- Support the next generation of sustainability leaders and provide a home to emerging sustainability scholars and practitioners.
- Include space for fierce advocacy for sustainability scholarship and knowledge-to-action, for sustainability.
- Have a clear mission and vision that allows strong priority-setting and clear goals.

DISCUSSION QUESTIONS

1. What are the barriers you face in working in sustainability research and innovation and how should a professional society structure be established to maximize its capacity to break down those barriers?
2. What key factors should be considered so that we can collectively maximize the benefits of such a structure to the GRPs, KANs, Regions or National Structures you are involved in?

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