The Earth Commission

Terms of Reference

Approved April 2019

Background

Human activities are accelerating changes in the Earth system at a scale and pace that is pushing the planet out of a safe operating space for humanity. Urgent action is needed to slow, and even stop, the change. While the UN 2030 Agenda with the Sustainable Development Goals (SDGs) provides a framework to address this challenge, governments, business and civil society working to achieve the SDGs often lack access to the latest scientific knowledge to inform their decisions. One of the missing pieces are clear, scientific targets for maintaining the Earth system in a stable state, and safeguarding Earth's life-support systems. The science behind Earth system targets, associated with risk assessments and uncertainty ranges, are a prerequisite for co-developing Science-Based Targets (SBTs) for the Earth system[1] with multiple stakeholders, which can be operationalised across society. To set SBTs the world needs a credible and accessible global synthesis of the state of science in providing a quantitative assessment of sustainable boundary conditions for the Earth system, with uncertainty and risks within and across biological, physical and human systems.

These insights (Nakicenovic et al., 2016) provided the impetus for the 2016 launch of the Global Commons Initiative by six organisations, the Global Environmental Facility (GEF), International Institute of Applied Systems Analysis (IIASA), International Union for Conservation of Nature (IUCN), Stockholm Resilience Centre (SRC), World Economic Forum (WEF), and World Resources Institute (WRI). This international initiative is dedicated to revitalising the global commons – the land, water and atmosphere we share, and the ecosystems and species they host – in ways that safeguard a stable and resilient Earth system, able to provide for human well-being and development.

An urgent priority identified by the Global Commons Initiative was to underpin the establishment of science-based targets for the Earth system, and to disaggregate them into specific, voluntary targets for entities such as companies, cities, and countries. The initiative invited Future Earth, the world's largest network of sustainability scientists, to establish an

[1] With Science-Based Targets for the Earth system we consider targets that go beyond climate to address all environmental processes and systems, e.g., land, water, and biodiversity, that regulate the stability and resilience of the Planet. Science-based targets derive from multi-stakeholder dialogues, are based on science, and adapted to different scales and sectors. With the Earth system we mean the entire coupled geosphere and biosphere system on Earth, which incorporates systems (e.g., ecosystems) and processes (e.g., the water cycle) that operates at different scales from local to global.

Earth Commission to provide the scientific basis for the setting of science-based targets for the whole Earth system.

A planetary science-based target of stabilizing the global mean temperature well below 2°C has already been established for climate. This target is based on science assessed and synthesised by the Intergovernmental Panel on Climate Change (IPCC) but was defined and selected through an international policy process of the United Nations Framework Convention on Climate Change, resulting in the Paris Agreement.

In recent years, work has been done to disaggregate this planetary target, based on the extent of the contribution of a given entity or sector towards causing a major planetary concern (e.g. CO_2 emissions by a given company), in turn, helping to define sector- or company-specific targets.

Recognising the need to define '2°C equivalents' for the entire Earth system, and building from the strong climate stance taken by the global business community,[2] the Global Commons Initiative established a process to support the development of integrated, science-based targets for Earth's systems beyond climate, leading to specific science-based targets for entities such as companies, cities and countries through multi-stakeholder engagement. The resulting initiative is composed of three key components, 1) the Earth Commission which conducts a scientific synthesis to underpin the setting of science-based targets, 2) a Science-Based Targets Network, to develop and implement science-based targets in companies, cities and nations, and 3) Earth HQ, a professional media platform to support this effort. The initiative is being implemented by an alliance of more than 20 partners. This document specifically outlines the terms of reference for the first component, the Earth Commission.

Earth system targets for planetary stewardship in the Anthropocene

Three strands of scientific advancements justify the need for an Earth Commission (Nakicenovic et al., 2016). First, there is evidence that humanity has entered a new geological epoch, the Anthropocene, where human pressures, after 70 years of exponential rise, are now the dominating force of change on the entire Earth system (Crutzen 2002). The human pressures on Earth are now so large, we are hitting the ceiling of hard-wired biophysical processes that regulate the state of the Earth system (Steffen et al. 2004), and can no longer exclude pushing the Earth system away from the relatively stable inter-glacial Holocene state Earth has resided in since the last Ice-Age some 12,000 years ago (Rockström et al. 2009).

Secondly, the advancements in Earth system science, showing not only that interactions between the different components and processes - the biosphere, the geosphere, the

[2] Climate initiatives include the UN Global Compact, the Carbon Disclosure Project, (CDP) and the Science-Based Targets Initiative for climate (a partnership of WRI, WWF, CDP and We Mean Business). The World Business Council for Sustainable Development (WBCSD), also aimed to define specific science-based targets for planetary boundaries in their Action2020 agenda.

hydrosphere, the cryosphere, the atmosphere, and the stratosphere - regulate the state of the planet, the Earth system is also characterised by feedback dynamics that determine its stability domain, where shifts in feedbacks and interactions can push the Earth system across tipping points/tipping elements, abruptly and irreversibly altering the state of the entire system (Lenton et al. 2008, Ciais et al. 2013, Steffen et al. 2018). During the past 70 years, the Earth system has been buffering the effects of Anthropogenic pressures (such as the biosphere taking up ~50 % of human carbon emissions), contributing to keeping the Earth system in its relatively stable Holocene state. The scientific evidence over the past decade provides indications of a gradual loss of Earth resilience resulting in weaker or even directional shifts (from dampening to reinforcing) in biosphere and cryosphere feedbacks, providing early warning signals that the Earth system is shifting from a state that - on aggregate - dampens human pressures to a state that self-reinforces a trajectory away from a (for humanity) desirable and manageable inter-glacial Holocene state (Steffen et al. 2018).

Thirdly, humanity is not only a dominant force of change on Earth, but also embedded in the social-ecological fabric of the Anthropocene. The future for humanity on Earth requires - as is manifested in the UN 2030 Agenda with its 17 SDGs - a truly integrated development path, connecting the health of people and planet. The world is currently projected to embark on the 4th industrial revolution (technological transformations ranging from artificial intelligence to robotics, molecular biology and nanotechnology), with continued exponential rise in world economic growth. There is a rising recognition and strong scientific support that the 4th industrial revolution must operate within the biophysical safe operating space of a stable Earth system. For climate, the Paris Agreement provides a planetary science-based target (SBT) for industry, societies and humanity at large (staying 'well below' 2 degrees Celsius, aiming at 1.5 degrees Celsius). Despite this achievement, we lack planetary science-based targets for the entire Earth system, which means that we are in fact allowing technological innovations and economic growth to evolve (along exponentially rising trajectories) without any integrated scientific guidance that provides the desirable trajectories for world development.

If the current development trajectory is allowed to continue - without scientific guardrails for a stable Earth system - the achievement of the UN 2030 Agenda will be jeopardized. Global policy, in some cases, lacks a credible and accessible analysis of the biophysical conditions for reaching the politically agreed SDGs. Planetary science-based targets for Earth stability can provide this missing piece.

Just like the planetary science-based target for climate (stay well below 2 and aim for 1.5 degrees Celsius), is translated to a global carbon budget, which can be (through different methodologies) allocated to different geographic scales and sectors in society, similar scaling efforts must be done for the other Earth system processes and systems that require science-based targets. The Earth Commission will provide scientific definitions (when needed) for quantification of boundary conditions at different sub-system scales, and will provide scientific support for scaling methodologies.

However, the science for achieving the SDGs appears incomplete and inaccessible to key stakeholders. The challenge is to formulate the socio-biophysical conditions for a stable Earth system in a way which can be scaled and made operational by a multitude of actors, equivalent to the Paris climate change target.

The Earth Commission in the context of existing global assessments and intergovernmental processes

It is important to recognize that several global scientific assessments have been performed over the past decades, ranging from biodiversity (e.g. the Millennium Ecosystem Assessment and the ongoing global assessment of biodiversity and ecosystem services of IPBES) and climate (IPCC) to global water resources (e.g. WWAP) and energy (Global Energy Assessment). The Earth Commission is the first attempt to conduct a global scientific synthesis taking an integrated Earth system approach, synthesising our current state of knowledge on the interactions between systems and processes.

It is also necessary to set this work in the context of other global targets set through intergovernmental processes, the most important being the SDGs. These 17 goals encompass 169 targets; the degree to which both the goals themselves and the targets are science-based, varies. Any global science-based targets that emerge from the work of the Earth Commission must therefore align with relevant frameworks and initiatives such as the SDGs and the Aichi biodiversity targets.

Objectives

The core scientific objective of the Earth Commission is to provide a state-of-the-art synthesis of the quantitative boundary conditions (with uncertainty ranges) for the biophysical processes and systems that regulate the stability and resilience of the Earth system, securing continued functioning life support systems (e.g., for water, land, oceans and biodiversity). This synthesis will inform the setting of science-based targets for the Earth system.

The Earth Commission will also synthesise and assess knowledge about the levers of transformation that can support transition towards a sustainable world. The Commission will also recommend metrics to measure progress towards the achievement of targets. The synthesis report will inform target-setting efforts by the Science Based Targets Network.

Analyses will be undertaken at the relevant geographical scale (e.g. global, regional, local, or watershed levels) and connected at the global level, acknowledging that global scale targets are not relevant for all components of the Earth System. In some cases, the scientific evidence might not allow for the definition of target ranges, in which case the Commission will synthesise the risks related to different scenarios of pressures or drivers.

In areas with intergovernmental processes in place, such as the CBD for biodiversity or UNCCD for land on UNCLOS for oceans, the Commission’s work will inform the setting of

science-based targets developed through those processes. In areas without established processes, the proposed target ranges and risk assessments of the Earth Commission will inform the methodologies for target setting developed by the Science Based Target Network.

Specific Objectives

1. The Earth Commission will harness natural and social science expertise to produce an overarching scientific synthesis report that will be peer-reviewed and published as an open access article in a scientific journal. As the scientific evidence evolves, subsequent reports may be published following the first overarching report.
2. The syntheses should provide the scientific basis for establishing targets that are measurable and usable by a large range of stakeholders such as policy-makers and businesses.
3. Working groups of experts focusing on particular sub-systems will be recommended by the Commission to deal with cross-cutting issues and to interface with the Science-Based Targets Network's Issue Hubs. Currently, the Issue Hubs cover biodiversity, freshwater, ocean, land, climate and cities.
4. The Earth Commission and its working groups will draw on existing literature and knowledge from a range of sources, including scientific literature, grey literature and indigenous and local knowledge. Additional reports and articles emerging from the Earth Commission and its working groups will be peer-reviewed and published as open access in scientific journals.
5. Commissioners and working group members will also present insights throughout the evolution of the reports at relevant intergovernmental fora and to the Science-Based Targets Network.

The Scientific Secretariat

1. The scientific secretariat of the Earth Commission will be hosted by Future Earth in collaboration with the Potsdam Institute of Climate Impact Research (PIK) and the International Institute of Applied Systems Analysis (IIASA).
2. The scientific secretariat will lead the nomination process for members of the Earth Commission by:
    a. Conducting an open and transparent call for nominations; and
    b. Synthesising the nominations and identifying a shortlist of candidates based on established selection criteria and considering overall balances by gender, expertise, disciplines, career stage and geography.
3. Support the work of the members of the Commission by organising their meetings and providing scientific support (e.g. research, writing and literature access). The secretariat will raise funds to support the travel of Commissioners to meetings to conduct their work.
4. Support the process of publication (peer review and liaising with the publisher).

5. Facilitate regular and effective interactions with the Science-Based Targets Network's Issue Hubs to ensure that the Earth Commission and the Science-Based Targets Network mutually support each other.
6. Provide professional communications support for the Commission reports, their connection with the Science Based Targets Network and integration with the Earth HQ mobilisation work.

Governance

1. Terms of Reference for the Earth Commission. The organisations constituting the Global Commons Initiative (GEF, IUCN, IIASA, SRC, WEF and WRI) and Future Earth have agreed by consensus on these Terms of Reference for the Earth Commission.

2. Appointment of scientific experts for the Earth Commission. A call for nominations of experts to serve in the Earth Commission will be communicated both publicly and through the networks of the principal organisations and Future Earth. On receipt of nominations, the Earth Commission scientific secretariat will put forward a proposal, including chairs or co-chairs. This proposal will consist of up to 20 experts, selected based on their scientific excellence, expertise in integrative and interdisciplinary research, as well as active participation in international collaboration.
The expert selection will ensure disciplinary, geographic, expertise, career stage and gender balance. The proposal for the Earth Commission is presented to Future Earth for pre-approval. The resulting proposal is presented to the scientific organisations of the Global Commons Initiative (GEF, IUCN, IIASA, SRC and WRI) for final approval.

3. Appointment of scientific experts for Working Groups. Working groups will each consist of up to 20 internationally recognised experts, selected to cover essential disciplines related to the processes and systems under review, including cross-cutting topics. Members of Working Groups will be proposed by the Commissioners and the scientific secretariat and approved by Future Earth.

Timeline and composition of groups

1. The Earth Commission will be established in mid 2019. The first overarching synthesis report will be completed by mid 2021. Other reports could follow in a staggered approach.
2. The Earth Commission will consist of up to 20 internationally recognised experts in Earth system science and global sustainability.
3. The working groups will be assembled based on need and available funding, consisting of up to 20 internationally recognised experts.

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