



# ONE PLANET APPROACHES

**Methodology Mapping and Pathways Forward**

**EXECUTIVE SUMMARY**  
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# COLOPHON

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# FOREWORD

Planetary changes such as rising global temperatures and persisting downward trends in biodiversity show that humanity is placing increasing pressure on the natural resources and the resilience of our planet. The research around planetary boundaries by Rockström and Steffen et al. reveals that on a global level, the boundaries for biodiversity, phosphorus and nitrogen flow have already been breached; whereas those for land system change and climate are at risk of irreversible and abrupt environmental change. The world community has acknowledged the need for action and adopted the Sustainable Development Goals (SDGs) to address these issues.

We are convinced that ensuring a healthy and resilient planet for generations to come requires that human development is decoupled from environmental degradation. Moreover, this requires a fundamental transformation that involves a paradigm shift towards an economy that uses natural resources in an efficient and fair manner, in order to preserve the habitability and resilience of this planet for future generations. Unfortunately, even though we see many positive developments towards sustainable consumption and production, a crucial economic transition still awaits. One reason for this is that incremental changes made by many different actors cumulatively do not accomplish the changes needed to reverse the breach of our planetary boundaries. We need to measure success against the boundaries of our planet and transform the way we manage natural resources from what is workable to what is necessary.

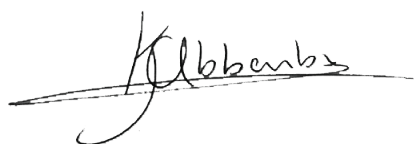
There is a strong business case to invest in pathways that are compatible with the limits of our planet. Many companies have developed approaches and strategies to measure and value their impact, define environmental objectives and improve sustainability practices. They include, for example, accounting initiatives such as the Science Based Target initiative (SBT), the Natural

Capital Protocol (NCP), and the Global Reporting Initiative (GRI), as well as certification programs for responsible production, such as the Roundtables on Responsible Soy or on Sustainable Palm Oil (RTRS, RSPO) and the Forest and Marine Stewardship Councils (FSC, MSC). These initiatives are all important elements on the path towards more sustainable business models.

Nevertheless, maintaining the habitability and resilience of this planet for future generations requires the need to address the most relevant issues and set targets at sufficient ambition levels. In order to find solutions to these questions, WWF has started the One Planet Thinking initiative based on the planetary boundaries concept. It seeks to unite a broad alliance of partners from business, science, civil society, and governments under the common vision of a world where humanity lives thrives within the planetary boundaries. The initiative aims to support companies throughout the economy to seize business opportunities while staying within the planetary boundaries by developing methodologies and approaches for setting targets and measuring progress.

This report maps and analyzes many existing One Planet Approaches. It acknowledges what is already available and identifies scientific gaps and necessary pathways for further development.

All relevant stakeholders – the research community, governments, civil society, and companies – have to act together in order to set in motion the necessary transformation. We invite the relevant communities under the roof of One Planet Thinking to implement and foster further discussions to make advancements. One Planet Thinking provides companies and governments with the tools to undertake the complex but highly urgent task of setting targets and progressing within the safe operating space of our planet.



Katinka Abbenbroek,  
**WWF. DIRECTOR OF ONE PLANET THINKING**







# EXECUTIVE SUMMARY

## THE NEED FOR ONE PLANET APPROACHES

Anthropogenic impacts are threatening to undermine the continued functioning of the Earth. Through our actions, humans are encroaching upon several boundaries that may lead to planetary changes so great we refer to them as “regime shifts” (Will Steffen, Richardson, et al., 2015). Despite the many sustainability initiatives currently underway internationally, it is clear that we are failing to halt some of the more concerning global trends, including climate change and biodiversity loss. This suggests that we are not taking enough action, or not acting in the right ways, in order to sufficiently mitigate the impacts of our behavior on the environment.

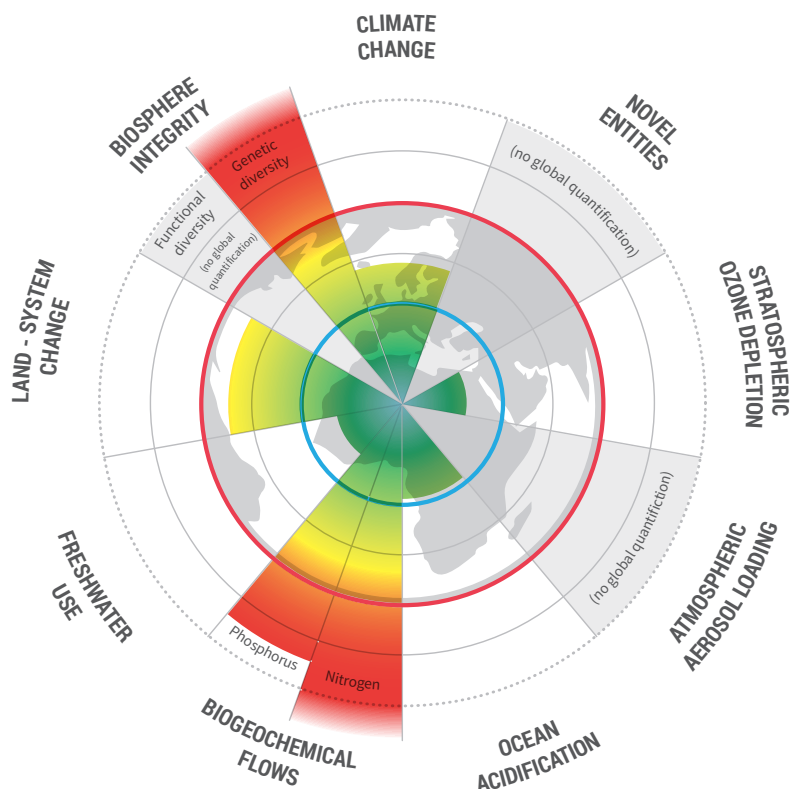
To address this problem, there is an urgent need to measure and communicate the level of individual human impact relative to larger scale planetary boundaries and systemic tipping points. Organizations and governments need to be given consistent and accurate feedback about whether the magnitude of their impact-mitigation efforts is sufficient to halt large-scale planetary change.

Since 2009, the Planetary Boundaries (PBs) framework (Rockström, Steffen, Noone, Chapin, et al., 2009) has become the most commonly used scientific framework for understanding environmental degradation relative to critical Earth system limits.

Over the last 10 years, a broad spectrum of methodologies, tools, programs, and action plans have emerged all of which, like the PBs, share the common characteristic of relating human impacts to critical planetary limits. In this report, we refer to this family of approaches as One Planet Approaches (OPAs).

**One Planet Approaches** are the complete family of tools, methodologies, frameworks, programs, and action plans, which recognize the need to **measure and reduce human impact in relation to the absolute boundaries of the Earth system**.

Most OPAs are at a research or theoretical level, and very few have been applied in a real-world setting. The overarching purpose of this study is to present and evaluate the current body of OPAs in order to describe the most reasonable pathways for bringing them into practice, particularly in the context of companies.



Source: Steffen et al. Planetary Boundaries: Guiding human development on a changing planet, Science, 16 January 2015.  
Design: Globaia



## THE OPA FRAMEWORK

In our research, we reviewed over 60 One Planet Approaches, mapping them based on their attributes and functionality. Through this process, we derived an 8-step framework that describes the full set of actions needed to translate an Earth system boundary to a level that is relevant for a decision-making agent (e.g., a government or company).

Each of the 8 steps can be completed in a different way, and different approaches are better suited to different contexts; applications for companies and countries will be different. We also evaluate the strengths and weaknesses of different approaches and describe how they might best be combined for application in different contexts.

## A REVIEW OF ONE PLANET APPROACHES: KEY RECOMMENDATIONS

At each of the 8 steps of our proposed OPA framework, we offer some recommendations for expansion, improvement, or pathways forward towards further development of the OPA methods currently applied.

01

### DEFINING THE SUSTAINABILITY OBJECTIVE

This step encodes the rationale behind setting a boundary or defining an operating space. It asks the question, “What are we trying to protect by establishing an impact boundary?”

A majority of OPAs, including the Stockholm Resilience Centre’s Planetary Boundaries, are built on a minimum viable objective of “maintaining planetary habitability for humans.”

#### KEY RECOMMENDATIONS:

Based on our research we recommend defining a more ambitious and holistic starting objective that additionally includes:

- » Regional targets to complement global ones
- » Socioeconomic targets like human access to freshwater, food, and ecosystem services, as well as considerations of intergenerational equity
- » Preservation of biospheric integrity as of inherent rather than utilitarian value, striving for zero biodiversity loss
- » The maintenance of system resilience

Adding these criteria as part of the rationale to set the boundaries will undoubtedly make them more stringent and potentially more challenging to apply, but the resulting program will be less likely to result in insufficient action or new externalities down the line.

02

### IDENTIFYING THE UNDERLYING SYSTEM PROCESSES

The second step of the OPA framework asks, “What Earth system processes are related to the defined objectives?” In other words, if our objective is planetary habitability, what systems have to be kept stable to maintain that goal?

The Planetary Boundaries framework identifies 9 key systems that need to be kept in a safe range (climate change, ocean acidification, stratospheric ozone depletion, biogeochemical flows, freshwater use, land use changes, biospheric integrity, aerosol loading in the atmosphere, and chemical pollution) to meet this objective.

#### KEY RECOMMENDATIONS:

We propose using modified and additional control variables at global and regional levels. These are all defined as flows that can be used for target setting and consider regional dynamics to preserve biospheric integrity. Because not all of these boundaries are adequately defined, and there are knowledge gaps in many of these areas, we recommend that companies place their greatest efforts on bringing their activities within planetary capacity for the boundaries that are already most transgressed (with a particular emphasis on biospheric integrity).

03

### MAPPING THE RELEVANT SYSTEM DYNAMICS

Once the relevant system processes are identified, we must map out how changes in key control variables (e.g., concentrations of atmospheric carbon) impact the functioning of the system.

#### KEY RECOMMENDATIONS:

Many gaps remain in our understanding of Earth system dynamics, and this is an active field of research, where current trends include the inclusion of social-ecological systems and moving towards regionalized system modeling (see Table 7 for an overview of main knowledge gaps for different Earth system processes).



## 04

DEFINING BOUNDARIES OR  
OPERATING SPACE

To define a “safe operating space,” or stable range for any of the key systems that have been identified, we need to understand the location of tipping points within the system. A tipping point has been crossed when a system enters a significantly different state as a result of a small alteration. Well-known tipping elements in the climate system include the Greenland ice sheet and the Atlantic thermohaline circulation. A climate change boundary of 2° C was set by the United Nations and the International Panel on Climate Change to avoid triggering these elements.

## KEY RECOMMENDATIONS:

Through our review, we note that one of the more significant shortcomings of current OPAs is the lack of sufficient knowledge on tipping points, and the lack of adequate methods to consistently and accurately identify them: this is an essential continued scientific agenda point. Our recommendations for boundary setting within OPAs include:

- » Because setting a boundary implies defining a level of socially acceptable risk, we recommend that boundary setting processes include appropriate social consultations.
- » Boundaries should be set at both global and regional levels. Additional impact areas roughly in line with the categories selected in current Life Cycle Assessment frameworks are particularly relevant to regional system stability (e.g., biomass extraction, soil acidification, ecotoxicity). If multiple boundaries are set for one system (a global and a regional boundary), then the stricter of the two boundaries should generally be applied.
- » The dynamic nature of the boundaries should be taken into account, with some boundaries requiring reassessment at more frequent intervals than others. For example, regional water boundaries may need to be reassessed multiple times per year to account for shifts in local rainfall and water demand. Ideally, we should develop a central database to monitor the state of all system boundaries across the world, to put an agent’s impact into the context of carrying capacity.
- » To make the boundaries actionable, they must also be expressed in terms of flows or stocks – units that can be quantified and linked to an agent’s activities. Many of the Planetary Boundaries are expressed in terms of states (for example, parts per million of CO<sub>2</sub> in the atmosphere), where actors need to understand directly how much CO<sub>2</sub> they can emit over time.

We recommend the development of an online central platform that serves as a “system boundary” database. This database would monitor and report boundary positions (and available operating space) in a geo-referenced and disaggregated manner for all impact categories, at the adequate regional levels. A first step towards this platform would be geographically defining the regional boundaries for all impact categories, a process that is already underway for some systems. For example, information for water basins is readily available.

## 05

DETERMINING THE EXTENT  
OF THE AGENT’S ACTIVITIES

Now that the boundaries have been defined, we need to start understanding how the behavior of target agents (like companies or governments) impinges upon these boundaries.

## KEY RECOMMENDATIONS

In the context of implementing OPAs for companies, it is critical to consider impacts across the whole supply chain, all over the world, and not only those that are bound to a specific territory. Thus, data must ideally be collected at each of the points where activities take place along the global chain.

## 06

QUANTIFYING THE FLOWS ATTRIBUTED  
TO THE AGENT’S ACTIVITIES

In this step, we inventorize all the flows related to a company’s activities, including its supply chains and the end of life of its products.

## KEY RECOMMENDATIONS

Trade and statistical information can help to complement data gaps in supply chain information. Different tools and initiatives are already under development to facilitate this process, but this is an area where action is needed. In the meantime, companies should increase their efforts to collect reliable and georeferenced data for their products’ life cycle.



This information can then be translated to actual environmental impact. Most approaches use databases from LCA and/or Footprint accounting methodologies to this end. However, the same environmental pressure will have different impacts in different contexts. To account for this, LCA databases need to be regionalized and consider the actual operating available in each area.

### KEY RECOMMENDATIONS

The development of regionalized LCA frameworks can be an important tool in this regard, but in an ideal state companies would have access to the equivalent of a dynamic impact dashboard that would show close to real-time transgression of boundaries in different geographic contexts along their supply chains.

We recommend the development of such a dashboard, connecting to the boundaries database described before. This tool should serve, in particular, to avoid burden shifting between different regions and/or impact categories and would contextualize the agent's impacts to the operating space available at each region of activities. The dashboard would show in a glimpse a company's contribution to each impact category, guiding attention to the most transgressed boundaries and comparing the company's impact intensity to that of best practices in the sector.

The final step of operationalizing any One Planet Approach is translating how much of the available safe operating space can be used by a given actor. All methodologies choose a principle upon which to base the allocation of operating space:

- » Egalitarian approaches aim at allocating an equal share of impact allowance or of access to life quality to every person on the planet or in a region.
- » Approaches based on economic throughput use measures such as GDP or production volume as proxies of value, and allocate budgets based on them.

- » Approaches based on economic capacity and efficiency result in differentiated allocations depending on the capacity to mitigate impacts or aim at achieving an economically optimal allocation.
- » Finally, historical approaches such as the polluter pays principle and the grandfathering principle, take into account responsibility for previous impacts or the need for a continuous access to resources.

### KEY RECOMMENDATIONS

Allocation remains a technically and ethically challenging endeavor. The socially ideal principle of egalitarianism is currently impossible to implement in the company context. Considering all feasible alternatives, the best way forward is for companies to establish impact ceilings based on demand trends, sectoral performance and best practices, and costs of impact abatement. The development of these impact ceilings and target setting approaches should ideally be completed under the stewardship of civil society organizations.

For many impacts (e.g., biodiversity loss, nitrogen emissions, the emissions of novel entities), we should ultimately be striving for net positive or no-net loss impact rather than setting targets for "allowable impact." In many cases, technological advancements and alternative system designs should feasibly allow for a near complete elimination of impact (as has occurred to a large extent with Ozone Depleting Substances), though the cost of technological development and switching will certainly play a significant role in the speed of these potential transitions.

Moreover, we recommend the development of a Code of Behavior for One Planet Companies, which would provide decision-making guidance for creating structural shifts towards sustainability (e.g., engaging with underperforming suppliers to encourage improvement rather than simply switching to lower-impact options).

In the long term, we need decentralized allocation mechanisms: market based solutions that internalize costs and provide full information transparently, in combination with redistribution mechanisms to guarantee equal access or life quality to all people, regardless of their actual income. This requires a long-term commitment from governments and society and extensive research and piloting, but we need to start moving in this direction.

## NEXT STEPS AND PRACTICAL APPLICATIONS

There are a number of actions and knowledge gaps that need to be taken care of by multiple stakeholders to implement OPAs at the necessary scale.



### Companies wishing to implement One Planet Approaches can take immediate action by:

- » Joining and supporting initiatives based on OPA philosophies, such as the Science Based Targets Initiative for setting greenhouse emissions goals or the Natural Capital Protocol to aid in decision-making; supporting the development of Context-Based Water Stewardship and similar projects.
- » Developing data collection and management capacity by building out corporate data collection programs. Companies should pay particular attention to collecting spatially and contextually relevant data.
- » Identifying impact hotspots and priority actions within supply chains. These high impact areas should be related to known global or regional boundary transgressions so that companies can set goals in the highest areas of priority for their particular operations. This hotspot analysis can be done based on a materiality check.
- » Explicitly incorporate a One Planet mindset in corporate goal-setting and communications. Even if targets cannot be set relative to specific boundaries.



### Governments need to embed this process into development strategies and structurally support the development of One Planet Approaches:

- » Supporting the boundary setting process in a socially fair and inclusive way:
  - Formalizing and quantifying social access to commons and basic resources
  - Hosting dialogues between science and policy
- » Leading efforts towards economically efficient impact abatement
  - Considering and testing economic instruments – including taxes and trading schemes – at small schemes to gather lessons for future implementation
- » Supporting companies and scientists implementing OPA
  - Supporting research with statistical information and territorial mapping
  - As possible, encouraging these measures through financial or other incentives
- » Starting national implementations (a parallel process to the private-sector led initiative)



### The research community provides the knowledge base on which OPAs are built, as such scientists can play a role in:

- » Expanding our knowledge of the Earth system, in particular:
  - Defining regionalization maps - the spatial limits in which to assess boundaries for all regional impact systems
  - Focusing on biodiversity loss and habitat loss and degradation, which haven't been addressed as much as other impact categories in the context of boundary setting studies
  - Engaging the social dimensions of the Earth system and finding ways to include socioeconomic factors into the biophysical models
  - Developing impact accounting methods that take into account planetary capacity, such as the LCAbsolute initiative
- » Developing systems to continuously monitor the state of the planet with relation to these issues.



### Civil Society Organizations, like the WWF and IUCN, have a central role protecting the ambitious spirit of One Planet Approaches by:

- » Serving as mission keepers:
  - Challenging sustainability objectives to more than habitable levels: zero level biodiversity loss, zero-impact targets, etc.
  - Defending the rights of the biosphere, future generations, and unrepresented minorities in allocation exercises
- » Serving as agenda setters in OPA development:
  - Ideating ways to adapt and bring OPA to the primary sector (agriculture, raw material extraction)
  - Identifying and focusing on impact hotspots in terms of geography, supply chain, and sector
- » Supporting implementation and decision making:
  - Developing the One Planet Code of Behavior or similar decision-making sets of principles.
  - Developing tools for widespread implementation of OPA: OP boundaries database, impact dashboard, feasibility studies

Regardless of the remaining challenges with the practical implementation of OPAs, it is certain that they are already having a catalyzing effect on moving towards more sustainable practices through the narratives that they elicit. With proper design and further development, OPAs will be a critical tool in identifying priorities in our progression towards a genuinely sustainable future.





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