

Recommendations and Evidence from the Planetary Boundaries Initiative on the SDGs

1. The Planetary Boundaries Initiative (PBI) is a recently formed legal think-and-do tank aimed at building a safe and just space for the future sustainable development of society. It is concerned with providing governance that will protect the functioning of the planet's Earth system, and is thus making a number of suggestions relevant to this that are included below.
2. The planetary boundaries analysis has been put forward in various scientific papers, including the initial papers with Johan Rockström as lead author¹, and is now the subject of a major research programme based at the Stockholm Resilience Centre. This analysis provides a clear way of conceptualising and working towards quantifying the environmental thresholds and boundaries to secure future resilience for human societies. It is a human-centric concept, requiring normative judgements about the need to provide future stable environments within which humanity can flourish. It is a concept recognised by the UN Secretary General's progress report in which he refers to the Rockstrom report and says '*Globally, the pressure on ecosystems continues to increase, and loss of forests and biodiversity has continued, albeit at a decelerating rate. A recent scientific study suggests that the safe boundary may already have been exceeded in three areas: ecosystems, climate change and the nitrogen cycle.*'²
3. The 'planetary boundaries' concept responds to current scientific understanding of the functioning of the Earth System. Scientists now consider it possible to quantify the risk of crossing thresholds and tipping points which would lead to fundamental state changes with major implications for human societies. For a summary of the "planetary boundaries" analysis, see:
<http://www.nature.com/news/specials/planetaryboundaries/index.html>
4. In this evidence, we submit that the international community must agree on *the protection of the Earth System as a principal , overall priority for post-2015 Sustainable Development Goals.*
5. The principal protection of the Earth System is a natural progression to the existing international environmental framework and the Precautionary Principle as derived from Article 15 of the Rio

¹ Johan Rockstrom and others, "A safe operating space for humanity" *Nature*, vol. 461, No. 7263, pp. 472-475 (September 2009).

² Progress to date and remaining gaps in the implementation of the outcomes of the major summits in the area of sustainable development, as well as an analysis of the themes of the Conference, (para 19), Report of the Secretary General, 17-19 May [A/CONF.216/PC/2]

Declaration stating that: *"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."*

6 The need for a new kind of governance based on protection of the Earth system is also in line with the measures set out in Agenda 21, and in particular chapter 39 which states that the further development of international law on sustainable development is a basis for action, giving special attention to the delicate balance between environmental and developmental concerns; with the specific objective to *' To set priorities for future law-making on sustainable development at the global, regional or subregional level, with a view to enhancing the efficacy of international law in this field through, in particular, the integration of environmental and developmental concerns'*

7. The planetary boundaries approach is also needed for the establishment of the new narrative called for in the Rio+20 outcome document, the Future We Choose, in which the world's leaders are called upon to ensure *' responsible planetary stewardship by strengthening the multilateral assessments and institutions for sustainable development at all levels, from global to local, including all stakeholders, and taking an integrated approach to equity, the economy and the environment'*

8. In general terms, we argue that planetary integrity is maintained if the Earth system stays in the Holocene, but it is lost if human-induced stress reduces the resilience or robustness and Earth undergoes a regime shift into what some scientists describe as a new geological epoch termed the Anthropocene³. Scientists consider that at least three of the planetary boundaries have been exceeded already, namely the boundaries for climate, nitrogen and biodiversity

Why the need for a cross-cutting SDG goal on planetary boundaries

9. In our view, the post-2015 SDGs should give effect to the planetary boundaries framework as a cross-cutting goal, indicating the need to develop a set of metrics and indicators to measure progress. Research conducted on behalf of PBI (the Kim⁴ report) notes how goals for poverty eradication and environmental conservation often lead to different actions being taken to achieve the objective effectively and may even lead to contradictory outcomes, or problem shifting. The authors take two indicators, MDG 1 and MDG 7, "proportion of population below \$1 (PPP) per day" (Indicator 1.1) and "CO₂ emissions, total, per capita and per \$1 GDP (PPP)" (Indicator 7.2), and note that between 1990 and 2010, the proportion of population in extreme poverty in China was reduced from 60 to 12 per

³ See Professor Will Steffen presentation @ www.planetaryboundariesinitiative.org

⁴ Planetary Boundaries in Post-2015 Sustainable Development Goals: Safeguarding Ecological Integrity as a Priority Goal and a *Grundnorm* of International Law, Rakhyun E. Kim,^{1,3} Klaus Bosselmann,² Volker Mauerhofer¹ available @ www.planetaryboundariesinitiative.org

cent (United Nations 2013), but that much of the energy used to power growth was based on fossil fuels, and particularly coal.

10. It can be concluded that improving the performance in relation to one goal or target in isolation may come to constrain actions concerning another goal or target⁵. There have been arguments made for the principle (approach) of sustainable development to be considered as a cross-cutting goal. However, while we recognise the value in this, we suggest that this is not sufficient in and of itself; and that a cross-cutting goal for the protection of the Earth system is also needed. One of the difficulties with the sustainable development principle being that there is no clear guidance as yet on how to integrate the two competing interests of environmental conservation (sustainability) and socio-economic growth and equity (development).

11. In this way we base the approach to sustainable development on the need to recognise the biophysical stability of the Earth system as a whole so as to avoid causing further transgression of planetary thresholds and boundaries.

12. Further, we are concerned at how sustainable development approaches often lead to a form of 'problem shifting'. The Kim report provides the following examples:

'expanding biofuel crop plantations, while potentially contributing to reductions in "CO₂ emissions, total, per capita and per \$1 GDP (PPP)" (Indicator 7.2), will likely decrease the "proportion of land area covered by forest" (Indicator 7.1) (Danielsen et al. 2008; Fargione et al. 2008; Searchinger et al. 2008; Kim et al. 2009; Tilman et al. 2009; Yang et al. 2012; see also Mackey et al. 2013). Replacing hydrochlorofluorocarbons (HCFCs) with hydrofluorocarbons (HFCs) which has zero ozone depletion potential, while contributing to reducing the level of "consumption of ozone-depleting substances" (Indicator 7.3), exacerbate climate change because HFCs have a high global warming potential (Oberthür 2001; Velders et al. 2007).'

13. There are other types of problem shifting that are more structural within Multilateral Environmental Agreements (MEAs), such as a failure to govern the use of the oceans for climate change mitigation, leading to an increase in ocean acidification. Ocean acidification has been described by scientists as one boundary where there is a discernible biological threshold and tipping point.

14. For these reasons we conclude that there is a need for threats to the earth system and solutions to socio-economic development to be evaluated by reference to an overall goal focused on the integrity of the earth system. The need for integration of the three pillars of sustainable development is

⁵ Ibid, n.2. The authors argue that 'In systems terminology this is called the problem of suboptimization, where optimizing the result for each of the subsystems independently (i.e., goals, targets, or indicators) may actually suboptimize the performance of the overall system (Heylighen 1992). The principle of suboptimization explains why some targets are met (United Nations 2013), but the spirit of the MDGs is not.

already an agreed UN goal and an earth system approach would assist with its achievement. Thereafter further determination should be made of the interaction between existing MEAs, such as climate, ozone, and biodiversity regimes, with the overall objective of achieving integrity for the earth system. Further, the threats addressed and the solutions outlined by individual environmental institutions should be evaluated in relation to this *overall* goal. As the Kim report found, *'Individual institutions with more specific objectives are then bound by the priority goal, but given a degree of flexibility to self-organize and make mutual adjustments* (Galaz et al. 2012c).'

15. We recognise that there needs to be greater clarification of the concept of an 'Earth system' for governance purposes. One suggestion is that the term is defined by reference to notions of either 'ecological integrity' or by reference to 'the global commons' (or both) which would mean building on international legal principles concerned with the common heritage of mankind.

16. The UN Task Team has suggested that governance of the global commons may help establish future international cooperation between states. The Team says: *"establishing a target for the attainment of an inclusive and equitable system of global governance and governance of the global commons could be a way to develop and establish a global partnership in the post-2015 development agenda. Such a partnership could enhance the participation of developing countries in multilateral institutions, increase their representativeness and accountability, and lead to the establishment of a UN-led monitoring and accountability mechanism with a focus on equitable growth, environmental sustainability and peace and security."*⁶

17. However, the Kim report suggests that the earth system is defined by reference to the term 'ecological integrity' - noting that the term is one well understood in international environmental governance. The report states:

'most of the key international environmental soft law instruments, including the World Charter for Nature (1982), the Rio Declaration on Environment and Development (1992), the Agenda 21 (1992), the Draft International Covenant on Environment and Development (2000, 2004, 2010), the Earth Charter (2000), the Plan of Implementation of the World Summit on Sustainable Development (2002), and The Future We Want (2012) contain the notion of ecological integrity in their cores (Table 1; Kim and Bosselmann 2013). The Rio Declaration, which is arguably the most authoritative text in international environmental law, states in the preamble that the UN Conference on Environment and Development worked towards "international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system". Furthermore, one of its core principles obligates states to "cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem" (Principle 7).

⁶ http://www.un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/24_thinkpiece_global_governance.pdf

The planetary boundary concept in terms of socio-economic development

18. A set of goals and indicators would flow from the principal cross-cutting goal. These must be set within the context of achieving *integrity* for the earth system.

19. In our view integrity implies understanding the biophysical boundaries and thresholds of the earth system and applying normative judgements regarding a safe operating space for humanity. In terms of a safe operating space, however, we submit that this must be defined both within the notion of environmental planetary boundaries and social planetary boundaries.

20. The notion of “social planetary boundaries” has been developed by Kate Raworth⁷ and refers to the adoption of a social foundation or floor. She describes this as consisting of the eleven top social priorities identified by the world’s governments in the run-up to Rio+20. Examples of these priorities include social concerns such as health, income, jobs, energy and water. Raworth argues that falling below this social foundation lies unacceptable human deprivation such as hunger, ill-health and income poverty. Between social and planetary boundaries lies a space in which humanity can thrive, albeit that there is likely to be questions of how responsibility for that common space might still require differentiation between developed, emerging and developing nations.

21. In essence, the notion of a social floor requires a rethinking of development for the sake of GDP growth. Development is an overriding imperative for those countries where they have not achieved the eleven top social priorities outlined by Rio+20. Thereafter, Raworth points out that major improvements in equity can be gained with relatively little additional consumption if appropriately targeted on measures of well-being and levels of equity. For example, she argues that⁸ providing the additional calories needed by the 13 per cent of the world’s population facing hunger would require just 1 per cent of the current global food supply and bringing electricity to the 19 per cent of the world’s population who currently lack it could be achieved with less than a 1 per cent increase in global CO₂ emissions. Also, ending income poverty for the 21 per cent of the global population who live on less than \$1.25 a day would require just 0.2 per cent of global income.

Choosing goals for interactions that matter across the safe and just operating space

22. PBI considers that the following are boundaries where the interactions between environmental and socio-economic development are particularly relevant. These are: ocean acidification, freshwater use, biodiversity, nitrogen and phosphorus, land use, and climate change. This amounts to six of the nine boundaries (the others are ozone depletion, aerosol loading, and chemical pollution), including

⁷Kate Raworth @ <http://www.kateraworth.com/doughnut/>

⁸ See A Safe and Just Space for Humanity Oxfam Discussion Paper, February 2012

all three of the boundaries which are currently being exceeded (biodiversity, nitrogen and phosphorus, and climate change).

23. Thinking about food supply and security in relation to planetary boundaries shows in a particularly acute form the predicament the planet and its people are currently in. Many policies to increase food production would increase the degree to which the three currently exceeded boundaries will be exceeded in the future: for example, policies involving far more use of nitrogen-based fertilisers, far more extensive use of land for agriculture, or increased carbon emissions.

24. At the same time, many policies designed to ensure that human impacts on the environment stay within the boundaries would reduce food supply and make the food security situation worse. If humanity had either solely environmental or solely social problems to solve, the tasks ahead would be far more straightforward than they are. The difficulties we face arise from the need to address both sets of problems at the same time.

25. We envisage a two-fold approach. One is the establishment of a cross-cutting goal as set out above. This might require further institutional changes at an international level for certain MEAs, whereby agreements on climate change and biodiversity loss, or new agreements on nitrogen use and ocean acidification, set a total "budget" for each relevant factor, such as total carbon emissions, or total nitrogen use. This global budget would then be divided up between different countries taking social planetary boundaries into account. Targets or indicators could be set to reflect the determination of such budgets.

26. In order for national governments to be able to deliver on such goals this would have to be complemented by policies on food and agriculture which will enable each country to stay within its allocated segment of the global budget. This would amount simply to reflecting biophysical reality in governance and policy arrangements. Although it may take many years to put such a framework in place, it seems very clear to us that this is what is required, in order to reconcile human needs with environmental limits. The sooner that humanity can agree to do this, the more likely it is that we will be able to afford to make such a transition and contribute to human and planetary well-being

LAND USE AND BIODIVERSITY

27. The land use and biodiversity boundaries are very closely connected, and both have an obvious relevance for food supply. However to some extent the implications of these two different boundaries point in different directions for policy. We can think of land use by analogy with geopolitical competition for territory among major powers. Instead of that form of rivalry, we can think about competition between agriculture, urban uses (such as industry, housing and transport), and biodiversity-rich biomes such as forest. Although the global situation is of course far more

complex than this, we can say as an initial generalisation that biodiversity depends principally on 'wild land', and food supply principally on agriculture. To the extent that this is a valid generalisation, the implications are in conflict with each other.

28. In order to 'square the circle', we will need forms of agriculture which retain biodiversity, uses of wild land which help to sustain food production, and urban design which provides space for biodiversity and enables efficient distribution of food supplies. Probably most significantly, we also need forms of food production which are efficient in their use of land, so that land remains available for biodiversity. That in turn needs to be reflected in diet and consumption patterns, agriculture subsidy expenditure, and relative prices for different foods. . Overall this implies the need for a shift amongst relatively affluent consumers towards lower levels of consumption of meat, along with a transition to agro-ecology in which we make better use of such things as cover-cropping, mulching, integrated pest management, no-till and soil conservation practices, and organic agriculture, etc.

NITROGEN AND PHOSPHORUS

29. Nitrogen and phosphorus are being released into the environment to a dangerous extent, currently exceeding the relevant boundary. Excess nitrogen and phosphorus are over- fertilising lakes and seas, and acidifying soils. This is particularly a problem for food policy, because most of the excess nitrogen and phosphorus is derived from fertilisers, which have contributed enormously to the worldwide increase in food production over the past century or so. It is possible to argue that nitrogen- and phosphorus-based fertilisers are the principal reason why the pessimistic predictions made by Malthus concerning food production have so far proved false. In order to maintain this level of food output without increased environmental damage, fertilisers will need in future to be deployed in far more efficient ways. Keeping within both of these boundaries means making the right choices. If we can adopt appropriate practices we are likely to find that they can and will support each other. The healthier ecosystem we have, the more food we can produce and vice versa

30. According to the Global Partnership on Nutrient Management (GPNM), the excess use of nitrogen is leading to severe pollution of air, water, land and sea around the world, as well as contributing to climate change when emitted to air in the form of nitrous oxide. One of the most serious consequences of the excessive release of nitrogen to the environment is the eutrophication of freshwater and marine systems when it enters water in untreated sewage or run off from fertiliser use. This is currently having devastating impacts on mangroves and river deltas. Phosphorus is also contributing to eutrophication.

CLIMATE CHANGE AND OCEAN ACIDIFICATION

31. Climate change is a threat to food production, both through changing the distribution of climatic zones, and therefore the food that can be produced in different areas, and through extreme weather events, such as droughts. Both ocean acidification and climate change have the same principal cause: the emission of excessive quantities of carbon dioxide (along with nitrogen pollution in the form of nitrous oxide). Carbon dioxide in turn is produced partly through food production, and its processing, refrigeration, and distribution. Carbon dioxide levels in the atmosphere are also tending to rise because agriculture is reducing the amount of land available for forests which absorb CO₂.

32. A policy for food therefore has to be inseparable from a policy for climate change, even though much of the debate about climate change has focused on energy generation and other aspects, such as transport policy. As with biodiversity and land use, climate change and ocean acidification considerations imply the need for greater efficiency in the use of land for food production, along with changes in consumption patterns.

CONCLUSION

33. The Planetary Boundaries Initiative, urges serious consideration to be given to the setting of a cross-cutting goal for the integrity of the earth system and separate goals reflecting the need for integration of environment and social boundaries, and the right to develop within a safe and just space.

Deborah Tripley

Director

on behalf of Planetary Boundaries Initiative

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