

Planetary Guardrails as Policy Guidance for Sustainable Development

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Introduction

Planetary guardrails are science-based suggestions¹ of limiting human-induced changes in the Earth system in order to avoid intolerable effects on ecosystems and human societies. This brief outlines the guardrail concept as developed by the German Advisory Council on Global Change (WBGU, an independent, scientific advisory body to the German federal government), illuminates its crucial relevance for sustainable development, and explains its importance for policy makers. It draws heavily on a recently published WBGU Policy Paper (WBGU 2014).

Starting point: Global environmental change

Humanity's impact on the natural environment has increased with the development of civilization, reaching a global dimension since industrialization. About half of the Earth's land surface has been transformed and about a quarter of the biomass produced is used by humans. The oceans, too, are in a much worse state than they were just a few decades ago – as a result of overfishing, coral-reef destruction and pollution (WBGU 2013, p. 39).

There are also profound changes in the Earth system's material flows. For instance, nitrogen turnover has approximately doubled in the past century, mainly because of nitrogen fertilization (Galloway et al. 2004). This has serious, negative consequences for biodiversity and ecosystem services. Not least anthropogenic emissions – mainly by the combustion of coal, mineral oil and natural gas – have increased the concentration of CO₂ in the atmosphere by 40 % (IPCC 2013). This has not only led to the acidification of the oceans – seriously endangering the marine ecosystems (WBGU 2006) – it

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has also triggered global climate change which is threatening to overstrain the ability of human societies and nature to adapt. Human beings have thus become a significant force for change within the Earth system (Vitousek et al. 1997).

These developments are threatening to reach a dimension at which severe damage to ecosystems, Earth system services and human societies is inevitable (Steffen & Smith 2013). The WBGU has defined this development as global environmental change 'to refer to those changes that modify, sometimes irreversibly, the characteristics of the Earth as a system and that, therefore, have a noticeable effect, either direct or indirect, on the natural life-support systems for a major proportion of human beings' (WBGU 1994, p. 9). In the understanding of the WBGU, global society must limit anthropogenic changes to the Earth system for the sake of its own future, if the damage to human societies is to remain tolerable.

The WBGU's guardrail concept

The WBGU's concept of 'planetary guardrails' was motivated by the need to keep human-induced global environmental change within tolerable limits. The WBGU has proposed the following definition: Guardrails are 'quantitatively definable damage thresholds whose transgression either today or in future would have such intolerable consequences that even large-scale benefits in other areas could not compensate these' (WBGU 2011, p. 32)².

A transgression of the guardrails puts humanity's natural life-support systems at risks that are no longer acceptable to society and would overburden the ability of societies to adapt. Transgression might lead to tipping points of the Earth system (e.g. instability of the Greenland ice sheet, monsoon transformation, Lenton et al. 2008) being reached, triggering non-linear, abrupt responses. For example, unabated climate change would entail considerable risks, e.g. from extreme weather

² Rockström et al. 2009 have introduced a similar concept under the term 'planetary boundaries' in 2009.

events, reduced food production or sea-level rise. The WBGU therefore suggested the guardrail of limiting global warming to less than 2 °C already in 1995 (WBGU 1995). The WBGU later quantified global guardrails also for soil degradation (WBGU 2005), biodiversity loss (WBGU 2001), ocean acidification (WBGU 2006), long-lived and harmful anthropogenic substances, and the loss of phosphorous (WBGU 2014).

Guardrails are global threshold values that define the ecological framework of the Earth system within which sustainable development is possible. Compliance with the guardrails is a necessary condition for sustainable development. It is nevertheless not a sufficient condition, because global environmental change can cause considerable local and regional ecological damage and socio-economic ills long before planetary guardrails are transgressed. Furthermore, guardrails remain subject to uncertainties, since our knowledge of the Earth system is limited.

Irrespective of the dynamics of environmental change, quantifying guardrails means setting a norm, since drawing the borderline between tolerable and intolerable changes is a decision based on value judgments. Turning a science-based guardrail into a specific policy goal should be undertaken by policy-makers within a democratic decision-making process.

Guardrails and Sustainable Development

It is a common assumption that environmental protection and corresponding goals may only be achieved at the cost of economic or social development. However, a closer look reveals that guardrails and sustainable development are not contradictory but mutually supportive (WBGU 2011, p. 34). Poverty eradication might serve as an example.

Transgressing guardrails and the related loss of Earth system services particularly hurts the poorer sections of the population in the newly industrializing and developing countries and hampers their development (WBGU 2005). Land and soil degradation mean lower soil fertility and a loss of arable land, biodiversity and water resources. All this affects the natural conditions for local agricultural production, endangers livelihood security, and promotes food insecurity and absolute poverty.

The negative impacts of climate change on poorer sections of developing and newly industrializing countries is particularly severe. They are the most vulnerable and more dependent on natural resources.

Furthermore, they are less able to adapt to climate fluctuations or extreme weather conditions (IPCC 2014, WBGU 2005, p. 65).

For many rural communities in developing and newly industrializing countries, natural ecosystems and their biological diversity are simultaneously a kind of the supermarket, hardware store, and pharmacy in one (WBGU 2005, p. 80). In addition to food, drinking water, wood and fibres, natural ecosystems also offer genetic resources, traditional medicines, as well as jewelry and sacred objects.

In conclusion, taking planetary guardrails into account does not impair poverty eradication. Environmental protection is rather the precondition for fighting absolute poverty (WBGU 2005).

Likewise, one finds that specific development goals, like goals for education, energy or access to food, do not collide with the planetary guardrails. This can be illustrated taking access to food and access to sustainable energy as examples.

The WBGU studied the amount of agricultural land needed for food production to cover the global demand for food in its 'Future Bioenergy and Sustainable Land Use' report (WBGU 2010). In order to determine global, sustainable bioenergy potential, a vegetation model was used to calculate the amount of land that was potentially available. The sustainability criteria used in the report included both the guardrails on climate protection, biodiversity conservation and soil protection, and – on the socio-economic side – targets on access to food, energy and health services. To indicate uncertainties in relation to future dietary habits and food needs, a stable or rising demand for land for food production was assumed. All the resulting scenarios revealed potential areas of land for sustainable bioenergy generation, albeit small ones in some cases. It follows that covering the global demand for food can be fundamentally consistent with global guardrails.

Securing access to sustainable energy services for all people in accordance with the initiative 'Sustainable Energy for All' of the UN Secretary-General Ban Ki-moon, and the increases in emissions this involves, is compatible with long-term compliance with the 2°C guardrail if it is embedded in comprehensive climate protection (Rogelj, McCollum & Riahi 2013). The provision of modern energy services primarily means access to electricity and to modern, clean fuels for cooking and heating. The Global Energy Assessment

comes to the conclusion that the effects on the climate of safeguarding access to energy for all people are negligible or even negative (GEA 2012).

Relevance for Policy

The guardrail approach offers policy an orientation and defines the framework within which political targets should be set. Without the guardrail perspective, the full significance of global environmental issues (and the global dimension of local environmental problems) is not grasped or given enough weight in science and policies. It is therefore of great benefit for both national and global environmental policy to quantify the limits of the Earth system and to visualize the limits of adaptability (e.g. of ecosystems or infrastructures for agriculture, transport or housing).

Furthermore, the guardrail approach underlines that certain forms of environmental damage can only be avoided with a global approach and by uniting the efforts of all those who cause the damage. Whenever environmental effects develop a global reach, a solution becomes difficult without involving global governance.

The guardrail approach has yet to find its way into national and global policy and its implementation. It is however a very useful tool to grasp the full extent of human activity's effects on the earth as well as understanding the synergies of environmental protection and human development.

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