

Perspectives of Global Environmental Change in the Anthropocene

Written by Úrsula Oswald Spring

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The world faces economic crises, population growth, climate change, water scarcity and pollution, food crises, soil depletion, erosion and desertification, urbanisation with slum development, rural-urban and international migration, physical and structural violence, gender, race and ethnic discrimination, youth unemployment and an increasing loss of ecosystem services. The interaction of these multiple crises may result in extreme outcomes, especially for the vulnerable people living in risky places, and may reduce human, gender and environmental security.

This chapter addresses the complex interrelations and feedbacks between the environment system and the human system. It also explores the potential of multilateral negotiations among governments, organised society, and business community on long-term sustainable development goals.

Background

Climate change is a long-term process that acts in a context of climate variability in the short term, and with many influences on environment and humankind. It takes place at the regional and global scale. Historically, climate variability existed before and was produced by natural events, like volcanic eruptions and sun activity. Both water and carbon cycles together with other external parameters for the planet – position and activity of the sun – have changed atmospheric conditions. Nevertheless, climate change is currently associated with human impacts on Earth (IPCC, 2013; 2014a; 2014b).

With climate change, temperature in the troposphere, over land and in the sea rises; water vapour increases; sea ice, glacier and permafrost lose volume; oceans maintain heat and energy, and sea level rise occurs due to the expansion of water and the melting glaciers. Linked to the interaction of these natural and human factors, extreme weather events (cyclones, droughts, landslides) occur more frequently and with stronger effects on many regions (IPCC, 2012).

Global environmental change is wider than climate change. The term refers to the transformation produced by human beings in the ecosphere and affecting the hydrosphere (the combined mass of water found above, on and under the surface of the planet), the atmosphere (the layer of gases surrounding the surface), the biosphere (the global ecological system where all living beings exist), the lithosphere (the outer layer of the earth) and the pedosphere (referring to the soil) (Brauch et al., 2008; 2009; 2011).

Changes in the natural system are the result of modifications in agricultural production, of rapid urbanisation processes, and of population growth—the human population tripled during the last century, but water consumption increased six-fold (Oswald, 2011). Furthermore, unsustainable productive processes are polluting natural resources and creating health threats for human beings, as well as endangering ecosystems (Elliott, 2011). Energy, transportation and production sectors have polluted heavily due to their use of fossil fuels (IEA, 2014). In addition,

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land-use change and deforestation are reducing the capture of carbon dioxide (CO₂) (IPCC, 2014a; 2014b). Hence, the emissions from greenhouse gases (GHG) have increased exponentially (IPCC, 2013).

In addition, a globalised financial system, unequal credit access, current patterns of consumption and production and uneven access to resources are also contributing to environmental change. Irrational behaviour has also produced poverty, hunger and inequality among regions and social groups (Wilkinson and Pickett, 2009).

In Earth and human history, gradually drastic changes have occurred since the industrial revolution (1780–1870). Crutzen (2002) links these changes with the concept of *Anthropocene*, which relates to environmental changes induced and produced predominantly by human interventions. Such changes have occurred especially during the last five decades due to the intensive use of fossil energy; the rapid increase in GHG emissions into the atmosphere; the pollution, warming and acidification of the seas; massive land-use changes; and an accelerated process of urbanisation. The Anthropocene represents a new geological epoch that is changing the history of Earth. Bond et al. (1997) defined it as ‘the most recent manifestation of a pervasive millennial-scale climate cycle operating independently of the glacial-interglacial climate state’. This concept is useful for understanding the transformative negative effects of human activity on the global planet, its ecosystem services, and humankind itself. Nevertheless, human agency also has potential for positive change.

It is in this sense that the PEISOR model has been developed (Brauch and Oswald, 2009: 9). Based on the OECD’s Pressure-State-Response model (2001), and by analysing the interaction among natural and human systems, this model combines five stages:

P: *pressure* refers to four natural drivers (climate change, water, soil and biodiversity), which interact with four social drivers (population growth, rural and urban systems and socioeconomic processes). The complex interaction and feedbacks cause environmental change.

E: *effects* of the interaction, where degradation and scarcity of natural resources produce stress, reinforced by urbanisation, productive processes, green revolution and population growth.

I: *impacts* of human-induced and climate-related natural hazards (storms, floods, landslides, droughts, forest fires, heat waves, cool spills), geophysical extreme events (earthquakes, tsunamis, volcanic eruptions) and technological or human-induced disasters (accidents, terrorism).

SO: *societal outcomes* represent the social response, where individual and community responses are analysed to overcome poverty, marginalisation and lack of education that often produce a survival dilemma: to stay at home, suffer and eventually die; to migrate and confront in the new place uncertainty of shelter, food, insecurity and labour; or to protest and fight for survival conditions at home. Crises, migration and conflicts may produce massive societal responses such as rapid urbanisation with slum development, violent outbreaks and internal crises, or conflict avoidance and peaceful resolutions of controversies, which enable negotiation processes for policy changes and institutional building.

R: *response* at local, regional, national or international level, where political processes involve the state, society and the business community to cope with global environmental change, reduce environmental stress, adapt to adverse conditions, develop resilience and build institutions, where traditional and scientific knowledge may help to restore a new equilibrium among socio-economic and environmental conditions.

The feedbacks among these different stages help to reduce the pressure and can promote disaster risks reduction (DRR) and disaster risk management (DRM), stimulate development processes and improve the global and local socio-economic, institutional and political contexts. Nevertheless, there are factors that often interact in unpredictable, non-linear and chaotic ways; challenging the society and the environment with possibly irreversible tipping points (Lenton et al., 2008). To overcome them, political negotiation processes may be needed to reduce environmental and social stress, reinforce adaptation and create institutions that can strengthen resilience from the bottom up with the support of sensitive top-down policies.

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Pressure and Actions on Natural and Social Systems

Humankind uses the equivalent of 1.6 planet earths to provide the resources we need for consumption and to absorb our waste, and if we continue with the same pattern, in 2030 we will need two planets (Global Footprint Network, 2015). The extinction rate of species – compared with the pre-fossil age – is today 1,000 times higher and if humankind continues with the present unsustainable system of production and consumption it will be 10,000 times greater on average; affecting amphibians and birds, collapsing fisheries, diminishing forest cover, depleting fresh water systems (MA, 2005) and increasing GHG emissions. All these will increase the effects of environmental change. Moreover, scientists have warned that the earth will enter into the sixth largest extinction event – the first caused by human activities. Eighty per cent of CO₂ in the atmosphere now comes from energy used in transportation and industrial, economic and consumer activity; the rest is related to deforestation (IPCC, 2013) and destruction of ecosystems.

Two key indicators of a changing climate are temperature and sea level rise with changes in precipitation. According to the IPCC (2013), the global average air temperature over land and ocean surface has warmed by 0.85°C during 1880–2012. During 1901–2010, the global mean sea level rose 0.19 metres, with an increase from 1901 of 1.7 mm/year to 3.2 mm/year between 1993 and 2010, and precipitation changes impact regionally with extreme weather events.

With the increase of wellbeing and the consolidation of the middle classes in emerging countries, people moved up the food ladder – though eating meat is inefficient in terms of feeding everybody on Earth. However, grains have been diverted to industry and biofuels used or transportation. For example, 40 per cent of corn in the US is used for ethanol production (Foley, 2013). But this approach is unsustainable. One litre ethanol requires 2.37 kg of corn and between 1,200 to 3,600 litres of water; burns 500 g of coal and causes erosion of 15 to 25 kg soil. Despite this, the US subsidises this industry.

It will not be possible to promote efficient mitigation and adaptation actions without the involvement of exposed people, transparent support by governments and investment by the business community. Regional and local dual vulnerabilities may increase threats, and a collaborative interplay from bottom up and top down can reduce risks, especially when they are reinforced by international, national and local knowledge, global projections and multilateral and bilateral support.

The complex interrelationships between natural and human systems with feedbacks in the political and social arena – characterised by national and local contexts – show the mainstreaming of social vulnerability and its links to environmental change. Policy decisions affect the whole of the society and are tied to negotiation processes. Indeed, the history of high civilisations is instructive regarding environmental deterioration and the management of socio-political conflict.

The year 2015 has been regarded as the hottest year in history since systematic measurements were begun (WMO, 2015). Extreme hazards have increased worldwide because of global environmental change, with higher death rates and more affected people in the South and elevated economic damage in the North. Asia is the most exposed continent and its dual vulnerability (environmental and social – see Oswald et al., 2014) increases both the cost of disasters and human losses (EMDAT, 2015).

In 2008, food price hikes increased hunger worldwide. Between 800,000 and a billion people currently suffer from hunger (UNGA, 2015). Forty-four per cent of the world's population depends directly on ecosystem services for rain-fed agriculture and in 2014 two billion people were affected by flooding (EMDAT, 2015). The World Meteorological Organisation (WMO) and the International Organisation for Migration (IOM) estimate that, as a consequence of extreme climate events, environmentally induced migration will increase substantially. The presence of disease is likely to rise. Malaria, dengue, chikungunya and other tropical diseases are increasing with the higher temperature and spreading to higher altitudes, affecting people without adequate defences in their immune system (WHO, 2014).

Climate change effects are not gender neutral. Women are highly exposed to disasters caused by natural events

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(Ariyabandu and Fonseka, 2009). For example, Anttila-Hughes and Hsiang (2013) have claimed that post-typhoon economic deaths account for 13 per cent of the national infant mortality rate in the Philippines and that baby girls die 15 times more frequently, while for baby boys no increase in mortality rate was found. The long-term effects of this type of natural disaster add further to poverty.

Responses to Global Environmental Change

The IPCC (2014a: 8) concluded that 'adaptation is becoming embedded in planning processes, with more limited implementation of responses. Engineered and technological options are commonly implemented adaptive responses, often integrated within existing programs such as disaster risk management and water management. There is increasing recognition of the value of social, institutional, and ecosystem-based measures and of the extent of constraints to adaptation.' Nevertheless, adaptation is often restricted to impacts, vulnerability and adaptation planning and preventive actions.

Global policy must limit the temperature increase to below 2°C above pre-industrial levels by the end of the century. This signifies a gradual process of decarbonising the economy, accompanied by a shift from fossil fuels to renewable energy (Ren21, 2015), the promotion of energy efficiency and the restoration of destroyed ecosystems. These actions should imply the dematerialisation of production, recycling of waste and adjustments to the existing model of civilisation and consumerism.

Global proactive policies of mitigation (Stern, 2006) can change the direction towards a sustainable transition (Grin et al., 2010), which may prevent an increasing number of disasters. Additionally, adaptive processes, precautionary learning, and resilience in communities exposed to environmental change allow developing capabilities needed to effectively protect people from future climate events. Restoration of coastal ecosystems, reforestation of slopes, land and environmental management, watershed sustainability and water protection support both mitigation and adaptation. Green agriculture and restoration of ecosystem services will not only improve water supply and air quality but also reduce the risks of disasters.

The IPCC (2014a; 2014b) explains that interaction in adaptation, mitigation and sustainable development occurs both within and across regions and scales, often in the context of multiple stressors. Some options to respond to climate change can imply risks of other environmental and social costs, have adverse distributional effects and draw resources away from development priorities such as poverty eradication.

To protect nature, people and their productive activities, an interdisciplinary cooperation among different epistemic communities is crucial. With this purpose in mind, climate change scientists have elaborated models for long-term climate policy and short-term prevention and early warning (IPCC, 2013; Dai, 2011). DRR and DRM communities' support for preventive and post-disasters activities is also noticeable (McBean and Ajibade, 2009; McBean, 2012), as well as socio-economic and cultural bases for resilience building (O'Brien et al., 2010; IPCC, 2014a; 2014b; World Bank, 2014). Moreover, there is a real chance of reducing risks to the most vulnerable people if a gender perspective is included (Ariyabandu and Fonseka, 2009; Fordham et al., 2011). Further, the potential interaction of these views can facilitate the adaptation to new and unknown risks (Beck, 2009; 2011). Simultaneously, it may also reduce damage to human lives and property and may help affected populations become more resilient and reduce their environmental and social vulnerability (Berkes, 2007).

From Negotiations to Extraordinary Multilateral Policy Measures

The limited successes of post-Kyoto are raising these questions: who is managing the human securitisation process (Wæver, 1997) and under what conditions? The next question is which are the obstacles to overcome? Politics change radically when there is a shift from 'usual' political issues to a 'matter of security' of 'outmost importance'. There is consequently the need to develop an argument that goes beyond moral or ethical grounds, one that explores a combination of three securities, human, gender and environmental – or HUGE security (Oswald, 2009). This concept can be used as an analytic tool for analysis or policy guidance for proactive action. By linking the PEISOR model with the HUGE security perspective, we suggest a broadening of the scope of conceptual, theoretical and

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empirical research on the climate–security nexus.

The policies of present business-as-usual management may produce a dangerous global change with an increasing number of catastrophes and irreversible tipping points. The HUGE security approach may have the potential to prompt multilateral negotiations among governments, organised society and the business community to achieve long-term sustainable development goals. These goals must offer even the most vulnerable livelihood and wellbeing, together with a systematic recovery of ecosystems and the services provided by such systems in relation to fresh water and the ocean. The challenge is to alter the model of concentrated global power based on multinational enterprises and military control in such a way as to enable long-term transformation towards sustainable transitions. This process requires a different political arena, without the dominance of any existing superpower and its control over people and resources. It is also necessary to change the Bretton Woods agreements and democratise the World Bank, International Monetary Fund and World Trade Organisation. Building new institutions from the bottom up and threatening disasters may achieve global sociopolitical contracts for a decarbonised and a dematerialised world with the potential to improve social equity and solidarity, which goes far beyond the voluntary agreements reached in the COP 21 in Paris 2015.

Observations

The HUGE security approach does not focus on security from military or political points of view, where the reference object is the state and the values at risks are sovereignty and territorial integrity. In the traditional understanding, the threats are related to other states, to terrorism and to sub-state actors or guerrillas. By focusing simultaneously on human, gender and environmental security, the reference shifts towards human beings, gender relations and natural, urban and rural ecosystems. The values at risk are the survival of humankind and nature, with equity, equality, identity, cultural diversity and sustainability in danger. Threats come from people themselves. They are also victims of this irrational behaviour. Changes must be made towards a new civilisation model, confirmed by a diverse, sustainable and global world where solidarity governs (Brauch et al., 2011). Who are the actors that can initiate and implement such a change? No social movement is doing it. The HUGE security approach could assist in analysing the best way to reach sustainable development goals, policies and strategies, out of which common but also differentiated responsibilities (CBDR) may offer ways forward.

Both concepts, HUGE and CBDR, are grounded in the Charter of the United Nations and the Universal Declaration of Human Rights, and both may be used to critically review existing international human rights conventions. In addition, the seventeen Sustainable Development Goals (SDGs) and their targets are initial roadmaps to challenge the present occidental global economic systems and the exacerbating injustice – since social equality, gender equity and sustainability are key elements.

The SDGs include small and smart economics, food sovereignty, fair international trade, alternative tax policies, and other bottom-up efforts, where private aid is scrutinised and transparency and accountability promoted by people. HUGE security also coincides theoretically with the 5 Ps – people, planet, prosperity, peace and partnership – with special focus on the reduction of dual vulnerability.

The required changes in the political arena imply transforming the model of governance. Participative governance (In't Veld, 2012) is needed, in which changing global arenas facilitate sustainable policies for water, air, climate, soil, food, biodiversity and energy. This requires negotiated agendas at local, national, regional and global levels, enabling policies to restore destroyed ecosystem services and overcome extreme poverty, hunger, illiteracy, diseases and disasters. Trained political actors and a critical participative civil society may be able to promote activities to achieve the common goals of a sustainable, equal and peaceful society in the 21st century.

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