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Thematic focus: Climate change

Emissions and Adaptation Gaps: Can we bridge the cracks in climate policy?

On May 9, 2013, the daily mean concentration of atmospheric carbon dioxide (CO_2) at Mauna Loa Observatory in Hawaii surpassed 400 parts per million—the highest recorded level since measurements began in 1958 (Figure 1). Since then, seasonally corrected monthly mean concentrations of CO_2 have continued to rise. The emissions gap — the difference between the emissions reductions pledged by parties to the United Nations Framework Convention on Climate Change (UNFCCC), and the reductions needed to stay within two degrees Celsius (2°C) warming — is increasing. With it, the adaptation gap — the difference between the level of funding and the capacities needed for adaptation and the amount committed to the task — is also increasing[1]. In order to bridge these gaps, it is critical to fill holes in funding, knowledge, technology, capacity and trust.

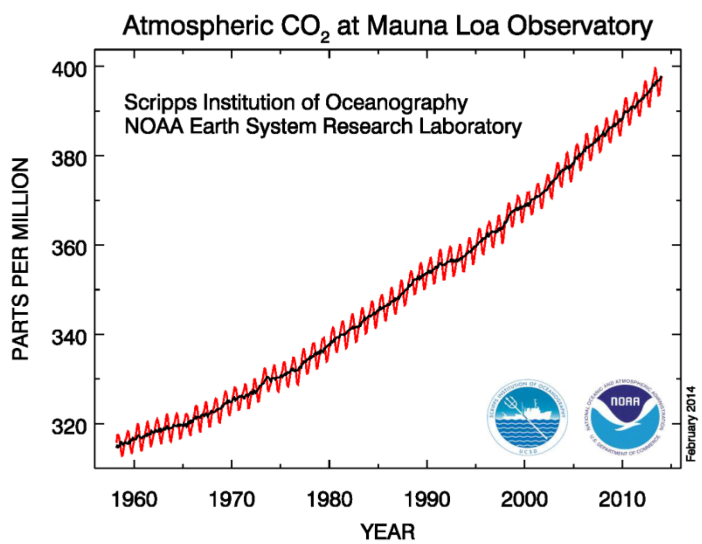


Figure 1. Increasing levels of atmospheric CO_2. (Source: Tans and Keeling, 2014).

Why is this issue important?

According to the recently released IPCC Fifth Assessment Report, land and ocean surface temperatures have increased globally by nearly 1°C since 1901 (0.89°C global average), mainly as a result of anthropogenic activities. However, in parts of Africa, Asia, North America and South America, surface temperatures rose by up to 2.5°C from 1901 to 2012 (Figure 2). Urban areas have also seen heightened increases in temperature, as

[1]A variety of different definitions exist. According to *The Emissions Gap Report 2013* (UNEP 2013), "the adaptation gap could measure vulnerabilities which need to be reduced but are not accounted for in any funded programme for reducing adaptation risks. Alternatively, it could estimate the gap between the level of funding needed for adaptation and the level of funding actually committed to the task…. The concept of the adaptation gap is in line with the IPCC's Working Group II's use of the term adaptation deficit, which is used to describe the deficit between the current state of a country or management system and a state that would minimize the adverse impacts of current climate conditions."

altered storage and transfer of heat, water and airflow result in urban heat islands. Although a recent slowdown in surface warming has been observed, probably as a result of cooling of the Pacific because of stronger trade winds, rapid warming is expected once wind trends abate (England et al., 2014). The IPCC predicts that a global mean temperature change of +0.3 to +0.7°C is likely between 2016 and 2035 (IPCC, 2013).

At the UN climate talks in 2010, during the 16th session of the Conference of the Parties to the UNFCCC, governments committed to "a maximum temperature rise of 2°C above pre-industrial levels." The world clearly sits at a critical juncture — appearing increasingly unlikely to meet this target. As governments work toward a universal climate agreement, it is vital to review what steps need to be taken to stay within 2°C of warming, and identify any gaps in policy and action.

What are the findings?

Necessary Action

In order to have a "probable" chance of staying within 2°C, the following are critical:

(1) Global emissions must peak before 2020. Emission levels at that time have to be in the range of 41 to 47 gigatonnes of CO_2 equivalent ($GtCO_2e$) (UNEP, 2012; Guivarch and Hallegatte, 2013; Rogelj et al., 2013a).

(2) Emissions must steeply decline after 2020 — decreasing to 40 $GtCO_2e$ by 2025, to 35 $GtCO_2e$ by 2030 and 22 $GtCO_2e$ by 2050 (UNEP, 2013). In fact, many projections assume negative emissions in the second half of this century (Peters et al., 2013; Guivarch and Hallegatte, 2013). This means that on a global basis, more greenhouse gases are taken up from the atmosphere by deliberate actions than emitted by anthropogenic sources (UNEP, 2012).

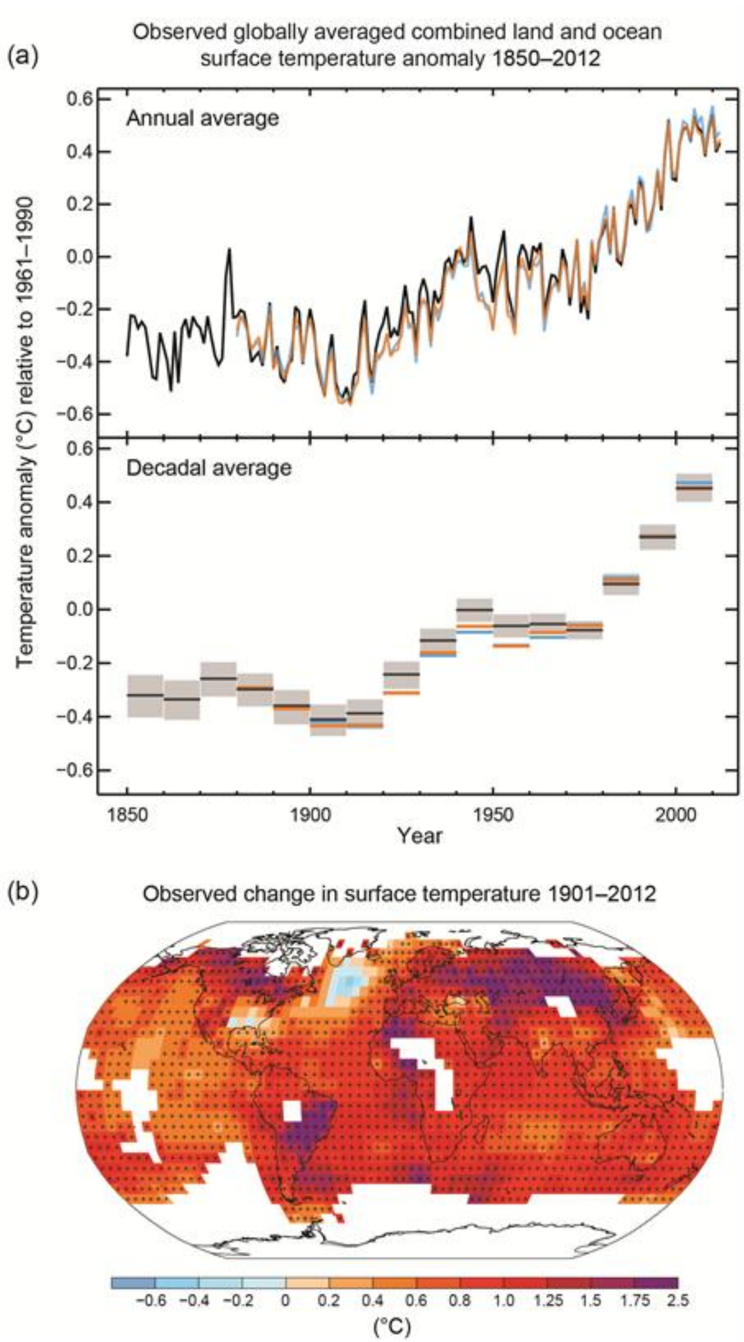


Figure 2. Observed annual and decadal global mean surface temperature anomalies from 1850 to 2012 and map of the observed surface temperature change from 1901 to 2012 (Source: IPCC, 2013).

The ability to achieve the above depends on actions such as limiting the growth of energy demand, improving energy efficiency, increasing use of renewable energy and finding means to minimize emissions from land-use change, for example, by ensuring low-carbon agriculture. Further, to achieve large-scale negative emissions later in the century, it might also be necessary to develop technologies such as Carbon Capture and Storage (CCS) (GEA, 2012; Rogelj et al., 2013b). Currently, such technology is fraught with controversy and remains immature and economically unviable (APS, 2011; Van Vliet et al., 2012; UNEP, 2012; IPCC, 2005). The potential environmental impacts and trade-offs along the life cycle need to be further explored. Thus, widespread and immediate implementation of general mitigation efforts remains critical (Rogeli et al., 2013b). "The longer that decisive mitigation efforts are postponed, the higher the dependence on negative emissions in the second half of the 21st century to keep the global average temperature increase below 2°C" (UNEP, 2013).

The Emissions Gap

Fortunately, there are some signs of progress in the above-mentioned areas. In 2012, the annual rate of global CO_2 emissions slowed, increasing by only 1.1 per cent compared with 2.7 per cent over the past decade (Olivier et al., 2013). This reflects a shift toward fewer fossil-fuel-intensive activities and more use of renewable energy and energy savings (Olivier et al., 2013). Indeed, in 2011 and 2012, total renewable power capacity worldwide grew by 8.5 per cent (Hare et al., 2013). Legislative progress has also been made. For example, a review of 33 countries identified 116 laws, out of 286, related to energy demand, and 156 laws about energy supply (GLOBE International, 2013). Twenty-eight out of 33 countries also had laws related to adaptation.

However, more action needs to be taken. For example, despite the growth in renewable energy, 60 per cent of the world's energy production is still based on fossil fuels. Coal-fired energy generation rose by an estimated 6 per cent from 2010 to 2012, and continues to grow faster than other energy sources on an absolute basis (IEA, 2013). As Christiana Figueres, the executive secretary of the UNFCCC, stresses: "The door is closing fast because the pace and scale of action is simply not yet enough" (UN News, 2012).

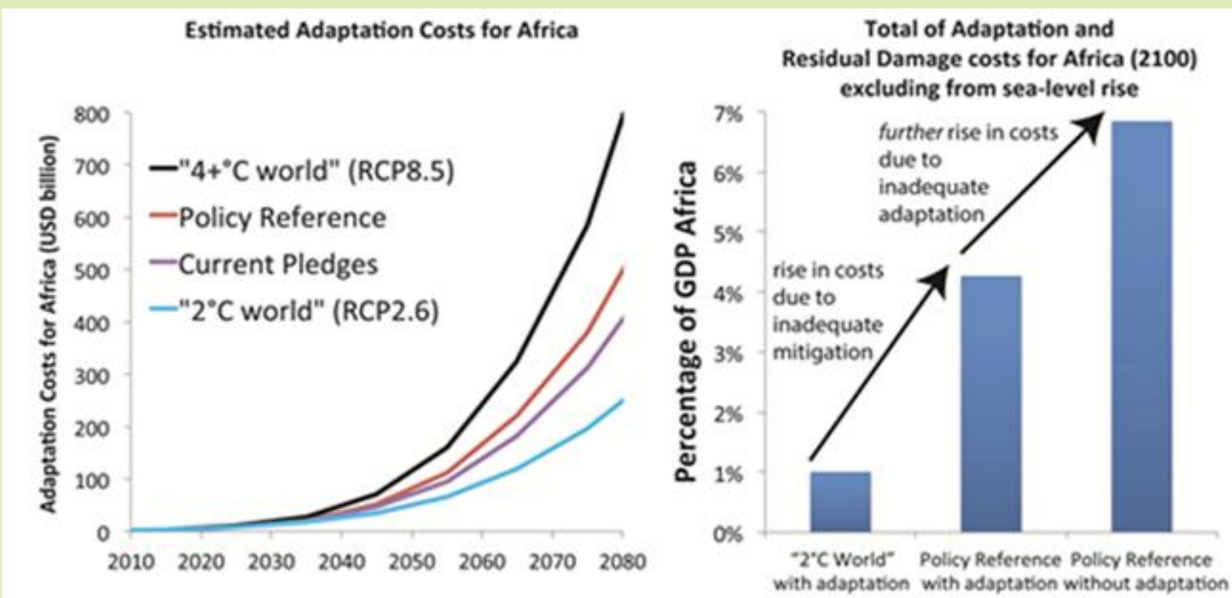
According to *The Emissions Gap Report 2013*, global greenhouse gas emissions are estimated at 50.1 $GtCO_2$ (with a 95 per cent uncertainty range of 45.6 to 54.6). This is already 14 per cent higher than the median estimate (44 $GtCO_2$) of the 2020 emission level with a probable chance of meeting the 2°C target. Even if current emissions reduction pledges are fulfilled, greenhouse gas emissions in 2020 will be 8 to 12 $GtCO_2$ above the level required to remain on the least-cost pathway to 2°C (UNEP, 2013). There is thus a significant emissions gap — the difference between emissions levels if pledges are met and emissions levels that offer a likely chance of staying within two degrees of warming. With some countries currently backtracking on pledges or making negative legislative progress (Hare et al., 2013; Olivier et al., 2013), the emissions gap is only likely to widen.

The Adaptation Gap

Box 1. Africa's Adaptation Gap

Africa is a "vulnerability hot spot" for climate change, with limited adaptive capacity due to high levels of poverty (IPCC, 2013). With two degrees of warming, total crop production could be reduced by 10 per cent in Sub-Saharan Africa, and the undernourished population could increase by at least 25 per cent by 2050 (World Bank, 2013). If warming exceeds three degrees, virtually all of the present maize, millet and sorghum cropping areas across Africa could become unviable (Schaeffer et al., 2013b). Sub-Saharan Africa's greatest adaptation needs include water supply, coastal zone protection, infrastructure and agriculture. In the Middle East and North Africa, adaption costs include infrastructure and coastal zone protection, as well as disaster risk reduction.

According to *Africa's Adaptation Gap Report*, traceable funding disbursed in Africa for climate change adaptation for the years 2010 and 2011 amounted to US $743 million, through bilateral channels, and US $454 million, through multilateral channels. However, adaptation costs are expected to range between US $7 billion and US $15 billion a year by 2020. To meet these costs, funds disbursed annually need to grow at an average rate of 10 to 20 per cent a year from 2011 to the 2020s. If warming reaches 3.5 to 4°C, adaption costs in Africa could total US $50 billion by 2050 and US $350 billion by the 2070s (Schaeffer et al., 2013b). Funds would further have to be scaled up by as much as 10 per cent each year from 2020 onwards (Schaeffer et al., 2013b).



Estimated Adaptation costs for Africa according to different scenarios. Costs are lowest if adequate mitigation efforts are taken (i.e. if the emissions gap is closed). Adaptation costs increase with increasing temperatures. (Source: Schaeffer et al., 2013b).

However, there is no clear agreed pathway to provide these resources. "Africa cannot risk failure of implementing serious adaptation measures, especially with Africa's predicted population rise of two billion by 2050 and the current ecosystem degradation trajectory," says Dr. Terezya L. Huvisa, minister of state for the environment in the United Republic of Tanzania. "An African Adaptation Programme to Climate Change would allow the continent to pool its resources, avoid duplication of efforts and co-ordinate responses and knowledge sharing," she says.

As the emissions gap grows, the adaptation challenge becomes larger and costlier, and not in a linear manner. "Adaptation deficits," barriers and limits threaten future development (Preston et al., 2013; Kates et al., 2012; Schipper, 2007). Irreversible loss and damages are already occurring (Warner et al., 2012).

Developing countries' adaptation needs are believed to cost in the range of US $100 billion a year (UNFCCC, 2007; World Bank, 2010) but might reach US $450 billion a year (Caravani et al., 2013). By comparison, the funds made available by the major multilateral funding mechanisms that generate and disperse adaptation finance add up to a total of around US $3.9 billion to date (UNEP, 2013). Precise estimates of the available funding are difficult to obtain due to donor classifications and unclear or nonexistent tracking (Nakhooda et al., 2013). Regardless of the specifics, it is clear that significantly more funding is needed. The world is facing an adaptation gap — the gap between the levels of funding and capacities needed for adaptation, and the level of funding actually committed to the task.

What are the implications for policy?

A variety of measures can be taken to help bridge the emissions and adaptation gaps.

According to *The Emissions Gap Report 2013* (UNEP, 2013), "strict accounting rules for national mitigation action could narrow the gap by 1–2 GtCO_2." Such rules would help standardize how to quantify and report greenhouse gas reductions from climate change mitigation actions. "In addition, moving from unconditional to conditional pledges could narrow the gap by 2-3 GtCO_2, and increasing the scope of current pledges could further narrow the gap by 1.8 GtCO_2. These three steps can bring us halfway to bridging the gap," the report says.

Additional savings can be made from changes in agriculture and land use. A variety of techniques, including use of no-tillage practices, improved nutrient and water management, and agroforestry can be used to reduce greenhouse gas emissions (UNEP, 2014). Policies promoting sustainable consumption and production (SCP) across sectors can further help reduce environmental impacts. The 10-Year Framework of Programmes on SCP is an opportunity to introduce SCP approaches into national policy.

The Emissions Gap Report also notes that international co-operation on initiatives such as renewable energy, energy efficiency, fossil fuel subsidy reform, methane and other short-lived climate pollutants outside of commitments under the UNFCCC can be used to achieve additional emissions reductions (UNEP, 2013). A recent study claims that there is a greater than 66 per cent likelihood of staying within two degrees of global warming, while also providing universal access to modern energy services, if the share of renewable energy is doubled and the rate of improvement in energy efficiency is doubled. These are the objectives of the UN Sustainable Energy for All initiative (Rogelj et al., 2013b). To meet them, Rogelj et al. (2013b) state that global investment in the energy sector will have to increase 67.7 per cent — to an average of US $1,620 billion a year in 2030. Changes in behaviour and lifestyles, at the country level and within communities, also remain important dimensions of the transformation of energy systems.

Greater research and information can help bridge the adaptation gap. "Assessing the extent of the adaptation gap is a challenge. Whereas carbon dioxide and its equivalents provide a common metric for quantifying the emissions gap, we lack a comparable metric for quantifying the adaptation gap and assessing the impacts of efforts to close it. While the emissions gap indicates the quantity of greenhouse gas emissions that need to be abated, the adaptation gap could measure vulnerabilities which need to be reduced but are not accounted for in any funded programme for reducing adaptation risks" (UNEP, 2013).

Developing countries completed submission of National Adaptation Programmes of Action (NAPAs) at the 19th Conference of Parties to the UNFCCC in Warsaw. NAPAs highlight urgent and immediate adaptation priorities and projects, as identified by the countries themselves. Information on adaptation needs for different development pathways and emissions scenarios will help policy makers understand the economic costs and political consequences of the adaptation gap. The national adaptation plan (NAP) process, established under the Cancun Adaptation Framework (CAF), will help identify medium- and long-term adaptation needs, enabling the development of strategies and programmes to address those needs. Evaluating the effectiveness of various adaptation interventions (e.g. improved access to and ownership of assets, knowledge and information; and effective institutions and governance systems) performed at different scales will also be critical for sound decision making.

Ultimately, the capacity to take adaptive action — such as restoring coastal ecosystems to counter the effects of sea-level rise or strengthening early-warning systems — depends on access to adaptation funding. New finance for adaptation can be raised from the private sector, but must be combined with public finance and development co-operation more broadly (Atteridge, 2011). In addition to greater funding, there is a need for greater financial reporting by donors and verification of use of funds by recipients. Donors are challenged to ensure that new and additional funding reaches the most vulnerable countries and populations. In turn, recipient countries must ensure financing is used effectively and equitably, a challenge given differing institutional capacities (Caravani et al., 2013). Improved transparency of climate finance will help better