

Mitigation and Adaptation Options in Relation to the Millennium Development Goals



Societies in developing countries are strongly vulnerable to climate changes because of their dependence on natural resources and agriculture and their limited adaptive capacity. Climate change may therefore aggravate persistent problems such as poverty. Agriculture is the most important economic sector in sub-Saharan Africa, accounting for about 20–30% of GDP and 55% of the total value of exports. Rainfed agriculture is highly sensitive to climate change if more frequent droughts but also floods occur. Also, it is expected that temperature rise will have negative effects on highly valued commodities such as coffee. Forestry and agriculture are often weakly developed,

highly dependent on each other, and vulnerable to climate change. Generally, policies and measures are developed and implemented without thorough consideration of their relation to climate change.

Ethiopia expects a 2 to 4 degree increase in temperature and the Horn of Africa a 10–30% increase in precipitation by the end of the century.

Projections from global circulation models on climate change are generally consistent in predicting temperature rise across Africa but show large uncertainty about the magnitude and directions of changes in precipitation. The current climate

in Ethiopia is highly variable and climate change projections predict large regional differences in both temperature and precipitation. The highlands will suffer the most from a temperature increase of about 4 degrees, while the lowlands expect a 2-3 degree increase. Predictions on future precipitation levels are difficult to make and various models predict inconsistent results. Most models, however, predict a 10–30% increase in precipitation, although projections on changes in the timing of this rainfall over the year are still unknown. Short-term climate change projections for the coming decades, however, are highly uncertain.

The National Adaptation Program of Action (NAPA) of Ethiopia

The adaptation strategies developed in the NAPA of Ethiopia mostly focus on agricultural land use. Adaptation of water and other natural resource management is seen as the most urgent subject to anticipate climate change. Diversification of farm activities and off-farm extension may be candidates for adaptive measures. Mitigation strategies include projects such as community-based carbon sequestration and promotion of on-farm and homestead forestry and agroforestry practices.

Hot spot areas are those most sensitive to climate change. An example is Ethiopia's Central Rift Valley where climate change threatens both coffee production and pastoralism.

The Central Rift Valley is an important area that provides many commercially important natural resources, but land degradation has resulted in profound erosion problems and loss of biodiversity. Rehabilitation of *Acacia* forests will improve the provision of essential ecosystem goods and services. Coffee is considered to be relatively sensitive to future temperature change and adaptation strategies will need to be developed for coffee farming in Ethiopia. Many native tree species play an important role in nitrogen fixation in soils. Harvesting these trees without replanting or replanting with non-native tree species will lead to soil degradation and loss of productivity. The project will assess strategies for the provision of various ecosystem services from a climate adaptation and mitigation perspective.

Mitigation and adaptation options

According to the UN, poverty rates in developing countries are estimated to have fallen from 52% in 1981, 42% in 1990 to 26% in 2005. Over a 25-year period, the poverty rate in East Asia fell from nearly 80% to under 20%. In sub-Saharan Africa, however, the poverty rate remained constant at around 50% (UN MDG factsheet). Although many developing regions, between 1990 and 2006, were successful in halving the proportion of underweight children, sub-Saharan Africa is still making least progress in reducing child malnutrition. In Ethiopia, 23% of the population had less than one dollar per day for consumption and 47% of the children under 5 are severely underweight (UN MDG website).

Climate change is likely to further inhibit any development in Africa. Food production and agricultural practices may be threatened by more extreme climate events such as frequent droughts and floods. Access to safe drinking water can also be affected by such developments. The proportion of people with access to improved drinking water in Ethiopia has increased from 13% in 1990 to 42% in 2006, but this MDG target may also be jeopardized by climate change in the future.

The framework presented in this report is focused on land-use adaptation and mitigation strategies on climate change. Natural resource management and land-use change are crucial factors for sustainable development in a region and their contribution to the millennium goals. For example, the rate of deforestation has been fastest in some of the world's most biologically diverse regions and old-growth forest ecosystems, including sub-Saharan Africa. In Ethiopia, the forest area has been reduced from a 13.8% cover in 1990 to 11.9% in 2003 (UN MDG website). Forests play a crucial role in combating desertification and water and nutrient losses. Therefore, forest management is taken central in the development of both adaptation and mitigation options. Among others, actions suggested by the UN include ensuring effective conservation and management to reverse the loss of natural resources and significantly reduce biodiversity loss. This may be achieved by introducing measures or mechanisms to reduce global greenhouse gas emissions by assisting developing countries—especially in sub-Saharan Africa—to transform subsistence agriculture

in order to ensure long-term, sustainable production and developing a more diversified economic base. This can be done by supporting research and development in yield-enhancing agricultural and climate change technologies and enhancing climate adaptation programs to reduce the negative impact of climate change.

Climate change and sustainable development

Numerous definitions of sustainable development exist and the 6th EU framework project LUPIS, from which parts of the framework are adopted, adjusted the definition of Brundtland's report 'Our common future' into the definition of sustainable development as 'the elimination of poverty of present and future generations through management of land and natural resources which avoids the risk of radical ecosystem change' (e.g., Verburg et al., 2008).

Sustainable development in developing countries mainly includes social aspects such as equity, while in rich countries, environmental issues play a prominent role. The agricultural sector and rural areas in East Africa will be strongly affected by climate change. In the long run, environmental issues such as droughts, floods, and temperature rise will severely affect developments in equity and poverty reduction. Diversification of agricultural activities may help reduce vulnerability of rural societies to climate change, on one hand, by the production of different agricultural commodities with various demands for natural resources, like water, and on the other hand, by diversification of income.

Uncertainty and the science-policy interface

Climate change adaptation in the context of sustainable development must be understood through the perspective of systems thinking and complexity. The development of a framework that we attempt to offer in this paper tries to capture much of the systems involved. At the same time, we acknowledge the high levels of uncertainty in this system. On the one hand, these uncertainties include the poor predictability of climate change and its impact as shown in uncertainties of projections. On the other hand, there are uncertainties in the dynamics of the human systems involved.

The development of NAPAs or any other adaptation strategy or plan is driven by different institutions, including stakeholders ranging from government departments, research institutes, donors to civil society. These are understood to belong to multiple, evolving systems with unpredictable relationships, including informal and intangible dimensions in which power and politics play important roles.

Policymakers involved in the development of climate change adaptation strategies have to deal with these uncertainties. Science can assist policymakers to understand the complexities of climate change and the unknowns. However, the interface between science and policy is a challenging one. Policymakers often want to get quick and straightforward answers to problems, while researchers would want time to thoroughly investigate options to meet high scientific standards. Investing in the mutual understanding of both sides of the science-policy interface will help to decrease the challenges.

Source

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Reference

Verburg, R., Bezlepkina, I., McNeill, D., Bonin, M., et al. 2008. Defining sustainable development in the context of LUPIS. LUPIS Project, EU 6th Framework Programme. www.lupis.eu.