

Chapter 1

Introduction:

The effects of increased global temperatures and comparative abilities of communities to adapt

Global scale generalisations have been observed over the twentieth century, which were summarised by Caspari¹ from the Intergovernmental Panel on Climate Change's (IPCC) Third Assessment Report. They included:

- An increase in global mean surface temperature in the 20th century of $0.6 \pm 0.2^\circ\text{C}$, the land having warmed more than the oceans thus far.
- Increases in northern hemisphere temperatures, possibly greater than in any century in the last millennium
- During the second half of the century, reduced diurnal temperature range over land, night time minimum temperatures appearing to have risen at twice the rate of day time maximum temperatures.
- Relatively more hot days and relatively fewer days of frost for nearly all land areas.
- Increased continental precipitation (probably in the range of 5 – 10%) in the northern hemisphere compared with reduced precipitation in north west Africa and parts of the Mediterranean.
- Increased likelihood of heavy precipitation events in mid and high northern latitudes and increased likelihood of summer drought, already observed in parts of Africa and Asia.

A warmer climate is likely to lead to an increase in the frequency of extreme events such as heavier precipitation and droughts. These are expected to become more random, less predictable. Changes in temperature are thought to have a larger impact on hydrological regimes in cold and temperate climates (of Asia and Australia) than changes of precipitation. In warmer regions (*e.g.* the Sahel, and Nile basins of Africa), this is reversed.²

For a large sector of the developed world, continuation of these trends in climate change may quite possibly bring some benefits in terms of a more clement atmosphere and improvements to agricultural production. Increases in atmospheric CO₂ can be shown to have beneficial impacts on crop growth in experimental conditions. It is anticipated that this will benefit crop yields in higher latitudes. Periodically these benefits may be offset by an increased frequency of drought and inundation requiring adaptation strategies, some of which are already being developed. But 'climate-change-induced warming at low latitudes (brings) not only accelerated growth periods

¹ Caspari, G. 2007.

² Wagener, T. & Franks, S. 2005, pp. 1–2.

for crops, but also greater heat and water stress, resulting in greater yield decreases than at higher latitudes, despite beneficial CO₂ direct effects.’³

Climate change adaptation programmes in the developed world may be expensive, but at least some are possible, given a political mandate. While debate continues about reductions in atmospheric CO₂ emissions between the developed nations and the emerging economies such as India and China, it is important to understand why the developing world finds the process of adaptation so extremely difficult.

The availability of water provides a potent illustration to this problem. Between 1940 and 2000 the world’s population doubled to 6.3 billion. In the same period use of freshwater has increased fourfold.⁴ In western countries, with relatively stable populations, technology is dramatically reducing demand. But in the developing world this trend is reversed and can be exacerbated by a variety of factors, which force a reduction of potable water. In the Himalayan region of India, for example, one third of government water schemes are estimated to be dysfunctional, and there remains a need for integrated water management systems and trained personnel.⁵ A study of water shortages and resources in the Nepali mid hills identified the inadequate design of spring boxes (*kumra*) that allow contamination by surface water. During the monsoon most water sources will, to some extent, be contaminated by sediment, chemical fertilisers and faecal matter. Caste issues can also restrict availability.⁶ These factors are already reducing sustainability. But the observable effects of climate change in the region include the reduction of the monsoon duration and the increasing length of droughts. Lack of predictable rainfall outside the monsoon has the potential for widespread malnutrition. Thus the existing precarious water situation becomes critical through climate change.

A paper for the Overseas Development Institute in 2002⁷ examined the concept and causes of vulnerability in developing countries. In dealing with extreme events, such as flood or drought, remoteness, together with the lack of resources and infrastructure, provide effective barriers to relief. Food production can be increasingly affected year after year by changes in temperature and precipitation which in turn affect soil moisture and fertility besides the range and duration of the growing season. The speed of these changes propagates a positive feedback on the affected communities, increasing poverty and malnutrition which in turn make adaptation more difficult.

Caspari’s summary mentioned ‘increased likelihood of summer drought, already observed in parts of Africa and Asia.’ But for the Himalayas there is the additional problem that atmospheric warming rates have been shown to increase with altitude, causing catastrophic glacier melt. This ‘altitude-dependent warming’ appears to be associated, in part at least, with atmospheric pollution. Nepal, with its numerous mountain population, is one of the countries of the region most profoundly affected by these regional scale influences but presently lacks the capacity to deal with them at a regional or local scale. For this reason, the relationship of atmospheric pollutants (aerosols) both to increased warming of the middle-to-upper troposphere and to

³ Rosenweig, C. & Parry, M. 1994, p. 134.

⁴ Wagener, T. & Franks, S. 2005.

⁵ Singh, R. 2005.

⁶ Merz, J. *et al.* 2004.

⁷ McGuigan, C. *et al.* 2002

summer monsoon precipitation is discussed in much greater detail than some other aspects of the text.

Interventions by way of misplaced aid or poorly conceived development programmes have the power to make life worse, often substantially worse, for indigenous and developing communities. Climate change is the new mantra of development in Nepal but remains poorly understood. The purpose of this publication is to provide a background for understanding some of the problems posed by climate change so that interventions can be better informed before they are implemented. Unless development workers have an understanding of why things are changing and how they may continue to change in future, their efforts may prove worse than useless. But when properly understood, and with viable adaptation strategies, there at least the slight chance that climate change might be turned to advantage:

Action on adaptation can produce benefits now and in the future. Many adaptation activities help to provide communities with diversified livelihoods, alternate sources of income, or better infrastructure. Such ‘no regrets’ strategies are attractive as they have immediate positive impacts whilst also supporting the ability of communities to adapt to climate changes in future.⁸

Chapter 1 Bibliography

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⁸ Practical Action nd [2008], p9.