

SOCIAL IMPACTS OF CLIMATE CHANGE

By Ross Rutherford, President, Engineers for Social Responsibility Inc.

1. Introduction

This paper discusses the existing and potential future social impacts of climate change.

2. The Present

Climate change in combination with a number of factors including ground water extraction and other pressures from population increases is already impacting people who live in areas that are vulnerable to sea level rise, drought, or ice melt, many of whom are poor. Here are some examples:

Papua New Guinea's Carteret Islands, highest point 1.7m above sea level, are home to 1,000 people. Due to coastal erosion and inundation by salt water, most of the small gardens of swamp taro and vegetables upon which families depend for food are no longer fertile. A plantation on Bougainville has been identified as a future resettlement site.

In Bangladesh, rising sea levels in the Bay of Bengal are encroaching on the vast agricultural lands of the fertile Ganges Delta. In combination with ground water extraction, this is resulting in increasing soil salinity. Although the trend towards salt-tolerant varieties of rice is helping some farmers, many are facing disaster.

In the Arctic increasingly variable spring weather conditions and changes in the rate at which ice melts in the spring are affecting access to traditional hunting and fishing camps.

In South America some 30 million rely on "tropical" glaciers for water for drinking, agriculture and hydropower. Quito, Ecuador and La Paz, Bolivia draw half and 30% respectively of their water supplies from glacier basins. Andean glaciers have shrunk by between 30 and 50% since the 1970s.

According to the Geographical Magazine, March 2014, in Kiribati, with a population of 110,000 spread over 33 low-lying islands, changes in rainfall patterns, rising sea levels and storm surges are leading to increased contamination of freshwater resources and soil. Taro is increasingly being killed by saline intrusion as are coconut palms and fruit trees. Sixty percent of children under 10 are suffering from vitamin A deficiencies and malnutrition. The Kiribati government has purchased about 2,200 ha of land from Fiji to attempt to guarantee its food security as its own arable land is infiltrated by rising tides, and eventually to act as a possible refuge should the population be forced to relocate. While some of Kiribati's problems are due to the pressures of population increases, climate change is exacerbating an increasingly difficult situation.



Unpredictable weather including an increase in severe weather is increasingly impacting on the ability of farmers in developing countries to grow crops and produce food for sale. For example, Eastern Africa has experienced an increased frequency of drought over the past 20 years which is expected to continue as long as global temperatures continue to rise. This is putting several million people at risk. Places such as the Nairobi region and southern Somalia are particularly affected. The drying of the area is associated with the warming of the Indian Ocean, which in turn has been associated with climate change, although this has yet to be confirmed.

3. Future Risks

3.1 IPCC Report

The IPCC Fifth Assessment Synthesis Report¹ states that:

“Continued emissions of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems.”

“Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.”

Over the 21st century surface temperature is projected to increase, heat waves are expected to occur more often and last longer, extreme weather events will become more frequent, and the ocean will continue to warm and acidify. Sea levels will rise further up to and beyond the end of the century. In addition Arctic sea ice will continue to reduce, and the extent of permafrost and global glacier volumes will continue to decrease as temperatures increase. The extent to which these changes occur will be largely determined by the total amount of CO₂ added to the atmosphere.

The IPCC Report points out that, even after CO₂ and other greenhouse gas emissions stabilise or even decline, surface temperatures will remain approximately constant at elevated levels for many centuries. “A large fraction of anthropogenic climate change resulting from CO₂ emissions is irreversible on a multi-century to millennial time scale, except in the case of large net removal of CO₂ from the atmosphere over a sustained period”.

3.2 Food, Poverty & Security

Climate change impacts are projected to slow down economic growth, make reduction of poverty more difficult, further erode food security, and prolong existing and create new poverty traps².

Climate change is expected to undermine food security. Causes include the potential reduction in fishing catches, and in wheat, rice and maize production in some areas².

Fish generally respond to ocean warming through moving to higher latitudes and deeper waters, altering the catch composition. Continuing warming to a level that exceeds the thermal tolerance of tropical species may significantly reduce the catch potential for socioeconomically vulnerable coastal

¹ Climate Change 2014, IPCC Fifth Assessment Synthesis Report, Approved Summary for Policymakers, 1 November 2014

fishing communities in tropical developing countries². It has been estimated that the fish catch potential will fall by 40% in the tropics over the next three to four decades³.

There is the potential for major impacts on water availability and supply, food security and agricultural incomes, including shifts in the production areas of food and non-food crops around the world.

Globally, on balance dry regions can expect to get drier and wet regions are going to get wetter. The expansion of deserts is a major problem, especially to nearby communities.

Climate change is projected to reduce renewable surface water and groundwater resources in most dry subtropical regions intensifying competition for water resources².

Climate change is also projected to increase the displacement of people.

The consequences include increased risks of violent conflicts. The current civil war in Syria, for example, has been identified as one such conflict triggered by climate change effects. In this context it is significant that one of the UK's most senior military figures has warned that climate change risks are increasing the threat of instability and posing a risk to geopolitical security⁴. The Pentagon has made similar statements.

3.3 Health

Climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income.

Rising temperatures are encouraging the spread of some diseases as the range of insects acting as vectors for the disease increases due to increasing temperatures.

The 2010 Russian extreme heatwave killed an estimated 55,000 people. According to an article in Nature journal⁵, under the 'moderate' scenario of climate change known as RCP4.5, researchers have projected that during the years 2020-2052, a number of regions in the United States, Europe and Africa will each experience at least one extreme heatwave. In the same period, parts of northern South America, Africa, the United States and southern Europe could have three such events. If greenhouse gas emissions continue to rise at current rates and the increase in global mean temperatures approaches 4°C, the United States and Europe could experience 'very extreme' heatwaves (more severe than the 2010 Russian heatwave) every one or two years by the end of the century.

² Climate change threatens global fish stocks, The Conversation, 16 May 2013.

³ www.ipsnews.net/2009/10/biodiversity-dwindling-fish-catch-could-leave-a-billion-hungry/

⁴ Climate change 'will see more UK forces deployed on conflicts around the world', The Guardian, Monday 10 November 2014.

⁵ Nature, October 2014

3.4 Sea Level Rise

In excess of 150 million people live within 1 metre above high tide level, and 250 million within 5 metres of high tide level⁶.

Sea level rise results from a combination of increases in volume due to ocean warming (approximately 90% of the additional energy in the climate system accumulated since 1971 has been stored in the oceans), and the loss of ice from the Greenland and Antarctic ice sheets plus global glacier reduction. Recent sea level rise projections to 2100 range from 30cm to 1m. The IPCC Report points out that ice sheets, ocean temperatures and associated sea level rise all have their own intrinsic long timescales which result in changes lasting hundreds to thousands of years after global surface temperature is stabilised. According to the World Bank⁷, even if global warming is limited to 2°C, global mean sea level could continue to rise with some estimates ranging between 1.5m and 4m above present day levels by 2300.

The effects of sea level rise can be exacerbated by storm surges and extreme rainfall events. The World Bank report states that cities highly vulnerable to extreme floods are to be found in Mozambique, Madagascar, Mexico, Venezuela, India, Bangladesh, Indonesia, the Philippines and Vietnam.

Sea level rise, combined with human activities including sediment removal (due especially to dams) and subsidence from groundwater extraction, is threatening the future of many river deltas. According to a recent article in Nature Magazine⁸, more than 500 million people live on deltas including cities such Shanghai, Dhaka and Bangkok. The Danube delta is home to about 2,000 plant and 5,000 animal species, many of which are threatened. By 2100, land losses from rising sea levels alone could reach 5% for the Ganges-Brahmaputra (Bangladesh and West Bengal, India), 30% for the Mekong (Vietnam), Nile (Egypt) and Yellow River (China) deltas and more than 80% for the Lower Danube delta (Romania and Ukraine).

The cost of restoring deltas can be very high. The Mississippi delta restoration could cost between US\$500-1,500 million a year for 50 years. The enclosure of the Rhine-Meuse delta in the Netherlands cost 5 billion euros (US\$6.3 billion). Lower cost techniques working with nature can avoid expensive restoration, but considerable research is required to determine the most appropriate measures.

⁶ www.cmar.csiro.au/sealevel/

⁷ Turn Down the Heat Executive Summary, World Bank, November 2012

⁸ Protect the world's deltas, Nature Magazine, Vol 516, 4 December 2014

3.5 Other Risks

In urban areas, climate change is projected to increase risks for people, assets, economies and ecosystems, including risks from heat stress⁹, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea-level rise, and storm surges.

Flooding from increased storm frequencies in some areas can have a major impact on insurance costs. Climate change may make it harder and more expensive for many people to insure their homes, businesses, or other valuable assets in risk-prone areas. Insurance is one of the primary mechanisms used to protect people against weather-related disasters. We rely on insurance to protect investments in real estate, agriculture, transportation, and utility infrastructure by distributing costs across society.

4. Conclusion

The potential social impacts of climate change are very large and are already starting to become evident. Some impacts are due primarily to increases in the emissions of greenhouse gases, while others result from climate change increasing the severity of the effects of other factors relating to human socioeconomic development.

The effects fall disproportionately on low income populations in less developed countries.

It is not an exaggeration to state that the impacts on some societies could cause their collapse and could lead to forced migration of large numbers of people¹⁰. Potential outcomes include warfare as nations fight over diminishing resources or seek to protect their borders.

Climate change effects are continuing to accelerate because of the failure of societies and the international community to act. Urgent action must be taken to reduce greenhouse gas emissions to avoid unprecedented disaster for humanity.

Peer reviewed by
Professor Colin D. Butler

University of Canberra, Faculty of Health

While the reviewer has provided comment on drafts of this article, he does not necessarily endorse it in its final form. The author is solely responsible for any errors and judgements that may exist in the published article.

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⁹ In 2003 a heatwave resulted in the deaths of 70,000 people in Europe according to J.-M. Robine et al., in *Comptes Rendus Biologies*, Vol 331, Issue 2 (2008). Such events are likely to become more frequent in the future.

¹⁰ Butler, C.D, 2014. Climate change and global health: a new conceptual framework – Mini Review. *CAB Reviews* 9, 027.