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Views and Comments

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Views & Comments

Sustainable Management and Action in China under the Increasing Risks of Global Climate Change

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1. Introduction

In the past 100 years, earth's changing climate has resulted in widespread and significant impacts, with the strongest and most comprehensive evidence of climate change being seen in natural systems. Some impacts on human systems have also been observed, including impacts on water resources and hydrological systems, species shifting and migration, and negative impacts on crop yields. The most noticeable impacts are believed to result from extreme climate-related events such as those that have recently occurred, including heat waves, droughts, floods, tropical cyclones, and wildfires.

The impacts of such climate-related extreme events also include the alteration of ecosystems, disruption of food production and water supplies, damage to infrastructure and settlements, morbidity and mortality, and consequences for mental health and human wellbeing [1]. The impacts of extreme events are of primary concern, as they can often induce severe and abrupt hazards and, in particular, compound disasters [2]. Climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for those of people living in poverty; direct negative outcomes include reduction in crop yields and the destruction of homes, while examples of indirect negative outcomes include increased food prices and food insecurity.

In the future development of humanity and human society, many kinds of risks will be met. The six highest environmental risks confronting humanity are as follows:

- Extreme weather and climate events, and especially the emergence of compound disaster events;
- The failure of human mitigation of and adaptation to climate change;
- Large-scale loss of biodiversity and collapse of ecosystems;
- Increasing supply shortage of water resources and food, particularly for developing countries;
- Large-scale natural disasters, including rapid sea-level rise and Arctic sea ice melting; and
- Anthropogenic environmental damage and disasters, including persistent air and water pollution.

Each of these risks is closely or directly related to climate change. Therefore, global climate change is a core risk that is ranked as the second most serious global risk.

2. Climate warming in China and its causes

Fig. 1 shows the global mean annual temperature anomaly for 1850–2016. Global warming over the past 100 years is clearly characterized by an increasing trend of the time series of temperature, although two accelerating warming periods (1915–1945 and 1980–1998) are visible, along with two warming hiatus periods (1950–1979 and 2000–2015). The trend of the annual surface temperature anomalies averaged in China for 1901–2016 (Fig. 2) is very similar to the trend shown Fig. 1, implying that the climate in China shows a good regional response to global climate warming. Fig. 3 presents recent atmospheric carbon dioxide (CO₂) concentrations at representative stations in the United States and China (Mauna Loa in Hawaii, USA, and Waliguan Mountain in Qinghai Province). The two CO₂ curves are very close to each other, and show a linear upward trend. In 2016, the CO₂ concentration exceeded 400 parts per million by volume (ppmv), the highest value (by about 280 ppmv) in the past 800 000 years. Detection and attribution studies have shown that anthropogenic CO₂ emissions are a dominating contributor to external forcing to global climate warming, as well as to climate warming in China [3] (Fig. 4 and Fig. 5 [4]). As the Intergovernmental Panel on Climate Change (IPCC)'s Fifth Assessment Report (AR5) (2014) states, the warming of the climate system is unequivocal and, since the 1950s, many of the observed changes are unprecedented over decades to millennia.

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