

## On Orderly Adaptation to Global Warming\*

YE Duzheng (叶笃正), and YAN Zhongwei<sup>†</sup> (严中伟)

TEA, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029

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Global warming during the last century has been a well-known fact. Despite arguments and uncertainties in explanations, most scientists agree that this century-scale warming trend is attributable to human activities. According to the recent assessment report of the Intergovernmental Panel on Climate Change (IPCC, 2007) based on worldwide scientific results, a major factor of the present global warming was in association with the enhanced concentration of atmospheric greenhouse gases such as CO<sub>2</sub> released from human activities; and current observations showed an on-going increasing trend in the anthropogenic emission and atmospheric concentration of greenhouse gases. Because of considerably long life-time of some greenhouse gases such as CO<sub>2</sub> and large thermal inertia of oceans, the force driving global warming would persist for a long time, even if anthropogenic emission were stopped right now. Therefore, global warming has increasingly been considered as a factual background by a wide-range of decision-makers. How to adapt to global warming has been a theme in the agendas of world summit conferences such as G8 and G20.

The topic is beyond science indeed, because how to adapt to global warming may influence economic development in different countries in different ways. Many countries have made efforts in reducing emission and developing clean energy sources. The Bali Conference organized by the United Nations symbolized that governments realized the necessity of coordinating human activities on a global scale. However, it should be noticed that the international community

is currently concerned only for reducing emission, not for adaptation to a warming world. In fact, there is still a need for scientific research, which should lay the foundation for a clear idea on how to adapt to global warming.

Since the Industrial Revolution, human activities driven by economic benefits have led to large-scale emission of atmospheric greenhouse gases and caused concurrent global warming. This may serve as a piece of evidence that human influenced climate on a global scale for the first time via large-scale disorderly activities (Ye et al., 2001). Global warming has exerted its impacts on all countries. In adaptation to global warming, we are possibly facing another wave of disorderly human activities, as governments make local adaptation measures based on considerations for protecting local benefits. It is understandable that each country will deploy an adaptation plan in order to get benefits from positive consequences of the changing climate/environment, while avoiding or reducing impacts of any negative ones to the locales. However, no country has a closed boundary nowadays. Development of each local economy influences that of another. So do local climate and environmental changes. What consequence these local changes may cause at a global scale remains unknown. To avoid any negative consequence on a global scale, it is necessary to carry out specific scientific research, based on which countries can then be coordinated to develop some orderly adaptation schemes.

This short note outlines basic ideas of how to realize orderly adaptation to global warming as follows.

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<sup>†</sup>Corresponding author: yzw@tea.ac.cn.

First of all, there is a need of further studies of the earth system, with human activities as a coupled component in the system (Ye and Ji, 1998; Ye et al., 2009). There have been many scientific investigations and programs dealing with local impacts of and adaptation to global warming, as reflected in the series IPCC reports. It is beneficial to synthesize these studies and develop further studies in order to provide some possible global scenarios of adaptation, then to study their possible consequences to global and local climate/environments, and hence feedbacks to the human societies and economy. The World Meteorological Organization (WMO) could play a role in organizing the study of the coupled earth system simulations. Based on comparative analyses of all experimental results, some best, in terms of global assessment, adaptation scenarios can take shape. These ideally lay the foundation for developing an orderly global adaptation scheme.

Unavoidably, the “best” global scheme may cause losses in local economy for some regions/countries. This problem is beyond what science can cope with. We suppose that any orderly adaptation scheme should be carried out under the coordination of the United Nations, with a compensation mechanism in place via a special foundation. Nevertheless, currently there still remains a lack of integrated means (and the scientific base as well) for the international community to cope with concurrent global warming. Cooperation among natural and social sciences and other commu-

nities at an international level is urgently required.

It is worth mentioning that global orderly adaptation is not contradictory to any means of mitigation as outlined at the Bali Conference. While international treaties about mitigation go on being in effect, all governments should be guided to follow an orderly adaptation scheme, which ensures the best interest for sustainable development of human beings on a global scale, best for developed as well as developing countries as a whole.

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