Paris Agreement: a roadmap to tackle climate and environment challenges

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Adopted by the 196 Parties of the United Nations Framework Convention on Climate Change (UNFCCC) last December, and signed by 175 countries on 22 April 2016, the Paris Agreement provides guidelines for global efforts in addressing climate change, and establishes a five-year review cycle for detailed work programs of cutting emissions, differentiation between countries as to their responsibilities for action, and financing for poor countries to deal with rising temperatures.

In a nutshell, Paris Agreement sets a target of holding the increase in the global average temperature to well below 2°C prior to 2100 and pursuing the efforts to limit the temperature increase to 1.5°C. The landmark Agreement has 29 articles, including mitigation, adaptation, loss and damage, finance, technology development and transfer, capacity building, transparency of action and support, and global stocktake, which pose many new global opportunities and challenges for climate research and services.

Global warming has caused ice melting in polar regions and the northern hemisphere and sea level rise, extreme weather and climate events such as tropical cyclone and ENSO, acceleration of global water cycle, as well as ocean acidification and hypoxia. Since the earth’s climate system is highly non-linear, even if the global temperature increase could be limited to 1.5°C via emission reduction, risks and vulnerability may remain that could result in more frequent extreme weather events, regime shifts of non-equilibrium ecosystem, and persistent rise of global and regional sea level. Therefore, in response to the Agreement, scientific community should build up a massive research effort on the mechanisms and adaptation of climate changes, including reliable assessment of climate changes and their impacts in global and regional scales, especially decadal predication that could provide scientific evidence in support of the reduction of carbon emission.

While the Agreement represents a monumental step in the international efforts in controlling global warming, many difficult problems remain to be solved. Most notably, it is unclear what amount of reduction in greenhouse gas emission is required to control the global warming below 2°C by 2100. Multi-components of the earth’s climate system and multi-scale spatial-temporal variations call for interdisciplinary research through collaboration and innovation, in order to improve the prediction of decadal and longer timescale climate changes. To achieve this goal, we need to build global comprehensive observational networks, reliable earth system models as well as develop more effective prediction-assessment approaches. In this regard, China’s investment still lags behind developed countries, and increased investment in fundamental research on the mitigation and adaptation strategies of climate changes are called for. The good news is that the government has recently approved the ‘Earth System Simulator’ project and is planning for the establishment of comprehensive ocean observation system over the China’s 13th ‘Five-Year Plan’ as well.

In terms of social economic development, ambition of the Agreement in emission reductions could be achieved by restructuring the world’s energy usage from fossil fuels to renewables, which influences geopolitics and world economy as well as will enhance the innovation-driven development in renewable energy. Key renewable marine energies, such as tidal wave energy, ocean thermal energy, and sea-water chemical energy, together with solar and wind energy, will contribute larger shares of energy sources and help to reduce carbon emission. With increasing use of marine energy, we can expect technological advances in equipment innovation and manufacturing, new materials, and ocean engineering, all of which benefit economy, promote upgrade and transformation of industries as ‘Marine Energy Plus’. The Paris Agreement will undoubtedly bring opportunity for a drastic restructuring of China’s energy industry, and we should be making early preparation to meet this upcoming adjustment.

In short, the Paris Agreement will promote climate research, industrial structural adjustment, and economic social development, in spite of potential difficulties in its implementation and the deficiency in current technologies dealing with many environmental issues. The Chinese government has shown its commitment in addressing climate change, tackling the challenges, and in shouldering major global responsibility. Meanwhile, the science community needs to be mobilized under new research initiatives in both basic science and technological development that directly address these new global challenges in the coming decades.

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