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RESEARCH ARTICLE

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Fostering a Triple Response Mechanism to Combat Global Climate Change: Emission Abatement, Carbon Capture and Water Improvement

Abstract The Kyoto Protocol has established emission abatement and carbon sink increase to cope with climate change. However, in recent years, developed countries tend to focus more on the former. The simplifying of GHG causes has posed challenges for the understanding of climate change issues and for the development of consequent counter-measures, leading to present controversy and dilemma over mechanisms to combat global climate change. It is held that a desirable global cooperative stance should be "harmonious but differentiated," i.e., the division of responsibilities and co-operation among the countries should be conducted after the diversities of different countries are recognized in terms of climate change, interests and functions. To meet this end, it is necessary to have UNFCCC play a leading role, under which emission abatement, carbon sink and water cycle improvement are concurrently reinforced. Under this triple mechanism, industrialized countries ought to continue to take the lead in emission abatement, while developing countries, especially those with great potentialities to strengthen carbon sink and water conservancy, ought to conduct ecological preservation and to develop hydraulic capacity so as to strengthen the natural carbon cycle and water cycle to combat climatic impacts.

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1 Introduction

Few of today's global environmental issues are like climate change that are fraught with uncertainties, variations and abnormities. It has become "a world priority and one which links government and non-government organizations in a way not seen before,"[1] The UN Secretary-General Ban Ki-moon described them as "the defining challenge of our age" in his address to the Intergovernmental Panel on Climate Change (IPCC) upon the release of the Fourth Assessment Synthesis Report in Valencia, Spain on Nov. 17, 2007. To combat these issues there has been an agreement on the development of global cooperation. The weak output recently produced at UN COP15 and the Copenhagen Accord further demonstrates the very magnitude of an internationally accepted cooperative mechanism.[2] However, for years the diverse stances of different countries and groups towards climate change failed to reach the same goal; on the contrary, they are becoming more and more diversified, and leading to increased difficulty in global cooperation. These stances are turning far more away from the Kyoto commitments. To put it with a Chinese proverb, the international efforts to tackle global climate change seem to be in a way to "trying to go south by driving the chariot north." This article reviews and analyzes the present dilemma in the implementation of the Kyoto Protocol worldwide, and then attempts to explore a more effective mechanism by combining emission reduction, carbon capture and water improvement to combat global climate change, concluding that international cooperation ought to be "harmonious but differentiated" on the basis of acknowledging divergence between developed countries and developing countries in the causes of climate change, interest patterns and corresponding functions in fighting against climate change.

2 Dilemma of Carbon Emission Reduction

The Kyoto Protocol provides the Emissions Trade (ET), the Joint Implementation (JI) and the Clean Development Mechanism (CDM) with an attempt to reduce greenhouse gas (GHG) that can cause climate change. As of Nov. 2007, 175

[1] Medugu N. I., *Communicating Global Climate* Change, Daily Trust (Abuja), January 26, 2010.
[2] Hunter D., *Exploring How Today's Development Affects Future Generations around the Globe.* In This lssue: Climate Law Reporter: Implications of the Copenhagen Accord for Global Climate Governance. Sustainable Development Law & Policy, Winter 2010, at 7.

countries have ratified the protocol with common but differentiated responsibilities to act on climate change impacts. However, in reality, the assumption of the very responsibility has taken on kind of "common but inharmonious" look.

2.1 Toward a Common "Political Will"

The recent years of fulfilling the Kyoto commitments have seen great "commonness" toward an increasing political will to cope with climate change within the international community. The United Nations and other international organizations as well as more countries are growingly concerned with global climate change. For instance, the UN Secretary-General Ban Ki-moon began to put climate change on top of his tasks soon after he took the office. Followed is the publication of a number of reports on climate change, the appointment of three special envoys in charge of the very issue. Apart from the UN, climate change issues have become a major focus of multilateral regimes and inter-regional cooperative organizations. For example, at the meetings of the Group of Eight (G8), the Asia-Pacific Economic Cooperation (APEC), and the Association of Southeast Asian Nations (ASEAN), climate change was a dominant topic for discussion.[3]

Common orientation is also found in the Bali Road Map, an important document, which finally concluded with difficulty at the conference of the United Nations Framework Convention on Climate Change (UNFCCC) in Bali Island (Indonesia) on Dec. 15, 2007. It detailed the time framework and content of negotiations for the next two years, till then a final agreement concerning the designated regime following the expiration of the first commitment period of the Kyoto Protocol in 2012 should be reached. Both developed countries (including the US) and developing countries are expected to be included in this agreement on the future undertakings in the area of emission reduction of greenhouse gases.

Common orientation also lies in the fact that the European Union has appeared unprecedentedly united and strong towards climate change issues. As one of the initiators, the EU has been a dominant political force to propel climate change dialogue for two reasons. One relates to its concern with climate change affecting its pleasant weather; and the other is its comparative advantage in reducing GHG emissions because of its moderately decreasing population, mature and stable economy, advanced technology and management, and relatively saturated energy consumption demand.

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[3] Chen Y., 多方制衡：全球气候变化政治较量升温 (Multiple Driving Forces—Escalated Political Contests in Combating Global Climate Change), 人民日报 (People's Daily), December 7, 2007.

To meet this end, countries throughout the world have been taking various actions and measures to adapt to climate change in national economic and social domains. The Obama Administration is encouragingly moving to a more appropriate position in the globally concerted efforts in fighting against climate change by appointing the special envoy for climate change in early 2009 and passed the "cap and trade" bill to limit GHG emissions in June 2009.

2.2 Increasing Inharmoniousness in Store

2.2.1 Simplifying the Causes of Climate Change

In practice, simplifying the causes of climate change is prevalent. The UNFCCC has clarified 6 types of GHG: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6. The IPCC 4th Assessment Report (AR4) has identified that, impacted by anthropogenic activities, there has been a dramatic rise in the concentration of all GHGs in global atmosphere since the pre-industrial times, which aggregates to cause global climate change.[4] The emission of GHGs was traditionally considered to be caused by economic activities where chemical substances, oil and coal were excessively utilized, and where the developed countries have contributed a large share. In developing countries such issues are common as the abuse of resources, industrial pollution, agricultural pollution and population growth, but this is not considered homologically correlated with greenhouse effects.[5] However, around the appearance of the IPCC AR4 quite a few of cause-effect theories about GHG emission sources have been prevailing with speed and momentum as follows:

(1) China's National Assessment Report on Climate Change (NARCC) holds that human activities relating to climate change are mainly through three channels: One channel is the combustion of fossil fuels which emits CO_2 and other GHGs add to the concentration of greenhouse effects and later affects the climate. That is a major driving force to cause climate change by human activities. Another channel comes from both industrial and agricultural activities that emit GHGs and reinforce climate change. The third channel derives from the change of land use, including the felling of forest woods, urbanization, alternation or damage of vegetation.[6]

(2) Arguably, microorganisms living in anoxic rice soils make greater

[4] Intergovernmental Panel on Climate Change (IPCC), *Climate Change*: *Synthesis Report 2007*, at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf (last visited February 25, 2010).

[5] See Yang Z. F., Liu J. L., 环境科学概论 (A General Introduction to the Science of the Environment), Higher Education Press (Beijing), at 75 (2004).

[6] The Ministry of Science and Technology (China),《气候变化国家评估报告》解读 (An Interpretation to China's National Assessment Report on Climate Change), at http://www.gov.cn/fwxx/kp/2007-04/10/content_577263_2.htm (last visited May 27, 2009).

contributions to global methane emissions, so rice soil constitutes one of the major GHG emission sources.[7] This new discovery seemingly regards rice soils as pools for methane, but it does count on having people understood afresh the role of agriculture-based countries in climate change.

(3) Russian scientists found through experiments that the reclamation of wasteland leads to the rise of methane concentrations in the atmosphere, which has increased 15 times in the past 150 years, resulting in obviously increased temperature on the earth.[8]

(4) American scientists discovered through some simulated tests that forest in the temperate zone helps to further exacerbate global warming instead of reducing it.[9] This viewpoint undermines, to a large extent, the long-perceived natural functions of forests to capture CO_2 on the one hand, and to destroy CO_2 emission sources by forestation on the other hand.

The above inharmonious voices might exert three effects:

(1) To bring about increased worldwide concerns for GHG emission issues related to economic activities in the developing countries. Undoubtedly, this would be a positive effect.

(2) To direct human understanding to the redistribution of responsibility for combating climate change, when countries heavily rely on agriculture and manufacturing will apparently suffer from emission reduction burdens. In fact, there is already an obvious trend calling for a redistribution regime on the side of the industrialized world. The failure to achieve any binding reduction targets during post-Kyoto period for industrialized countries at the Copenhagen Conference has powerfully confirmed this trend.

(3) To trigger more extensive and heated controversy on the issues, which have not been included so far. The recent disagreement on how to define reduction responsibilities for manufacturing and consumer goods, and on reduction issues related to developing countries, has also added virtually to inharmoniousness.

Traditional disagreement on international environmental issues remained between developed countries and developing countries, but the disagreement on climate issues exist overtly among developed countries. Not until recently did some kind of split-up occur within the developing countries due to limited foreign monetary aids. For example, small island nations, directly threatened by

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[7] See Lu Y. H. and Conrad R, *In Situ Stable Isotope Probing of Methanogenic Archaea in the Rice Rhizosphere*, 309 Science 1088–90 (2005).

[8] See Dong Y. B., 俄提出全球变暖新因素 开垦荒地可使气温升高 (Russians Release a Newly Climate Change-Induced Factor: Wasteland Reclamation Will Make the Temperature Rise), at http://news.sina.com.cn/c/2005-10-11/15127141450s.shtml (last visited May 27, 2009).

[9] News, 美国科学家研究称温带森林能加剧全球变暖 (American Scientists Claim Forests in Temperate Zones Can Aggravate Global Warming), 科技时代 (The Science Times), at http://tech.sina.com.cn/d/2005-12-14/1345791821.shtml (last visited December 8, 2009).

the rise of sea level, give strong backing for reduction goals put forth by the EU. They even appeal for making long-term global reduction goals to suit to their cases. The OPEC member countries, for fear that global emission restrictions might influence international oil markets, insist that the international community should help to improve their economic structure in response to any negative effects that global reduction actions might cause to their economies. Those least-developing countries in Africa tend to address how to adapt to climate change and long for more international monetary fund because of their small emission volume. Likewise, developing countries such as China, India and Brazil, differ from each other.

2.2.2 Implementing a "Unitary" Response Mechanism

ET, JI and CDM are three so-called "flexibility mechanisms," originally designed by the Kyoto Protocol to help ratified countries in Annex I to meet their reduction targets in a cost-effective manner. ET and JI serve to promote cooperation among ratified Annex-I countries. CDM helps to identify the potential for cooperation in CO_2 reduction between developed and developing countries, where the former are committed to supply the latter with financial and technological assistance in their fight against any adverse impacts caused by climate change. The CDM mechanism encourages member countries to conduct tree-planting so as to set off CO_2 emissions. This may be the fact that developed countries, which had produced massive amounts of GHGs in their previous industrial activities but now unable to reduce GHG emissions through technological innovation, can put their money in tree-planting in developing countries for exchange of carbon emission cuts with carbon sinks. Hence the trading of carbon credits was established. Under the Kyoto Protocol, these developed countries are expected to purchase from developing countries 200–400 MtCO_2-eq/year of GHGs by way of developing CDM projects in the commitment period (2008–2012). China alone will be able to satisfy more than half of that demand.

Generally speaking, the Kyoto Protocol is reduction-orientated through two channels: Direct emission reduction and increased carbon stocks. However, this dual mechanism seems to be transforming towards merely reduction orientation. According to Germany National Business Newspaper (*Handelsblatt*), the EU commission is going to articulate more stringent provisions for the trading of CO_2 emission credits. Its draft proposal says that from 2013 on the EU will cut down CO_2 emission targets: For electricity-generating and oil refinery enterprises, 90%–100% of targets will be obtained through bidding; the certified emission targets by 2020 will be 21% below the 2005 level. Under this provision, enterprises must reduce the emissions of any harmful greenhouse gases with an

average reduction range of over 1/5.[10]

Voice doubting the functions of carbon stock arises from the reports in developed countries, helping to undermine carbon stock mechanism. According to the British *Guardian Weekly*, a study report indicates that the capacity of forests to take in anthropogenic CO_2 is weakening, which means that anthropogenic CO_2 will produce more impacts on climate instead of being safely locked in trees or soils.[11] This conclusion, along with the afore-mentioned findings done by American scientists that forests in the temperate zone cannot reduce global warming but worsen it, is almost like pouring cold water on the carbon stocking mechanism identified in the Kyoto Protocol as well as on the efforts that the developing countries have made to reach this end.

Likewise, the unitary emission reduction orientation is also found in the response mechanism put forward in the IPCC AR4, which encourages governments to adopt various mitigation policies and measures such as imposing higher GHG emission taxes and more stringent emission standards and limits, and promoting the use of cleaner energies and relevant R&D progress. Nevertheless, concern for the trading of carbon credits seems low on the agenda of the report. Compared with the Kyoto Protocol, the IPCC AR4 has placed more emphasis on rigid and unified tax imposition rather than on combined emission mitigation and carbon credit trading.

The simplifying of the causes of GHGs and the mitigation-orientated mechanism, two trends going along with each other, are bound to encounter conflicts inevitably. On the one hand, the simplifying orientation virtually helps to double the climate response responsibilities of developing countries; on the other hand, this tendency calls for diversified response mechanisms to cope with various causes of climate change. If two orientations are concurrently hailed, it will be no different from encouraging all kinds of vehicles including lorries, buses and mini-buses to drive on one traffic lane, leading to traffic jams and clashes.

2.2.3 Functioning of Diverse Understandings of Climatic Impacts

Although there is a general agreement on the severity of climate change within the international community, cognitional differences do exist towards some concrete issues, or rather, these differences are widening increasingly, upon

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[10] Chang X. M. ed., 欧盟酝酿碳排放关税 (The EU Deliberates on Carbon Emission Tariffs), at http://www.ce65.com/news.shtml?id=250370 (last visited December 5, 2009).

[11] Xinhua News Agency, 研究显示森林吸收二氧化碳能力在下降 (A Study Shows Forest's Capacity to Absorbing CO_2 Is Weakening), at http://news.163.com/08/0107/07/41JBUJHD000120GU.html (last visited December 6, 2009).

which different stances in resolving climate issues are rested. The IPCC AR4 identifies three major impacts from climate change:

(1) Threat to biodiversity;

(2) More widespread climatic disasters;

(3) The developing world will be particularly at risk.

China's NARCC generalizes the following three major threats that climate change may pose to China:

(1) Change of temperature. In the past 100 years China's average surface temperature has been increasing, ranging between 0.5℃–0.8℃, a bit higher than the average global temperature (0.6℃±0.2℃) for the same period.

(2) Change of precipitation. NARCC indicates that there has been a slight difference in total volume of annual precipitation for the past 50 years, but regions differ significantly. There is a varying increase of annual precipitation in the regions along the middle and lower reaches of the Yangtze River, the southeastern regions, most western regions, the north of the northeastern regions as well as the majority of Inner Mongolia; but a slight decline in the northern regions, the east of the southwestern regions and the south of the northeastern regions.

(3) Change of other elements. An obvious fall is found in sunshine time, evaporation volume on water surface, average wind velocity close to earth surface, total cloudiness. Abnormal climatic accidents happen more frequently, such as heat and cold waves, droughts and floods.

It is argued that the level of economy of a country relates to the hazards that climate change may occur in the country, but it is not the most decisive dominant. It is the country's natural climate and geographical features that are closely related to the impacts of climate change. The authors hold that:

(1) The larger the depth and breadth of land in a country or a region is, the more capable it endures climate change; or vice versa.[12]

(2) Ecologically, the richer the climatic diversity of a country or region is, the more capable it endures climate change; or vice versa.[13]

(3) Countries with continental climate are more capable of enduring climate change than those with marine climate.[14]

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[12] For example, the US has a vast area of land, and it is not so sensitive to climate change as Europe. See supra note 3.

[13] The balance of the eco-system is relative and dynamic, where there exists a sort of self-regulating capacity. Generally, the more complicated the structure of the ecosystem, the more species of organisms, the more channels for the circulation of substances, the more capable the ecosystem regulates itself; or vice versa. See Zhou K., 生态环境法论 (On Ecological Environmental Law), Law Press (Beijing), at 7 (2001).

[14] According to general ecological principles, the stability and carrying capacity of the eco-environment rest greatly upon diversity of climate patterns. Therefore, the continental climate with clearly rotating four seasons should be more capable of enduring climate change than the marine climate that is usually characterized with two rotating seasons.

(4) Continental countries are more capable of enduring climate change than island countries.

(5) Countries that stand higher above sea level are more capable of enduring climate change than countries that stand lower above sea level.

In terms of economic development level, there do exist in reality differences in the degree of impacts from climate change on developed countries and developing countries, but it is by no means a reason to regard these differences absolutely, or rather, to amplify them inappropriately. On the part of the authors, the argument that China is one of the most vulnerable countries to climate change and the way to simply relegate developing countries into the biggest victims of climate change is open to discussion. This is a metaphysical conclusion and contrary to the reality, which is neither helpful for developing countries to fight against climate change on their own, nor constructive to international cooperation for this purpose. In fact, this improper placement of the developing world has already had an influence on the formation of global interest patterns and set-ups to cope with climate change, trapping global cooperation in a dilemma.

3 Climatic Interest Patterns: Basis for Establishing Response Mechanisms

Climate change is an issue impacting nature and quality of life with wide-ranging socio-economic implications,[15] so any solutions to climate change issues should be considered and pursued in an integrated and multi-dimensional manner. The major Chinese media once described global climate change patterns like this:

> Currently international climate politics is primarily characterized by states confronting one another with tripartite balance of forces. The EU, the US and China all make up of a larger share worldwide in terms of population, economy, energy consumption and emissions. They play an important role in negotiations among ratified countries, forming three powerful forces. The EU, being an initiator of climatic negotiations, has been a vital propellant of climatic negotiation. The second force comes from a fan-shaped group headed by the US, including Japan, Canada, Australia, New Zealand and Russia, which is also influential on international climatic arena. China has been involved in climatic negotiations along with other developing countries in a pattern of "the Group of 77 and China." Meanwhile, China has been actively performing its functions in coordination and promotion of unity among the countries in this camp.[16]

[15] See supra note 3.
[16] Ibid.

This "three forces" conclusion needs further discussion. As is known to all, the stance of the US towards climate change has varied significantly between the Clinton Administration and the Bush Administration. Its unilateral orientation has found expression in climate change issues. There has been no substantial change in the US unilateralism so far until the UN Copenhagen Conference though a universal belief has long prevailed that the Obama Administration will "do the right thing in international affairs." As such, it seems a bit far-fetched to put the US in the same group with Japan and other countries. The authors contend that global climatic patterns count at least on the following three factors:

The first is direct economic benefit and loss. As has been discussed above, different climate change impacts on the economy of a country or region in terms of climatic zone and geographical zone largely determine its stance towards climate change. Logically those much affected countries are more concerned with the issues and respond more fiercely than those less affected ones. Of course, those responsible countries are otherwise discussed. According to a journalist of the Wall Street Journal, while people are discussing heatedly and anxiously about adverse impacts that global warming has produced on human beings when ice melts and sea level rises, some Greenlanders are happy to plant vegetables on the projected land that has long been covered by ice and snow. Obviously global warming to the Greenlanders is by any means sort of benevolence rather than threat.[17] On the contrary, most countries in Europe are suffering from climate change, especially from global warming.

The second is global economic patterns. Greenhouse effect is the very result accumulated primarily from the Industrial Revolution, so there is good reason to take into consideration global economic patterns thereof when climatic issues are addressed. Europe has been among the earliest and biggest beneficiaries, followed by the US, Russia and Japan; and then, India, China and other Asian countries that have just begun to benefit from the very revolution. Since climate change is dramatically bottlenecking today's industrial development, it is not difficult to understand why the whole Europe has taken a more unpromising stand than ever towards climate change issues, which, for one aspect, relates to the severity of impacts of these issues on Europe, and for another, relates presumably to its instinct to defend its vested interests within this global economic patterns.

The third goes to benefit-sharing patterns in global performance of harnessing climate change. Firstly, those suffering most from climate change should benefit the most from the harnessing performance. There have been wide-spread

[17] 全球气候变暖的七宗"最" (Seven "Mosts" of Global Warming), 上海新闻晚报 (Shanghai Evening Post), November 16, 2006.

criticisms on asymmetrical distribution of damage and benefit after harnessing climate change. Based on an analysis of current data, Patz claim that "the warming trend over recent decades has already contributed to increased morbidity and mortality in many regions of the world. Potentially vulnerable regions include the temperate latitudes, which are projected to warm disproportionately, the regions around the Pacific and Indian oceans that are currently subjected to large rainfall variability due to the El Niño/Southern Oscillation Sub-Saharan Africa and sprawling cities where the urban heat island effect could intensify extreme climatic events."[18] In most cases, the regions facing the biggest risks are those that should be the least responsible for climate change.

Economic benefits could come from those newly emerging industries engaged in harnessing climate change. A relatively optimistic viewpoint holds that the policy on climate change will not exert too much negative impacts on the competitiveness of enterprises; instead, it will help to encourage technological innovations, promote resources allocation among industries, and enhance resources utilization efficiency as a whole. Globally, more and more enterprises have realized that climate change means not only risks but also challenges. Thus they are more than enthusiastic about being involved in the post-Kyoto negotiations, and they have become a powerful driving force.[19] According to the Router Agency, a sci-tech committee under the British Parliament has recently pointed out in its research report that, as for increasingly serious warming trends, it seems a workable makeshift to capture and sequestrate carbon (CCS) out of burning fossil fuels. The report predicts that there is a momentum behind the development of the CCS technologies and Britain will get a head start in the follow-up research activities, but developing countries like China and India are expected to become the biggest demanders for such technologies.[20] Undoubtedly the industrialized countries will play a leading role in this aspect.

Harnessing climate change can generate ecological benefits. The first benefit is carbon credit trading. It is an artificially designed mechanism under the UNFCCC and the Kyoto Protocol, where a market is created for invisible objects such as environment capacity for air. The second benefit is marginal benefits for agriculture and forestry by building up their carbon capture capability. The third benefit lies in the potential for promoting agriculture, forestry and fishery through improving water cycle to counteract the effects of climate change. That is why some Chinese experts argue that agriculture, along with its ecosystem is

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[18] Patz J. A., Campbell-Lendrum D., Holloway T., Foley J. A., *Impact of Regional Climate Change on Human Health*, 438 Nature 310–17 (2005).

[19] See supra note 3.

[20] The Science Net, 碳的捕捉和封存技术将迅速发展 (A Momentum behind the Development of Carbon Capture and Sequestration Technology), at http://www.cbcsd.org.cn/themes/Energy_Climate_Change/3566.shtml (last visited December 20, 2009).

most sensitive to climate change and must be a focus or priority area to be addressed, so is the case for water resources.[21] Two methods can be applied to reduce and stabilize the concentrations of greenhouse gases, including emission restrictions and carbon sinks, of which the latter being closely related with forest. Forests give off oxygen after absorbing and fixing CO_2 through photosynthesis, which is called forest carbon sink. China's National Program for Combating Climate Change (NPCCC) urges to speed up the development of forest resources so as to bring into full play the role of forests to stock and absorb carbon.[22] Clearly, this kind of benefit is more favorable to developing countries; the developed countries, however, have not shown too much interest in this function.

The major current issues related to climatic interest patterns are: First, the existing international instruments place more emphasis on global common interests with undue regard to differentiated interests and benefit-sharing structures. Hardly have any existing conventions or agreements ever adequately and timely addressed these issues. Second, among the most fundamental UNFCCC principles: Equity, common but differentiated responsibilities and sustainable development, international environmental laws reiterate the principle of common but differentiated responsibility and apply it to resolving climate change issues. However, given to diverse attitudes, interests and benefit-sharing patterns induced by climate change, these issues are incompletely identical to those traditional international environmental ones, thus it is necessary to reallocate responsibilities according to special interest structure.

The subjects with varying interests may have different claims for legal adjustment. Therefore, norms makers, if unaware of these diversified claims in theoretical cognizance or unable to pay due regard to them, shall not articulate effective rules and regulations, not speaking of voluntary compliance. That could better explain why today's global discrepancy and dilemma about climate response mechanisms remain.

4 A Way Forward: Fostering a "Harmonious but Differentiated" Triple Mechanism

4.1 China's Tactics to Cope with Climate Change

At the 15th APEC informal meeting in Sept. 2007, China's President Hu Jintao put forward four propositions and one suggestion: "Adhere to cooperative

[21] Qin D. H., 中国气候与环境演变来源 (The Evolving Sources of China's Climate and the Environment), 光明日报 (Guangming Daily), July 5, 2007.

[22] The National Program for Combating Climate Change of China, 气候变化国家评估报告 2007 (National Assessment Report on Climate Change), June 2007, at http://www.china.com.cn/city/txt/2007-06/04/content_8343118_5.htm (last visited December 22, 2009).

response to climate change, sustainable development, the leading role of the UNFCCC and technological innovations, and to develop the networks for forest rehabilitation and sustained management in the Asia-Pacific region." Premier Wen Jiabao reiterated at the Copenhagen Conference in Dec. 2009 China's consistent attitude by calling on all sides to build up consensus and strengthen cooperation to promote the historical process of combating climate change. Just shortly before the Copenhagen Conference, China resolutely and responsibly declared to the world a 40%–45% national reduction target from the 2005 level. These suggestions are detailed in China's NARCC, including but not limited to the following:

(1) To strengthen construction of agricultural infrastructure, select and cultivate climatic-resistant crops and develop new technologies including bio-tech, enhance scaled growing of high-quality produce, and raise calamity relief capability of agriculture by adopting high and stable yielding measures.

(2) To reinforce construction of water conservation facilities and improve the capability of flood control, draught relief, water supplying and emergency response.

(3) To continue afforestation and improve the adaptation capability of species to environmental changes, enhance protection and management of nature reserves, strengthen prevention and control of forest fires and insect pests.

(4) To raise livestock according to grassland adaptation to climate change, avoid over-grazing and grassland degradation, strengthen calamity relief capacity of grassland husbandry.

(5) To increase designing standards of tidal facilities and reinforce construction of coastal tidal facilities.

(6) To continue to enhance forecasts of disease-induced weather disasters, set up forecasting, monitoring and controlling networks to enlarge precautionary zones.

In addition, China has also advanced "saving energy and reducing emissions," which in fact acts as an important measure in response to climate change. At the present, forests throughout the country are able to stock per year 0.5Bt net of CO_2 equivalent, equally 8% of total national GHG emission amounts for the period. China is expected to increase its forest coverage from current 18% to 23% by 2020.[23]

4.2 China's Water Cycle Scenario

Compared with the mechanisms under the Kyoto Protocol, China's response mechanisms appear more diversified and pragmatic than reduction-centered.

[23] See Wang L. B., Zhang Z. L., 中国联合东盟国家发起"亚洲碳汇行动" (China Jointly with the ASEAN Countries Will Launch the "Asian Carbon Stock Actions"), at http://www.ce.cn/xwzx/gnsz/gdxw/200710/30/t20071030_13424865.shtml (last visited December 25, 2009).

They address more carbon stock and capacity building while harnessing climate change. But what also needs to be addressed is that water has made itself one of the biggest bottlenecks for China to conduct carbon stock as well as ecological protection. Traditionally, water resources in China are irregularly distributed between the north and the south, and climate change would add to floods in the south and draught in the north. Therefore, climate change issues in China not only relate to emission reduction and carbon sink, but also to water circulation.

The authors contend that carbon cycle and water cycle are closely interrelated, in which the former changes the latter and the latter reacts upon the former. Nevertheless, the traditional attention of the international community has been on how to overcome abnormity and calamity caused by the change of carbon cycle to water cycle with little account of how to improve water cycle to offset adverse effects induced by the change of carbon cycle. Undoubtedly, the mechanisms guided by this notion are far from workable.

It was once pointed out that carbon dioxide affects global water cycle with a mere focus on the fact that the rise of CO_2 concentrations will cause a reduction of moisture absorbed from the atmosphere, leading to more water inflows into inland rivers, and thus changing water cycle with increased potential for floods.[24] The two poles of the earth are more discussed when it comes to the relationship between climate change and water cycle, which seems to ignore the third pole of the earth, or Tsinghai-Tibet Plateau and Mt. Everest in China.[25] Inarguably global warming would exacerbate flooding and waterlogging on the southeast Asian subcontinent and in the southeastern countries. However, the international community has failed to address how to reduce such adverse consequences from the water cycle, or how to transform negative water cycle into favorable one.

Compared with the other two poles on the earth, the third pole can be feasibly controlled by human beings. According to China's NARCC, in the past 50 years, its average temperature on the earth's surface has increased by 1.1℃ with a growing speed by 0.22℃ per ten years, apparently faster than that of the whole world or the north globe for the period.[26] That means the level of change based on integrated ecological factors in China is higher than the level of change based on climate change factors. To put it in the other way, temperature increase on the

[24] China Economics Net, 英国学者认为二氧化碳影响全球水循环 (An English Expert Holds CO_2 Affects Global Water Cycle), at http://www.ce.cn/kjwh/gengduo/200602/19/t20060219_6128919.shtml (last visited December 27, 2009).

[25] Tsinghai-Tibet Plateau covers an area of 2.4 million square kilometers with an average elevation of 4,000–5,000 meters above the sea level, it is rich in ice and snow with abundant precipitation, averagely 500–600 mm per year, but as high as 2,800–3,600 mm in some southeastern regions.

[26] See supra note 6.

surface the earth is the biggest factor that China has contributed or is contributing to global climate change, which, if able to be slowed down, would dramatically reduce the momentum of global climate change. To meet this end, an optimal option is to improve the *status quo of* China's water cycle so as to "lower the temperature of the land," and further lowering the temperature of global climate. Meanwhile, it is necessary to ameliorate and increase vegetation through water cycle, thus strengthening the capability for carbon stock.

Not as with other countries in the world, China's water cycle is irregular. Rivers and watercourses on other continents are comparatively even distributed, not only helpful for the growth of forest and vegetation, but also helpful for lowering the temperature on the earth. It is not the case at all in China, though. As early as a century ago a well-known Chinese geographer vividly described about the irregularity of China's river system in his "three-turning theory,"[27] and finally proposed to take advantage of the country's special topography, i.e. high in the southwest and low in the northwest and the north, to divert water from the southwest to the northwest where water is deadly in need. This very proposal was later written in the Program for Building the Country during the Sun Yat-sen administration in early 20th century.[28]

It is safe to say that China is a country with the world's greatest influence and potential in terms of water cycle. China is now conducting water diversion works from the south to the north, which is surely a helpful initiative for global water cycle and carbon stock. In addition, such water works as the West Water Diversion Scheme has attracted the worldwide attention in the last two decades. This scheme is expected to solve fundamentally imbalance of water distribution and water cycle in China, meanwhile to increase dramatically carbon stocks. What is more, it will help to reduce growingly severe climatic-induced flooding faced by the river basin areas in the southwest of China as well as adjacent countries.[29] Certainly, such works needs further careful discussion and demonstration as well as global cooperation and support.

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[27] Because of geological formation of Mt. Himalayas, a line connects three turnings from the Yarlung Zangbo River, the Yellow River and Hetao Regions, forming a long and hollow zone of about 3,500 meters below the sea level, though the water resources in the southwest regions can be easily diverted into the northwest water-short regions.

[28] "大西线调水"首倡者郭开：拯救黄河迫在眉睫 (Guo K.—A Pioneer Advocator of Diverting Water from the West of China: Imminent to Save the Yellow River), 第一财经日报 (No. 1 Financial Daily), March 21, 2006.

[29] 郭开——开发西藏之水解救干旱中国 (Guo K.—Developing Water Resources in Tibet to Save Draught-Stricken China), at http://tech.china.com/zh_cn/science/nature/11023062/20061027/13704636_1.html (last visited December 28, 2009).

4.3 To Develop a Triple Response Mechanism

Global cooperation against climate change is a precondition for the existence of the UNFCCC and the Kyoto Protocol, and a warranty for the implementation of them as well. Given diversified propositions based on the interests of various countries and groups, which can impossibly be avoided; the only solution to compromising this discrepancy is to further specify in detail the responsibilities of the ratified countries for combating climate change.

The authors hold that it is necessary to have the UNFCCC play the leading role, under which the ratified developed countries need to continue to take the lead in emission abatement. For Asian countries, more attention should be given to their potential in carbon sink and in the improvement of water cycle. Whether this option would be an effective solution to climate change is open for further discussion since neither the IPCC AR4 nor China's NARCC has supplied a convincing answer. However, the fact that the precipitation in the west regions of China has been kept rising though climate change has led to flooding in the south and draught in the north, has vividly evidenced a close relation with China's efforts to promote ecological protection in its western regions in recent years.

5 Conclusion

It has been a long-term pursuit for conserving nature and generating welfare for the human on the earth. Guided by a mindset "to pay due respect to nature while exploiting it to produce welfare for human beings" advanced by a Chinese sage thousands of years ago, China has taken for years highly proactive measures to preserve nature when making full use of it, thus avoiding similar ecological tragedies occurring in Asia Minor and Mesopotamia, and accumulating rich experience in ecological construction. All this will be of great value for solutions to global climate change facing all human beings. Being "harmonious but differentiated" is an ideal cooperative mode that the Chinese have long appreciated for climate protection. Given divergence in the causes of climate change, interest patterns and according to the roles in combating global climate change between developed countries and developing countries, where there is huge potential in supplying such eco-system service as carbon sink and water improvement, a triple response mechanism is recommended, i.e., emission reduction, i.e., carbon stock and water improvement. Only by effectively combining the three factors can we expect more stable and sustained concerted efforts for international cooperation in combating global climate change.

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