

THE CLEAN DEVELOPMENT MECHANISM AND
ENVIRONMENTAL PROTECTION IN RAPIDLY DEVELOPING
COUNTRIES: COMPARATIVE PERSPECTIVES AND LESSONS
FROM CHINA AND INDIA

Michael Addaney*

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* PhD candidate at the Research Institute of Environmental Law, School of Law, Wuhan University, Wuhan, China. Michael is also staff of the University of Energy and Natural Resources, Sunyani, Ghana. Email: appl.adm@gmail.com.

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Abstract

The Clean Development Mechanism (CDM) was adopted as one of the greenhouse gas mitigation measures in the Kyoto Protocol. Apart from promoting environmental sustainability and other ecosystem benefits, the CDM projects also ensure the transfer of technologies and sustainable growth in the host country through prioritizing projects such as clean energy production and conservation as well as waste treatment. China and India together account for over 70% of the CDM projects in the pipeline. Meanwhile, China and India are the most environmentally polluted countries in South Asia according to current statistics. This demonstrates that a multitude of CDM projects in these countries are not yielding corresponding benefits especially in protecting and sustaining ecological treasures. Using comparative analysis, this article discusses the progress made in China and India in terms of policy development and highlights the policy implementation challenges hindering CDM projects from achieving clean and green development. The article shows that although both countries have taken positive steps through the adoption of enabling policies and institutional structures, the twin-forces of incoherent policies and poor institutional designs are impeding the success of CDM projects. This article contends that China and India must share their best practices in the areas of environmental protection and CDM governance to guarantee that CDM projects lead to ecologically sustainable development. Lastly, the article emphasizes how potential policy and institutional reforms to the existing environmental and CDM regulatory mechanisms in China and India would remedy identified deficiencies to achieve the intended sustainable targets sought by the CDM.

I. INTRODUCTION

Climate change is considered as one of the most severe threats to humanity and sustainable development.¹ It raises considerable legal challenges when issues of economic growth and ecological sustainability are examined. Emissions from fossil fuel, land-use change, and agriculture have led to increases of several greenhouse gases that are driving climate change.² Climate change and ecological sustainability are therefore closely linked and indivisible.³ There is a general consensus that the effects of climate change on humans, the

¹ M. Burkett, *Rehabilitation: A Proposal For a Climate Compensation Mechanism for Small Island States*, 13 SANTA CLARA J. OF INT'L L. 81(2015).

² Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Thirteenth Session, held in Bali from 3 to 15 December 2007 Addendum—Part 2: Action Taken by the Conference of the Parties at Its Thirteenth Session*, UN Doc FCCC/CP/2007/6/Add.1 (March 14, 2008).

³ K. Halsnaes et al., *Framing issues*, in CLIMATE CHANGE 2007: MITIGATION OF CLIMATE CHANGE, 121 (Bert Merz et al. ed., 2007).

environment, and ecological processes are negative.⁴ Some of these effects include extreme weather conditions, reduced agricultural crop yield and aggregate food production.⁵ As one of the three pillars of sustainable development, ecologically sustainable development has been conceptualized as the process of “using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be improved.”⁶ Martin and Sutton define the concept as “the maintenance of life support systems and the achievement of a natural extinction rate.”⁷ Ecologically sustainable development therefore advances “economic and social improvement that achieves ecological sustainability while striving to meet society's other needs.”⁸ Based on this concept, governments are to develop and implement national legislation, policy, and programs for the protection and conservation of the natural environment. Fleming et al contend that ecological sustainability should be pursued for the benefit of both humans and the millions of other species on the planet.⁹ This implies that economic development should not be pursued at the expense of the environment and therefore, a sustainable solution should be found for climate change.

Addressing climate change and its adverse effects requires stabilizing greenhouse gas (GHG) emission in developed countries and promoting sustainable development, particularly in developing countries. The international community therefore adopted the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 1992 and 1997 respectively.¹⁰ To guide developing countries toward green growth so that they do not repeat the unsustainable development pathway trekked by developed countries, the Clean Development Mechanism (CDM) was adopted as

⁴ M. PARRY & T. CARTER, *CLIMATE IMPACT AND ADAPTION ASSESSMENT: A GUIDE TO THE IPCC APPROACH* 5 (1988); ANDREW E. DESSLER & EDWARD A. PARSON, *THE SCIENCE AND POLITICS OF GLOBAL CLIMATE CHANGE: A GUIDE TO THE DEBATE* 145 (2nd ed. 2010).

⁵ *CLIMATE CHANGE: THE IPCC IMPACTS ASSESSMENT 1* (William John McGregor Tegart et al. eds., 1990).

⁶ Department of the Environment and Energy of the Australian Government, *Australia's National Strategy for Ecologically Sustainable Development: Ecologically sustainable development* (1992), <http://www.environment.gov.au/about-us/esd> (last visited Apr. 15, 2018).

⁷ M. Powell & P. Sutton, *Ecological sustainability: A definition of ecologically sustainable development*, GREEN INNOVATIONS (Aug. 7, 2000), <http://www.green-innovations.asn.au/ecolsust.htm> (last visited Oct. 26, 2017).

⁸ *Id.*

⁹ M.L. Fleming et al., *Ecological Sustainability: What Role for Public Health Education?* 6(7) INT'L J. ENVTL. RESOURCES AND PUB. HEALTH 2028, 2040 (2009); Powell & Sutton, *supra* note 7.

¹⁰ See, e.g., A/RES/43/53, 70th Plenary Meeting (Dec. 6, 1988); *Climate Change: Guide to the Kyoto Protocol Project Mechanisms*, https://wbcarbonfinance.org/docs/b_en_cdm_guide_ld.pdf (last visited Mar. 18, 2018).

one of the GHG mitigation measures in the Kyoto Protocol.¹¹ The CDM contains clear and binding obligations for industrialized countries to reduce their overall emissions by an average of 5% below 1990 levels during the initial commitment period of 2008-2012.¹² The CDM was set up with the embedded assumption that it will create win-win opportunities for both developed and developing countries to promote ecologically sustainable development while mitigating climate change.¹³ Apart from pursuing environmental sustainability and other ecosystem benefits, the CDM projects also ensure the transfer of technologies and sustainable growth in the host country by prioritizing projects such as clean energy production and conservation as well as waste treatment.

Recent statistics from the CDM database show that China and India dominate the CDM project pipeline. The two countries together account for over 70% of the CDM projects in the pipeline.¹⁴ They have been successful in supplying over 80% of global certified emission reduction credits (CER).¹⁵ Interestingly, the consumption of fossil fuel in China and India are similar, with coal accounting for 70% and 63%, respectively, of their total energy consumption.¹⁶ Despite dominating the CDM project pipeline, China and India are the most polluted countries in South Asia according to 2017 statistics.¹⁷ This implies that the successes of these two countries in attracting CDM projects have not been transformed into environmental sustainability. For example, three of the ten most polluted cities in Asia are located in China and the other seven cities are in India.¹⁸ Further, in 2015, the largest number of deaths attributable to pollution occurred in India and China, with an estimated 2.5 million and 1.8 million deaths, respectively.¹⁹ This is a clear demonstration that despite the plethora

¹¹ Kyoto Protocol to the United Nations Framework Convention on Climate Change, (Kyoto: 1997), http://unfccc.int/kyoto_protocol/items/2830.php (last visited May 26, 2018).

¹² *Id.*

¹³ K. Olsen, *The Clean Development Mechanism's contributions to sustainable development: a review of the literature* 84(1) CLIMATE CHANGE 66 (2007).

¹⁴ Centre for Energy, Climate Change and Sustainable Development, *CDM projects by host region*, UNEP-DTU PARTNERSHIP CDM/JI PIPELINE ANALYSIS DATABASE by 21 October 2017, <http://www.cdmpipeline.org/cdm-projects-region.htm> (last visited Oct. 29, 2017).

¹⁵ O. Adejowo-Osho, *The clean development mechanism and sustainable development: Comparative analysis of governance of cdm in China and Nigeria* 1(4) J. OF COMP. L. IN AFR. 125, 144 (2017).

¹⁶ Z. Cainenga et al., *Energy revolution: From a fossil energy era to a new energy era* 3(1) NAT. GAS INDUSTRY 1, 11 (2016); E.D. Larson, Z. Li & R.H. Williams, *Fossil Energy*, in GLOBAL ENERGY ASSESSMENT 910 (Ronald Bruce Mitchell et al. eds., 2006).

¹⁷ P.J. Landrigan et al., *The Lancet Commission on pollution and health*, 2017 S0140-6736(17) THE LANCET COMMISSIONS, 32345-0, <http://dx.doi.org/10.1016/>

¹⁸ *Id.*

¹⁹ B. Dennis, *Pollution kills 9 million people each year, new study finds*, WASH. POST, (Oct. 19, 2017), https://www.washingtonpost.com/news/energy-environment/wp/2017/10/19/pollution-kills-9-million-people-each-year-new-study-finds/?utm_term=.3f0b1f8ea3fc (last visited Oct. 27, 2017).

of laws and policies as well as a multitude of CDM projects in these countries, there are no corresponding benefits to the protection and sustenance of their environment and associated ecological treasures yet.

This article therefore utilizes a comparative analysis to explore the progress made in China and India in terms of the implementation of CDM projects and environmental protection. It also examines the policy implementation challenges hindering CDMs project from promoting green and clean development. The article argues that, to guarantee that CDM projects leads to “clean and green growth” or ecologically sustainable development in the beneficiary countries, the countries should set clear environmental protection standards and define their sustainable development priority areas. The article is therefore underpinned by the assumption that for CDM projects to deliver sustainability results, it is important for the host countries to have a coherent and robust environmental protection and climate change regulatory frameworks. The article is divided into four sections. Following this introduction, section II discusses the international framework governing the CDM emphasizing its contribution to environmental protection and ecological sustainability. Section III examines the environmental protection regulatory frameworks and the implementation of the CDM projects in China and India. It focuses on how CDM projects enhance environmental protection, particularly in advancing clean and green growth in both countries. Section IV draws the analysis together and concludes the article.

II. THE CLEAN DEVELOPMENT MECHANISM AND ECOLOGICAL SUSTAINABILITY IN EMERGING ECONOMIES

The Kyoto Protocol sets targets for the reduction of GHG emissions for 39 developed countries and some other developing countries.²⁰ The CDM is one of the market mechanisms set up to fulfill the emissions reduction commitments under the UNFCCC. Both the Annex I Party and the non-Annex I Party must participate voluntarily, ratify the Protocol, and designate a national authority known as the Designated National Authority (DNA).²¹ It is essentially a partnership structure specified by the Kyoto Protocol with the objective of encouraging the implementation of investments and

²⁰ Kyoto Protocol to the United Nations Framework Convention on Climate Change (Kyoto Protocol) (Kyoto: 1997).

²¹ See *Modalities and Procedures for a Clean Development Mechanism*, decision 3/CMP.1, (FCCC/KP/CMP/2005/8/Add.1, Mar. 30 2006). This Decision established the Modalities and Procedures for a clean development mechanism as defined in Article 12 of the KP. The Decision forms part of an agreement of 39 decisions which facilitated the prompt start of the CDM and the other flexibility mechanisms in the Protocol.

projects that would promote reductions in GHG emissions. The CDM involves two parties including an investor from a developed country (Annex I Party) and the host developing country (non-Annex I Party). It is based on the premise that the investment in clean technologies in developing countries has the potential to offer carbon emission reductions at a relatively lower cost.²² Apart from advancing environmental sustainability and other ecosystem benefits, the CDM projects also ensure the transfer of technologies and sustainable growth in the host country by prioritizing projects such as clean energy production and conservation as well as waste treatment.²³

Although the UNFCCC does not commit Annex I Parties²⁴ to binding emission reduction targets, it sets the groundwork for binding targets and commitments for GHG emission reductions for Annex I Parties. For instance, the Convention provides that the international law principles of common but differentiated responsibilities, sustainable development, and the precautionary principle shall guide the international climate change regime.²⁵ The Kyoto Protocol further establishes binding emission reduction commitments for Annex I countries in its Annex B.²⁶ The Kyoto Protocol commits Annex I Parties to an average reduction of emissions by 5.5% below their 1990 emissions level by the year 2012. To achieve the required reduction, Parties can either use domestic actions only or a mixture of domestic actions and one or more of the Protocol's flexibility mechanisms.²⁷

²² MICHAEL GILLENWATER & STEPHEN SERES, THE CLEAN DEVELOPMENT MECHANISM: A REVIEW OF THE FIRST INTERNATIONAL OFFSET PROGRAM, www.c2es.org/docUploads/clean-development-mechanism-review-offirst-international-offset-program.pdf.

²³ Kyoto Protocol, *supra* note 20.

²⁴ Annex I countries are developed countries and countries that are undergoing the process of transition to a market economy. They include Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, European Economic Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland and United States of America. Every other country not included in this list is a non-Annex I country for the purpose of the UNFCCC.

²⁵ UN Framework Convention on Climate Change (UNFCCC) art. 3, (May 9, 1992) 1771 U.N.T.S. 107.

²⁶ Annex B countries are the 39 emissions-capped industrialised countries and economies in transition listed in Annex B of the Protocol. The emission reduction commitment of each country varies from country to country. The average emission reduction commitment is 5.2% below 1990 emission levels.

²⁷ The mechanisms are called "flexibility mechanisms" because it allows Annex I Parties with emission reduction commitments, or their entities, the opportunity of choosing how and where to reduce their GHG emissions. For example, they can do so locally through national programmes and initiatives, or through the CDM, by investing in emission reduction or removal projects in non-Annex I countries and earning Certified Emission Reduction (CER) credits for the reductions achieved.

The flexibility mechanisms are the Clean Development Mechanism, Joint Implementation,²⁸ and Emissions Trading.²⁹

The developing countries argued during the UNFCCC and Kyoto Protocol negotiations that they are not liable for the quandary of climate change historically and consequently should not be burdened with the responsibilities for mitigating it. For instance, during the negotiations leading to the Kyoto Protocol, Luiz Felipe Lampreia, the Chancellor of Brazil, reportedly contended that “we cannot accept limitations that interfere with our economic development.”³⁰ Based on this, there seems to be a divergence of views. While the developed countries insisted that environmental protection should be addressed by all, the developing countries argued that environmental protection should not restrict their aspirations for economic development.³¹ Despite these positions, the parties agreed that the adverse effects of climate change are not location specific. It also became clear that the GHG emissions of developing countries such as China and India will overtake those of developed countries in a few decades.³² In fact, despite being categorized by the UNFCCC as developing countries, China and India currently have some of the highest GHG emission levels globally.³³ The Kyoto Protocol categorized countries into Annex I and non-Annex I with the Annex I being developed countries and the non-Annex I being developing countries respectively.³⁴

The rules and procedures for the CDM are included in the Marrakech Accords, a set of agreements reached at the 7th Conference of the Parties (COP7) to the UNFCCC, held in 2001, on the rules of

²⁸ The basic principles of Joint Implementation are defined in Article 6 of the Protocol. JI allows an Annex I country with an emission reduction or limitation commitment under the Protocol to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another Annex I country. The ERUs earned can be counted towards meeting its Kyoto target. In practice, JI operates like the CDM because it allows more developed countries to invest in countries in transition.

²⁹ The basic principles of Emissions Trading are defined in art 17 of the Kyoto Protocol, *supra* note 20. Emissions trading allow countries or entities to sell carbon credits. Carbon is now tracked and traded like any other commodity in what is known as the carbon market.

³⁰ Chancellor Luiz Felipe Lampreia was Brazil's Minister of State for Foreign Relations from 1995 to 2001.

³¹ K. Halsnaes & P. Shukla, *Sustainable development as a framework for developing country participation in international climate change policies* 13(2) MITIGATION & ADAPTATION STRATEGIES FOR GLOBAL CHANCE, 105, 116 (2008).

³² D. Freestone, *The International Climate Change Legal and Institutional Framework: An Overview*, in LEGAL ASPECTS OF CARBON TRADING: KYOTO, COPENHAGEN AND BEYOND 3, 15 (David Freestone et al. eds., 2009); INT'L BANK FOR RECONSTRUCTION AND DEVELOPMENT (IBDR), INTERNATIONAL TRADE AND CLIMATE CHANGE: ECONOMIC LEGAL AND INSTITUTIONAL PERSPECTIVES 46 (The World Bank, 2004), 46; L. Parker & J. Blodgett, *Greenhouse gas emissions: Perspectives on the top 20 emitters and developed versus developing nations*, <http://www.fas.org/sgp/crs/misc/RL32721.pdf> (last visited Oct. 28, 2017).

³³ See WORLD RESOURCES INSTITUTE, CLIMATE ANALYSIS INDICATORS TOOL (CAIT) VERSION 7.0. (2010). See also KEVIN A BAUMERT ET AL., NAVIGATING THE NUMBERS: GREENHOUSE GAS DATA AND INTERNATIONAL CLIMATE POLICY 12 (2005).

³⁴ Kyoto Protocol, *supra* note 20, art. 12(3).

meeting the targets set out in the Kyoto Protocol.³⁵ The most important requirement is that a CDM project should contribute to sustainable development in the host country. A project therefore needs to satisfy some requirements before it can be adopted onto the CDM. The most crucial one is the “additionality” requirement. Such a project must reduce any of the GHGs including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbon (HFC), perfluorocarbon (PFC) and sulphur hexafluoride (SF₆). After this process, the government of the host country or the appropriate authority usually represented by Ministry of Environment needs to approve the project to ensure that it complies with the environmental and development policies and regulations of the country.³⁶ However, opinions have differed widely regarding the impacts of CDM on reducing hosting countries’ carbon emissions in particular and environmental pollution in general. Some scholars argue that the CDM has failed to bring about real and additional GHG emission reductions or control the negative impacts of economic development on the environment.³⁷ For instance, China and India currently have the first and second highest transacted volumes of carbon credits in the world respectively.³⁸ Meanwhile, they are among the leading carbon emitters in the world and are regarded as two of the world’s most environmentally polluted countries.

These UNFCCC and the Kyoto Protocol are the principal instruments governing clean development mechanisms at the international level. They serve as guidelines for incorporating sustainability and environmental impact assessment into all aspects of energy production and distribution in developing countries. However, as observed earlier, there is no obligatory enforcement mechanism to ensure that developing countries are following through on their commitments. In fact, a number of reports have indicated that China and India, which have adopted the Kyoto Protocol and other sustainability policies, often fail to implement their own basic domestic commitments relating to environmental protection.³⁹ Often, there are abundant commitments and activities which are *ad hoc* and

³⁵ Marrakech Accords adopted at the UNFCCC Conference of Parties 7 in Marrakech, Morocco (29 Oct. – 9 Nov. 2001).

³⁶ Kyoto Protocol, *supra* note 20.

³⁷ C. Sutter & J.C. Parreño, *Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects*, 84(1) CLIMATIC CHANGE 75, 90 (2007); Y. Huang & T. Barker, *The Clean Development Mechanism and low carbon development: A panel data analysis*, 34(4) ENERGY ECON. 1033–40 (2012).

³⁸ Adejonwo-Osho, *supra* note 15.

³⁹ Dennis, *supra* note 19; S. Pillai & V. Rambani, *Delhi Chokes on Smoke From Neighbouring States*, HINDUSTAN TIMES, (Oct. 24, 2016), <http://www.hindustantimes.com/delhi-news/delhi-chokes-on-smoke-from-neighbouring-states/story-zAkXkflle5MoUXLNyZa0H.html> (last visited May 27, 2018).

at the grassroots level, whereas full integration and transformation of country-wide practice are rare.⁴⁰ The key reasons of this include a lack of commitment from the central governments and executive management, a lack of acceptance from industries, and a lack of accountability for not fulfilling these commitments. The next section explores the environmental protection mechanisms and how the implementation of CDM projects in China and India are contributing to environmental sustainability.

III. THE CDM, CLEAN GROWTH AND ECOLOGICAL PROTECTION IN CHINA AND INDIA: PROGRESS, PROBLEMS AND PROSPECTS

During the UN Conference on the Human Environment held in Stockholm, 1972 (Stockholm Conference), the Stockholm Declaration was proclaimed and a resolution was adopted for the preservation of the environment through preventing and controlling various types of pollution.⁴¹ Since the Stockholm Conference, there have been increased activities in the area of international environmental protection at both international and national levels. China and India in particular have increased their efforts to improve the global and domestic environmental situation.⁴² As developing countries with populations of more than 1.38 billion and 1.31 billion, respectively,⁴³ China and India are among those countries most severely affected by the adverse impacts of climate change.⁴⁴ Both countries are currently going through rapid urbanization and industrialization with associated

⁴⁰ L. Ganjie, *Ministry of Environmental Protection: China pledges to further cut PM2.5 density*, XINHUA, (Oct. 23, 2017), http://news.xinhuanet.com/english/2017-10/23/c_136700303.htm (last visited May 27, 2018).

⁴¹ U.N. Conference on the Human Environment, *Report of the United Nations Conference on the Human Environment*, ¶ 3, A/CONF.48/Rev1 (5-16 June 1972), <http://www.un-documents.net/aconf48-14r1.pdf> (last visited Oct. 27, 2017).

⁴² M. Yun, *Vertical Environmental Management: A Panacea to the Environmental Enforcement Gap in China?* 1 CHINESE J. ENVTL. L. 37 (2017); J. Holdaway, *Environment and Health Research in China: The State of the Field*, 214 CHINA Q. 255 (2013); M. Greenstone & R. Hanna, *Environmental Regulations, Air and Water Pollution, and Infant Mortality in India* 104 AM. ECON. REV. 3038 (2014), <http://dx.doi.org/10.1257/aer.104.10.3038>.

⁴³ U.N. DEP'T OF ECON. AND SOC. AFF. POPULATION DIVISION, *World Population Prospects: The Key Findings and Advance Tables 2015 Revision*, ESA/P/WP.241 (2015), https://esa.un.org/unpd/wpp/Publications/Files/Key_Findings_WPP_2015.pdf (last visited Oct. 27, 2017).

⁴⁴ JOINT GLOBAL CHANGE RES. INST. AND BATTELLE MEMORIAL INST., PACIFIC NORTHWEST DIVISION, INDIA: THE IMPACT OF CLIMATE CHANGE TO 2030 NIC 2009-03D (2009), https://www.dni.gov/files/documents/climate2030_india.pdf (last visited Mar. 18, 2018); DEP. OF CLIMATE CHANGE, NAT'L Dev. AND REFORM COMMISSION OF CHINA, CHINA'S INTENDED NATIONALLY DETERMINED CONTRIBUTION: ENHANCED ACTIONS ON CLIMATE CHANGE, submitted to the UNFCCC Secretariat (30 June 2015), <http://www4.unfccc.int/ndcregistry/PublishedDocuments/China%20First/China%27s%20First%20NDC%20Submission.pdf> (last visited Oct. 27, 2017).

environmental impacts.⁴⁵ At the same time, they are dealing with multiple challenges such as economic development, poverty alleviation, improving standards of living, environmental protection, and tackling climate change.⁴⁶ The two countries are increasingly being recognised as playing leading roles in advancing environmental protection particularly in the areas of climate change mitigation and sustainable development among the rest of the developing world.⁴⁷ This section therefore examines China and India's environmental protection regimes in relation to CDM projects and their ecologically sustainable development efforts.

A. Step Towards Progress: The Environmental Protection Regulatory Framework in China

The Government of China has constantly placed as much importance on environmental concerns in the past as it does today. The speech by the former premier of China, Li Peng at the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro embodied an apparent divergence in China's environmental protection goals. Cai Shouqiut and Mark Voigtsit commenting on the speech observed that:

While most of the proposal the premier advanced in the speech called for stricter international controls on environmentally-damaging activities, it also equally emphasized that economic development should not be neglected in the pursuit of environmental protection, and that international cooperation should not interfere with national sovereignty.⁴⁸

This speech demonstrated a clear conflict in that although China portrayed its readiness to play a leading role in the protection of the global environment, conversely it seemed to be unwilling to control development in order to clean up its own environment.⁴⁹ These

⁴⁵ P. Hassan, *Role of the South in the Development of International Environmental Law*, 1 CHINESE J. ENVTL. L. 133,143 (2017); M. Greenstone et al., *The Solvable Challenge of Air Pollution in India*, (India Policy Forum held at the National Council of Applied Economic Research, 11-12 July 2017, New Delhi India); V.K. Agarwal, *Environmental Laws in India: Challenges for Enforcement*, in ECOLOGY AND ENVIRONMENTAL MANAGEMENT: ISSUES AND RESEARCH NEEDS 227 (Joyeeta Gupta et al. eds, National Institute of Ecology, New Delhi & Jaipur 2005).

⁴⁶ Nirupam Bajpai, Anjali Chowfla & Srilekha Sita Yasodhara Jayanthi, *Inequality: A China and India Perspective* (Columbia Global Centers--South Asia Working Papers No 7, 2013), <https://doi.org/10.7916/D83R0T9H>.

⁴⁷ Holdaway, *supra* note 42; Greenstone & Hanna, *supra* note 42.

⁴⁸ C. Shouqiut & M. Voigtsit, *The Development of China's Environmental Diplomacy*, 3 PACIFIC RIM L. & POL'Y J. 18 (1993).

⁴⁹ *Id.*

concerns provide a context for understanding the environmental protection dilemma in contemporary China.

Not much has changed after more than two decades: China's approach to the environment has continually been fashioned by the matching nature of economic, social and political factors that affect most developing countries.⁵⁰ Even when facing apparent environmental threat, there is still a considerable emphasis on increasing national wealth and improving standards of living through sustained economic development.⁵¹ The Chinese government always weigh all these pressing factors when deciding how far to pursue environmental protection at both domestic and international levels. Munro observes that although environmental laws and policies in China are generally strict with detailed normative standards, there have traditionally been no practical and/or effective means to enforce them.⁵² Much of China's perceptible backwardness in environmental regulation thus originates from its attempts to incorporate development and environmental concerns.⁵³ In practice, it has been very difficult to implement the provisions of the environmental laws on a national scale.⁵⁴

Over the last three decades, China has passed a plethora of laws and policies to govern environmental protection and revised existing ones. The Environmental Protection Law⁵⁵ is the foundational instrument for ecological protection in China. The primary objective of this law is to protect and improve the environment, prevent and control pollution and other public hazards, safeguard public health, promote ecological civilization improvement, and facilitate sustainable economic and social development.⁵⁶ It further promotes the production and use of clean energy and resources recycling at all societal levels.⁵⁷ The Environmental Protection Law defines the "environment" as:

⁵⁰ X. Zhu et al., *A Review of China's Approaches Toward a Sustainable Energy Future: The Period Since 1990* 3 WIRE ENERGY AND ENV'T 409, 409–23 (2014); S. Tsang & A. Kolk, *The Evolution of Chinese Policies and Governance Structures on Environment, Energy and Climate*, 20 ENV'T POL'Y AND GOVERNANCE 180, 180–96 (2010).

⁵¹ Maxwell et al., *A Review of the Economic, Social, and Environmental Impacts of China's South–North Water Transfer Project: A Sustainability Perspective* 9 SUSTAINABILITY 1, 8 (2017).

⁵² X. Zhang, *Green Bounty Hunters: Engaging Chinese Citizens in Local Environmental Enforcement*, 11 CHINA ENV'T SERIES 147 (2011).

⁵³ N. Munro, *Profiling the Victims: Public Awareness of Pollution-Related Harm in China*, 23 J. CONTEMPORARY CHINA, 314–29.

⁵⁴ K. Bradsher, *China's New Antipollution Push Could Cool Its Growth Engine*, N. Y. TIMES, Oct. 23, 2017, <https://www.nytimes.com/2017/10/23/business/china-pollution-economy.html> (last visited Oct. 27, 2017).

⁵⁵ Environmental Protection Law, (promulgated by the Nat'l People's Cong. 2014),

⁵⁶ *Id.*, art 1.

⁵⁷ *Id.*, art 40.

The total body of all natural elements and artificially transformed natural elements affecting human existence and development, which includes the atmosphere, water, seas, land, minerals, forests, grasslands, wetlands, wildlife, natural and human remains, nature reserves, historic sites and scenic spots, and urban and rural areas.⁵⁸

This definition is very comprehensive and advanced as it covers contemporary issues in environmental protection such as artificially transformed natural elements that affect ecological preservation and protection. The Environmental Protection Law makes the protection of the environment a fundamental policy of the state,⁵⁹ and underscores the underlying principles as prevention, integrated governance, public participation, and liability assumption of damages according priority to protection.⁶⁰

The rights of citizens, legal persons, and other social organizations to environmental information and participation in environmental decision-making are subsequently guaranteed.⁶¹ The underlying principles and most of the provisions in this law are very progressive in terms of advancing ecologically sustainable development due to their relevance for social mobilization around ecological protection issues (particularly those concerning procedural law). This is particularly significant because unequal geographical distribution of ecological benefits and hazards in China has long been a core environmental problem.⁶² For instance Jin Hai observed that “while the urban environment improves, the rural environment continuously degrades” in China.⁶³ Therefore, these principles and provisions will enable vulnerable people and communities to seek justice on environmental protection issues in China.⁶⁴

Progressively, the Environmental Protection Law sets key ecological functional zones and fragile ecological environment as “ecological redline” for strict protection.⁶⁵ Environmental impact

⁵⁸ *Id.*, art 2.

⁵⁹ *Id.*, art 4.

⁶⁰ *Id.*, art 5.

⁶¹ *Id.*, art 53.

⁶² Alice Mah & Xinhong Wang, Research on Environmental Justice in China: Limitations and Possibilities, 1(2) CHINESE J. ENVTL. L. 263, 264 (2017).

⁶³ Jin Hai (晋海), *Zouxiang Chengxiang Huanjing Zhengyi—Yi Fazhi Biange Wei Shijiao* (走向城乡环境正义—以法制变革为视角) [On environmental justice in urban and rural areas in China—from the perspective of legal reform], 10 FAXUE ZAZHI (法学杂志) [L. SCI. MAG.] 74, 74 (2009).

⁶⁴ Ke Jian, *Environmental Justice: Can an American Discourse Make Sense in Chinese Environmental Law?* 24 TEMP. J. SCI., TECH. & ENVTL. L. 253, 277 (2005).

⁶⁵ Huanjing Baohu Fa (环境保护法) [Environmental Protection Law] art. 29 defines ecological redline as key functional zones and areas of sensitive and fragile ecological environment including rare and endangered wild animals and plants, major water conservation sources, geological structures of major scientific and cultural value, areas with karst caves, fossil deposits, traces of glaciers, volcanoes and hot

assessment involving experts and all stakeholders are mandatory before the commencement of any operation or project at all levels.⁶⁶ Other commendable provisions such as the introduction of environmental tort liability to hold to account those who cause environmental pollution and ecological destruction are guaranteed.⁶⁷ It also contains controversial and impractical provisions such as the criminalization of environmental pollution.⁶⁸ Under this law, entities or business operators who commit environmental crimes or offenses are to be jailed for up to 15 days in addition to paying penalties.⁶⁹ One of the transformational aspects of the Environmental Protection Law is that it permits social organizations that meet certain laid down conditions to engage in public interest litigation on environmental matters.⁷⁰ Qualified social organizations should:

- (1) have their registration at the civil affair departments of people's governments at or above municipal level with sub-districts in accordance with the law; (2) specialize in environmental protection public interest activities for five consecutive years or more, and have no law violation records.⁷¹

According to this law, the only cases admissible at the People's Courts are those filed by social organizations that meet these conditions and secondly such cases should not be economically motivated.⁷² Although this is very progressive, it suffers some weaknesses. For example, Zhang and Barr contend that environmental social organizations in China are likely to avoid direct confrontation with the state.⁷³ This makes it challenging for such organizations to use laws, regulations and policies to demand environmental changes. This prevailing situation underscores the practical inadequacy of the existing environmental protection framework in addressing the mounting ecological disasters and degradation in China. When creatively utilized, however, public participation and environmental

springs, traces of human history, and ancient and precious trees. It strictly forbids causing damage to any of them.

⁶⁶*Id.*, art 14 obligates relevant departments of the State Council and people's governments at all levels to prioritize the conduction of full environmental impacts in all their operations and to engage experts and relevant stakeholders in this regard.

⁶⁷ *Id.*, art 64

⁶⁸ *Id.*, art 69.

⁶⁹ *Id.*, art 63.

⁷⁰ *Id.*, art 58.

⁷¹ *Id.*

⁷² *Id.*

⁷³ See JOY Y. ZHANG & MICHAEL BARR, GREEN POLITICS IN CHINA: ENVIRONMENTAL GOVERNANCE AND STATE-SOCIETY RELATIONS (Pluto Press, 2013).

public interest litigation could have the capacity to address critical ecological issues within Chinese legal traditions.⁷⁴

In 2015, China revised the Prevention and Control of Atmospheric Pollution Law of 1995 (Revised Air Pollution Control Law).⁷⁵ The Revised Air Pollution Control Law endeavours to “protect and improve the environment, prevent and control atmospheric pollution, safeguard public health, advance ecological civilization and promote the sustainable development of the economy and society.”⁷⁶ It seeks to achieve this essentially by restricting various sources of atmospheric pollution such as air pollutants and emission of greenhouse gases, particles, sulphur dioxide, nitrogen oxides, volatile organic compounds, ammonia, etc.⁷⁷ Through this law, the Chinese government is obliged to particularly adopt comprehensive measures against pollution “caused by the burning of coal, industrial production, motor vehicles and vessels, volatile organic compounds, ammonia, dust as well as agricultural activities.”⁷⁸ The government is further obliged to make information on atmospheric hygiene readily available to the public.⁷⁹ The government is responsible also for the promotion of clean and efficient use of coal through cooperating with local governments to ban low-quality coal for residential use.⁸⁰ The law also provides for the government to advocate low-carbon and eco-friendly transportation.⁸¹ Some of the major improvements in the law include its strong emphasis on environmental transparency to the public. It stipulates the items to be disclosed to the public including air quality standard, catalogue of major polluters, contact information of environmental authorities and supervisors, and sources and fluctuations of air pollution in important areas.⁸² Violating or non-complying with the provisions in the law may lead to fines ranging between 5,000 RMB (USD\$ 760) and 1,000,000 RMB (USD\$ 152,000) based on the severity of offense, type of entity, operation and recurrence of offense.⁸³

In February 2008, the Law of the People’s Republic of China on the Prevention and Control of Water Pollution (Water Pollution Law)

⁷⁴ Paul A. Barresi, *The Role of Law and the Rule of Law in China’s Quest to Build an Ecological Civilization*, 1(1) CHINESE J. ENVTL. L.9, 9–36 (2017).

⁷⁵ Daqi Wuran Fangzhi Fa(大气污染防治法)[Prevention and Control of Atmospheric Pollution Law] (promulgated by the Standing Comm. Nat’l People’s Cong., Apr. 29, 2000), http://english.court.gov.cn/2016-04/15/content_24565639.htm (last visited May 27, 2018).

⁷⁶ *Id.*, art 1.

⁷⁷ *Id.*, art 2.

⁷⁸ *Id.*, art 2.

⁷⁹ *Id.*, art 91.

⁸⁰ *Id.*, ch IV, Sec 1.

⁸¹ *Id.*, arts 32, 50.

⁸² *Id.*, ch III.

⁸³ *Id.*, ch VII.

was revised and promulgated.⁸⁴ One of the primary objectives for the revision and promulgation of this law was to ensure that China's environmental laws comply with her international and domestic commitments.⁸⁵ The Water Pollution Law was adopted to prevent and control water pollution, protect and improve the environment, safeguard the safety of drinking water and to enhance the comprehensive, harmonious, and sustainable development of economy and society.⁸⁶ It is applicable to the prevention and control of pollution of rivers, lakes, canals, irrigation channels, reservoirs, and other surface waters and ground waters within the territory of the People's Republic of China.⁸⁷ It entrusts the prevention and control of marine pollution with the Marine Environmental Protection Law of the People's Republic of China.⁸⁸ The Water Pollution Law contains 9 comprehensive sections and 92 provisions on preventing and controlling water pollution. Section 1 contains general provisions on the list of prohibited substances that cannot be discharged into waters including highly toxic liquid wastes;⁸⁹ medium and high radioactive substances;⁹⁰ solid wastes and waste water;⁹¹ industrial solid waste, urban refuse, and other castoffs.⁹² This law is particularly commendable as it demonstrates the government's resolve to strengthen its regulatory mechanisms to sustainably address the issue of water pollution in the country.⁹³ One of the apparent contradictions in this law is that, it obliges the government and other county and provincial level departments to present the protection of water environment into the national economic and social development planning.⁹⁴ This provision validates the assertion by some scholars and practitioners as discussed earlier that the environmental protection standards and economic development targets negate each other in China.

Section 5 of the Water Pollution Control Law protects drinking water sources and other special waters including the classification of water sources into Grade I and II and consequently permits the

⁸⁴ Prevention and Control of Water Pollution Law (promulgated by the Nat'l People's Cong 2008).

⁸⁵ *Id.*

⁸⁶ *Id.*, art 1.

⁸⁷ *Id.*, art 2.

⁸⁸ *Id.*

⁸⁹ *Id.*, art 29.

⁹⁰ *Id.*, art 30.

⁹¹ *Id.*, art 31 & 32.

⁹² *Id.*, art 33.

⁹³ *Id.* art. 3 states that "[i]n the prevention and control of water pollution, the Government shall follow the principles of giving priority to prevention, combining prevention with control and preventing and controlling in an all-round way, protect drinking water sources first, rigorously control industrial pollution and urban domestic pollution, prevent and control agricultural non-point pollution, vigorously promote the construction of ecological management projects, and prevent, control and reduce water pollution and ecological damage."

⁹⁴ *Id.*, art 4.

delimitation of certain areas at the periphery of a drinking water source reserve as a quasi-reserve.⁹⁵ Article 58 prohibits the building, renovating, or enlarging of any construction projects that are irrelevant to water supply facilities or the work of water source protection in a Grade I drinking water source reserve. It authorizes the county and local government to order the demolition or closure of those already constructed.⁹⁶ Although these provisions are progressive, they lack the coherence to effectively protect water sources and water bodies from pollution. For instance, when a drinking water source is polluted which may threaten water safety, article 62 directs the administrative department of environmental protection to order the related enterprises and/or public institutions to stop or reduce the discharge of water pollutants.⁹⁷

Although this law establishes remedial and compensatory mechanisms in case there is pollution,⁹⁸ there are several contradictions and conflicts of interest in the law. For instance, it mandates the maritime administrative body under the administrative department of traffic to exercise supervision and administration over the prevention and control of water pollution from vessels.⁹⁹ Similarly, it goes further to oblige the departments in charge of water administration, state land and resources, health, construction, agriculture and fishery at the county level and other institutions in charge of protecting water resources in important rivers and lakes to exercise supervision and administration over the prevention and control of water pollution within their respective scope of duties and functions.¹⁰⁰ These apparent contradictions and conflicts of interest do not only weaken the institutional supervision but also negatively affect the general efficacy of this law in addressing water pollution since these are some of the major sources of pollutants.¹⁰¹ Interestingly, the law obliges all entities and individuals to protect water and surrounding environment with a corresponding right to report them to authorities who are essentially the same institutions polluting or damaging water environment.¹⁰² This provision is very ambiguous and vague; it is not forceful enough to deter polluting enterprises and public departments from causing water pollution.

⁹⁵ *Id.*, art 56.

⁹⁶ *Id.*, art 58.

⁹⁷ *Id.*, art 62.

⁹⁸ *Id.*, art 7 states that "The state shall, in the mode of financial transfer payment or other, establish a compensation mechanism for the ecological protection of the water environment in drinking water source reserve areas and upper reaches of rivers, lakes and reservoirs". See *id.* art. 7.

⁹⁹ *Id.*, art 8.

¹⁰⁰ *Id.*, art 8.

¹⁰¹ Maxwell et al., *supra* note 51, at 8.

¹⁰² Shui Wuran Fangzhi Fa (水污染防治法) [Prevention and Control of Water Pollution Law] (promulgated by Standing Comm. Nat'l People's Cong. 2008) art 10 (Chinalawinfo).

Other issues such as corruption and poor institutional design further weaken this law.¹⁰³

In terms of legal liability, Chapter VII contains wide-ranging provisions to deter officers and administrative departments supervising the enforcement of this law from failing to investigate alleged illegal acts, or commits any other act in failure to perform its duties prescribed by this Law.¹⁰⁴ The law appears to be biased towards economic development and fails to provide strong deterrence to wealthy corporations from causing water pollution. For instance, in case an entity pollutes a drinking water source reserve, the people's government at the county and municipal level are authorised to dismantle it within a certain time limit and impose upon it a fine of not less than 100,000 Yuan nor more than 500,000 Yuan.¹⁰⁵ When the entity fails to dismantle it within the prescribed time limit, the people's government may mandatorily dismantle the source of pollution with necessary expenses including a fine of not less than 500,000 Yuan nor more than 1 million Yuan to be paid by the wrongdoer; when necessary, the entity may be ordered to stop production until it has put itself in good shape.¹⁰⁶ These provisions are problematic because most of the entities causing water and other pollutions in China are state enterprises; and the others include wealthy and powerful multinational companies contributing to the rapid economic growth of the country. Therefore, it becomes challenging if not impossible for the same government to prosecute itself for wrong doing. In addition, governments at the county and local levels are not relatively powerful to control the wealthy and powerful corporations in their jurisdiction.¹⁰⁷ All these prevailing conditions erode the efficacy of the Water Pollution Control Law from preventing and controlling water pollution in China.

Similar to the Water Pollution Control Law, the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes (Solid Wastes Control Law) was promulgated on 29th December 2004 and came into force on 1st April 2005.¹⁰⁸ The Solid Wastes Control Law is detailed containing six chapters and 91 articles on various aspects of addressing the critical issue solid wastes pollution in China. It primarily seeks to prevent and control environmental pollution by solid wastes, safeguard human health, maintain the ecological safety and promote the sustainable

¹⁰³ Maxwell et al., *supra* note 51, at 8.

¹⁰⁴ *Id.*, art 69.

¹⁰⁵ *Id.*, art75.

¹⁰⁶ *Id.*

¹⁰⁷ Maxwell et al., *supra* note 51, at 8.

¹⁰⁸ Gutu Feiwu Wuran Huanjing Fangzhi Fa (固体废物污染环境防治法) [Prevention and Control of Environmental Pollution by Solid Wastes Law] (promulgated by Standing Comm. Nat'l People's Cong., amended Dec. 29, 2004) (Chinalawinfo).

development of economy and society.¹⁰⁹ In several respects, the Solid Wastes Control Law contains similar provisions just like the Water Pollution Control law with the only difference being their protective scope of solid wastes and water respectively. Some of the relevant provisions in the Solid Wastes Control Law include article 3 which provides that “in preventing and controlling environmental pollution by solid wastes, the State shall implement the principles of reducing the discharge and harm of solid wastes, fully and rationally utilizing solid wastes and making them hazardless through treatment so as to promote cleaner production and the development of recycling economy.”¹¹⁰

The Solid Wastes Control Law incorporate the polluter pays principle and obligates the government to implement the principle that any entity or individual causing the pollution shall be responsible for it in accordance with law.¹¹¹ The “polluter pays principle” requires that the person or entity causing the harm should be held responsible by the state for this violation.¹¹² It accordingly holds the manufacturers, sellers, importers and users responsible for the prevention and control of solid wastes pollution produced thereby.¹¹³ The “polluter pays principle” therefore obliges the Chinese government to protect the people and environment from solid wastes pollution caused by third parties such as corporations. Consequently, the state will be deemed as the polluter and liable to “pay” for the environmental degradation that the state has failed and or refused to regulate. States are therefore not excused merely because they are not the direct perpetrators of the environmental degradation. This places a positive obligation on states to ensure that legislative and other measures are put in place to regulate activities of both individuals and corporations in order to maintain satisfactory environments conducive for development. In this regards, it must be highlighted that it is relatively easier to allocate responsibility for restoration of the environment where it is clear that certain entities are responsible for the pollution.

Furthermore, in order to engender clean and green development, the Solid Wastes Control Law encourages entities and individuals to purchase and use renewable products and reusable products.¹¹⁴ Article 9 obliges all entities and individuals to protect the environment

¹⁰⁹ *Id.*, art 1.

¹¹⁰ *Id.*, art 3.

¹¹¹ *Id.*, art 5.

¹¹² MICHAEL FAURE AND WILLEMEN DU PLESSIS (EDS) *THE BALANCING OF INTERESTS IN ENVIRONMENTAL LAW IN AFRICA*4 (Pretoria Univ. Law Press 2012).

¹¹³ Gutu Feiwu Wuran Huanjing Fangzhi Fa (固体废物污染环境防治法) [Prevention and Control of Environmental Pollution by Solid Wastes Law] (promulgated by Standing Comm. Nat'l People's Cong., amended Dec. 29, 2004) art. 5 (Chinalawinfo).

¹¹⁴ *Id.*, art 7.

and give them the right to report or file charges against those entities and/or individuals that cause environmental pollution by solid wastes.¹¹⁵ Concerning the administration of the prevention and control of environmental pollution by generating solid wastes, Chapter II sets out the institutional arrangements for the purpose of ensuring environmental quality standards and state economic and technical conditions are always met.¹¹⁶ The Solid Wastes Control Law forbids the dumping, piling up, or treating any solid waste from abroad within the territory of China.¹¹⁷ It further prohibits the importation of non-usable solid wastes and places restrictions on the importation of solid wastes that can be used as raw materials.¹¹⁸

In addition, the 13th Five Year Plan¹¹⁹ lays down the strategy and pathway for China's development for 2016-2020 including concrete environmental and efficiency targets. The Plan also aims to modernize commercial agriculture production to reduce overcapacity, while aiming to turn 1 million hectares of marginal cropland into forest or grassland. In an effort to reduce air pollution, the Plan also aims to increase forest coverage to 23.04% over the next five years. Other legislative measures include the Revised Energy Conservation Law of 2007 (Energy Conservation Law). The Energy Conservation Law seeks "to strengthen energy conservation, predominantly for key energy-using entities, protecting and improving the environment, and promoting comprehensive, coordinated and sustainable economic and social development."¹²⁰ It obliges "the government to encourage and support the application of renewable energy in various areas."¹²¹ The Energy Conservation Law further stresses on the adoption and usage of energy conservation practices that are economically rational and bearable to the environment and society.¹²² One of the progressive provisions in this law is that it prohibits the building of new coal-burning generating sets, fuel-burning generating sets or coal-burning thermoelectric generating sets inconsistent with state provisions.¹²³ This provision is a very bold initiative in regulating the energy and power generation sector to ensure that they comply with the GHG

¹¹⁵ *Id.*, art 9.

¹¹⁶ *Id.*, arts 14, 15.

¹¹⁷ *Id.*, art 24.

¹¹⁸ *Id.*, art 25.

¹¹⁹ Guomin Jingji he Shehui Fazhan Di Shisan Ge Wunian Guihua (国民经济和社会发展第十三个五年规划纲要) [13th Five-Year Plan of China], Executive, Mitigation Framework of 2016.

¹²⁰ Jieyue Nengyuan Fa (节约能源法) [Energy Conservation Law] (promulgated by the Standing Comm. Nat'l People's Cong., amended Oct. 28, 2007) art. 1 (Chinalawinfo).

¹²¹ Gutu Feiwu Wuran Huanjing Fangzhi Fa (固体废物污染环境防治法) [Prevention and Control of Environmental Pollution by Solid Wastes Law] (promulgated by Standing Comm. Nat'l People's Cong., amended Dec. 29, 2004) art.1 (Chinalawinfo).

¹²² Jieyue Nengyuan Fa (节约能源法) [Energy Conservation Law] (promulgated by the Standing Comm. Nat'l People's Cong., amended Oct. 28, 2007) art. 1 (Chinalawinfo).

¹²³ *Id.*, art 33.

emission reduction standards set in the Kyoto Protocol. The Energy Conservation Law works in tandem with the revised Renewable Energy Act of 2006, which establishes measures to generate 15% of China's energy from renewable sources by 2020 through encouraging and supporting the usage of renewable energy in various sectors.¹²⁴

B. The Legal Framework on Environmental Protection in India

Similar to China, several laws and policies were adopted to govern environmental protection and clean development before and right after India's Independence.¹²⁵ The need for protection and conservation of the environment and sustainable use of natural resources is reflected in the constitutional framework of India. The 1950 Constitution obliges every citizen of India "to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures."¹²⁶ Under the Directive Principles of State Policies, the Constitution provides that "the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country."¹²⁷ Nevertheless, the urgency to formulate a well-developed framework to protect the environment was reinforced only after the Stockholm Conference in 1972.¹²⁸ Shortly after the Stockholm Conference, India established the National Council for Environmental Policy and Planning in 1972 under the aegis of the Department of Science and Technology to set up a regulatory framework to govern environment-related issues. This Council became the Ministry of Environment and Forests in 1985.¹²⁹ The Ministry of Environment and Forests is currently the apex governmental body for the regulation and protection of the environment.¹³⁰ Since the 1970s, several environmental legislation and policies have been adopted. The Ministry of Environment and Forests and the Pollution Control Boards including the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs) form the core institutional regulatory mechanism for the environmental protection sector.¹³¹ Some of the key legislation on environmental protection includes the National Green Tribunal Act of 2010 (Great Court Act); the Air Prevention and Control of Pollution

¹²⁴ Ke Zaisheng Nengyuan Fa (可再生能源法) [Renewable Energy Law] (promulgated by the Standing Comm. Nat'l People's Cong. 2006, amended Dec. 26, 2009) art. 1 (Chinalawinfo).

¹²⁵ Furqan Ahmad, *Origin and growth of environmental law in India*, 43(3) J. INDIAN L. INST. 358, 358–387 (2001).

¹²⁶ INDIA CONST. § 51A.

¹²⁷ *Id.* art 48A.

¹²⁸ Ahmad, *supra* note 125, at 362.

¹²⁹ Greenstone & Hanna, *supra* note 42, at 3042.

¹³⁰ *Id.*

¹³¹ *Id.*

Act of 1981 (Air Pollution Act); the Water Prevention and Control of Pollution Act of 1974 (Water Pollution Act); the Environment Protection Act of 1986 (Environment Act) and the Hazardous Waste Management Regulations (Hazard Waste Regulation). These laws are very similar in wording to those of China and they were originally formulated and adopted in the same era.

The Environment Protection Act of 1986 (the Environment Act) was adopted for the protection and improvement of the environment.¹³² The Environment Act is a comprehensive legislation that provides a framework for coordinating the key authorities established by the Water Pollution Act and the Air Pollution Act. It establishes the framework for studying, planning, and implementing long-term policies and programs for safeguarding the environmental safety and provides a mechanism for the speedy and adequate response to situations that threaten the environment. The most significant environmental act in India is conceivably the Environment Act which was adopted during the Bhopal gas tragedy in 1984. The Act empowers the Central Government with a massive clout for the protection and improvement of the environment.¹³³ It strengthens the arms of the central government to coordinate the activities of the various authorities established at the national and state levels under the other environmental laws.

The Environment Act is often called the Umbrella Act since a number of subsequent environmental laws and regulations have their origin attributed to its provisions.¹³⁴ Most of the fines for violations of those regulations and most environmental laws are also usually specified in the Environment Act.¹³⁵ The Environment Act defines “environment” to include water, air and land as well as the interrelationship, which exists between water, air, and land, and human beings, other living creatures, plants, micro-organisms, and property.¹³⁶ Under the Environment Act, the Central Government is obliged to take appropriate measures to protect and improve the quality of environment through setting specific standards for emissions and discharges of pollution in the atmosphere by any person carrying on an industry or activity, regulating the location of industries, managing hazardous wastes, as well as the protection of public health and welfare.¹³⁷ The Environment Act further provides that the Central Government shall “restrict areas in which any industries, operations or processes shall discharge or emit or permit to

¹³² The Environment (Protection) Act § 3(1), 1986 (India).

¹³³ M.S.A. Samada et al., *Environmental Forensics in India –Four years after the National Green Tribunal Act*, 2010, (2015) 30 *PROCEDIA ENV'T SCI.* 93, 91–96.

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ The Environment (Protection) Act § 2(a), 1986(India).

¹³⁷ *Id.* § 2(3).

be discharged or emitted any environmental pollutants in excess of such standards as may be prescribed.”¹³⁸

The Central Government also has the responsibility to protect ecologically-sensitive areas. Similar to the Chinese Environmental Protection Law, where public department violates the law, the head of the department shall be guilty of the offence and shall be liable to be punished accordingly.¹³⁹ In case of any contravention of the Environment Act, the wrongdoer will be punished with imprisonment up to five years or with fine up to Rs 100,000 or with both.¹⁴⁰ In the case that the violation persists, an additional fine of up to Rs 5,000 for every day during which the contravention continues after the conviction for the first offence will be levied. Additionally, if the violation continues up to one year after the initial date of conviction, the offender shall be imprisoned for a term which may extend to seven years.¹⁴¹ Despite the comprehensive nature of the Environment Act, Agarwal argues that the apparent multiplicity of pollution control standards for the same type of industries makes the law difficult to enforce.¹⁴² He further observes that scores of the standards have not yet been set as specified in the Acts due to lack of appropriate instruments to assess the parameters of pollution.¹⁴³ This weakens the entire framework for enforcing environmental protection laws in India.

The Water Prevention and Control of Pollution Act, 1974 (Water Pollution Act) was enacted to provide for the prevention and control of water pollution and to maintain or restore wholesomeness of water in the country.¹⁴⁴ The Water Pollution Act defines pollution as the:

Contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.¹⁴⁵

¹³⁸ *Id.* § 2(3)(v).

¹³⁹ *Id.* § 17(1).

¹⁴⁰ *Id.* § 15(1).

¹⁴¹ *Id.* § 15(2).

¹⁴² Agarwal, *supra* note 45.

¹⁴³ *Id.*

¹⁴⁴ *See* Water Prevention and Control of Pollution Act preamble, 1974 (India).

¹⁴⁵ *Id.* § 2(e).

It further provides for the establishment of Boards for the prevention and control of water pollution with a view to carrying out the aforesaid purposes.¹⁴⁶ The Water Pollution Act prohibits the discharge of pollutants into water bodies beyond a given standard and lays down penalties for non-compliance.¹⁴⁷ Any person who contravenes the provisions in the section shall be punishable with imprisonment for a term which shall not be less than one year and six months, but which may extend to six years, and with fine.¹⁴⁸ When a company violates the provisions of this Act, “every person who was in charge when the offence was committed, and conducting the business of the company, and the company, shall be liable and punished accordingly.”¹⁴⁹ Similar to the Chinese law, where an offence has been committed by a government department, the Head of Department shall be guilty and liable to be proceeded against and punished accordingly.¹⁵⁰

At the national level, the Water Pollution Act sets up the Central Pollution Control Board (CPCB) to provide the standards for preventing and controlling water pollution.¹⁵¹ At the state level, the State Pollution Control Boards (SPCBs) work under the supervision of the State Government and the CPCB. Article 32 mandates the State Board to issue emergency measures in cases of pollution of stream or well. Under such circumstances, the Board when necessary can take immediate actions such as removing that matter from the stream or well or on land and disposing of it appropriately and/or mitigate the pollution.¹⁵² It can also issue immediately the orders to restrain or prohibit the person or entity concerned from discharging any polluting matter into the stream or well or on land.¹⁵³

Despite these comprehensive provisions, Agarwal observes that people and companies still pollute water bodies such as lakes and rivers because of poor enforcement and weak institutions. The Supreme Court sometimes has to intervene to hold perpetrators to account and to penalize them accordingly. For instance, in the *Ganga Water Pollution* case the owners of some tannery factories were

¹⁴⁶ *Id.* ch. 3.

¹⁴⁷ *Id.* § 24(1), which provides that (a) no person shall knowingly cause or permit any poisonous, noxious or polluting matter determined in accordance with such standards as may be laid down by the State Board to enter (whether directly or indirectly) into any Stream or well or sewer or on land; or (b) no person shall knowingly cause or permit to enter into any stream any other matter which may tend, either directly or in combination with similar matters, to impede the proper flow of the water of the stream in a manner leading or likely to lead to a substantial aggravation of pollution due to other causes or of its consequences.

¹⁴⁸ *Id.* § 43.

¹⁴⁹ *Id.* § 47(1).

¹⁵⁰ *Id.* § 48.

¹⁵¹ *Id.* ch 4.

¹⁵² *Id.* § 32(1)(a) & (b).

¹⁵³ *Id.* § 32(1)(c).

discharging effluents into Ganga River without constructing treatment plants.¹⁵⁴ The Court directed the tannery factories to stop operating and also ordered that trade effluents should not be allowed either directly or indirectly into the Ganga River without subjecting the effluents to a permanent process through setting up primary treatment plants as approved by the SPCB.¹⁵⁵ Furthermore, the Water Prevention and Control of Pollution Act (Cess Act) was passed in 1977 and amended in 2003 for the collection of a cess¹⁵⁶ (levy) on water used by persons and entities undertaking certain types of industrial operations and activities. This levy is collected with the primary purpose of augmenting the resources of the CPCB for the prevention and control of water pollution as provided constituted under the Water Pollution Act.¹⁵⁷ The industries may obtain a rebate as to the extent of 25% if they set up treatment plant of sewage or trade effluent. This is supposed to provide incentives for companies to desist from causing pollution to water bodies. This is contrary to what is prevailing in China where wrongdoers are fined and/or imprisoned. In addition, there is no law like the Cess Act in China due to the socialist inclination of the Chinese political system as opposed to the capitalist leanings of the Indian system.

The Air Pollution Act provides for the prevention, controlling and abatement of air pollution¹⁵⁸ and establishes National and State Boards undertaking such duties.¹⁵⁹ In order to respond to the air pollution and its associated problems, the Air Pollution Act empowers the Central Board to set ambient air quality standards.¹⁶⁰ It primarily seeks to combat air pollution through prohibiting the use of polluting fuels and substances and through regulating other appliances that contribute to air pollution.¹⁶¹ The Air Pollution Act empowers the State Government in consultation with the SPCBs to declare any area or areas within the State as air pollution control area or areas.¹⁶² Under the Act, any entity who wants to establish or operate any industrial plant in a pollution control area requires permission from SPCBs.¹⁶³ The SPCBs are responsible for testing the air in pollution control areas as well as the inspection of pollution-controlling

¹⁵⁴ M.C.Mehta v. Union of India,AIR 1988 SC 1037 (India). *See also* Bhavani River v. Sakthi Sugar Ltd.,AIR 1998 SC 2059 (India).

¹⁵⁵ *Id.*

¹⁵⁶ The term was formerly applied to local taxation in India. During the colonial era, it was applied with a qualifying prefix to any taxation including irrigation-cess, educational-cess etc. like.

¹⁵⁷ Water Prevention and Control of Pollution Act (Cess Act) (1977) (India), § 3(1).

¹⁵⁸ *Id.* preamble ¶ 1.

¹⁵⁹ *Id.* § 6(3) & 7(4).

¹⁶⁰ *Id.* § 16(2)(h).

¹⁶¹ *Id.* § 19(2).

¹⁶² *Id.* § 19(1).

¹⁶³ *Id.* § 21 (1).

equipment and manufacturing processes.¹⁶⁴ The Air Pollution Act empowers the Board to apply to the court for a restraining order to stop a person or an entity from causing air pollution.¹⁶⁵ This law is comprehensive and provides recourse for appeal and other remedial mechanisms that do not exist in the Air Pollution Law of China.

The National Green Tribunal Act, 2010 (No. 19 of 2010) (Green Tribunal Act) was adopted for establishing the National Green Tribunal in India to efficiently and expeditiously dispose of the cases concerning environmental protection and forest conservation as well as other natural resources.¹⁶⁶ The Green Tribunal further has jurisdiction to hear cases involving the enforcement of any legal right that relates to the environment and gives relief and compensation for damages to persons and property as well as similar matters.¹⁶⁷ The Act establishes the Green Tribunal in order to deal with all environmental laws relating to air and water pollution, the Environment Protection Act, the Air Pollution Act; the Water Pollution Act; the Environment Protection Act and the Cess Act as having been set out in Schedule I of the Green Tribunal Act.¹⁶⁸ Consequent to the coming into force of the Green Tribunal Act, the National Environment Tribunal Act of 1995 and the National Environment Appellate Authority Act of 1997 are repealed.¹⁶⁹ The Green Tribunal is authorized to enforce any legal right relating to the environment and natural resources and apply internationally recognized environmental law principles including sustainable development, the precautionary principle, and the “polluter pays” principle while issuing an order, decision or award.¹⁷⁰ The Green Tribunal gives directions ranging from the imposition of bans on environmentally damaging activities such as sand mining to directions to government authorities such as the Ministry of Environment, Forest and Climate Change as well as other relevant agencies including Pollution Control Boards found to be deficient in the performance of their statutory duties relating monitoring and ensuring compliance with the laws.¹⁷¹

Shrotria underscores the significance of the establishment of the Indian Green Tribunal due to the demand for greater environmental

¹⁶⁴ *Id.* § (1)(e).

¹⁶⁵ *Id.* § 22A.

¹⁶⁶ National Green Tribunal Act (enacted by the Parliament of India 2010) (Green Tribunal Act).

¹⁶⁷ *Id.* § 14(1) & (2).

¹⁶⁸ *Id.* at Schedule I.

¹⁶⁹ The National Environment Appellate Authority established under § 3(1) of the National Environment Appellate Authority Act of 1997 stands dissolved, in view of the establishment of the National Green Tribunal under the National Green Tribunal Act, 2010 *vide* Notification no. S.O. 2570(E) (18 October 2010). *See also* Green Tribunal Act, *supra* note 166, § 38.

¹⁷⁰ *Id.* § 20.

¹⁷¹ Gram Panchayat Totu (Majthai) v State of Himachal Pradesh OA No. 2 of 2011; Krishi Vigyan Arogya Sanstha v The Ministry of Environment and Forest Appeal No. 7 of 2011 (T).

justice and the increasing complexity of environmental law.¹⁷² Citing Lord Woolf, she reasserted that environmental courts are very important since the general courts were unable to address with the growing specialization of the environmental law.¹⁷³ She reasoned with Woolf that:

The development of environment courts was basically because the High Courts were overburdened and not in a position to attend to the influx of complex environmental issues, particularly due to problems of multiplicity of proceedings and the criminal courts in addition to their own cases were having to preside over quasi-criminal offences giving rise to technical crimes which did not fit into the structure of criminal trials.¹⁷⁴

In India, despite some apparent weaknesses and criticisms as well as restricting its mandate to civil matters relating to the seven environmental legislations enumerated in Schedule I of the Green Tribunal Act, with a combination of judges and environmental experts, Shrotria observes that “the Green Tribunal has contributed to the strengthening of the enforcement mechanism for ensuring a safe and clean environment.”¹⁷⁵

The Energy Conservation Act of 2001 requires large energy consumers to adhere to energy consumption norms and appliances to meet energy performance standards and to display energy consumption labels. Unlike the Energy Conservation Law of China, this Act does not contain any specific provisions on clean or green development. This is a major gap since energy generation, distribution and usage are the dominant sources of GHG emissions and source of atmospheric pollution in that country. The Electricity Act of 2003 also recognises the role of renewable energy in the country’s National Electricity Policy and in stand-alone systems. Key provisions of the Act in relation to renewable energy include the preparation of a National Energy Policy and tariff policy based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. This act is also silent on concrete legal standards that can ensure the generation, distribution and usage of clean energy and advancement of ecological protection in India. In terms of policy instruments, the National Action Plan on Climate Change and the Mitigation and Adaptation Framework of

¹⁷² S. Shrotria, *Environmental justice: Is the National Green Tribunal of India effective?*, 17(3) ENVTL. L. REVIEW 169, 169–88 (2015).

¹⁷³ *Id.* at 170.

¹⁷⁴ *Id.*

¹⁷⁵ *Id.* at 186.

2008 recommends a minimum share of renewable energy in the national grid of 5% in 2010 to be increased by 1% every year to reach 15% by 2020. The REDD+ aspects of the climate action plan seeks to increase forest cover on 5m ha of non-forest lands and improve quality of forest cover on another 5m ha of non-forest lands by a total of 10m hectares and to improve ecosystem services such as biodiversity, hydrological services, increase forest-based livelihood income of about 3m households living in and around the forests by the year 2022.¹⁷⁶

C. Toward Promoting Clean Development: Institutional Efforts and the Enforcement of Environmental Protection Standards in China and India

Following President Donald Trump's decision regarding the US withdrawal from the Paris Agreement in June 2017, there has been a shift on the global leadership of climate change. Donald Trump's decision has wide ramifications for international climate governance and politics, as well as for the national commitment to keep global warming to less than 2 degrees Celsius (3.6 degrees Fahrenheit).¹⁷⁷ China is predicted to assume the political responsibility of international climate leadership, especially considering its financial resources and colossal investments in renewable energy sources, e.g. solar power and wind markets.¹⁷⁸ India also has national commitments on promoting solar energy and curbing fossil fuel use.

However, India is less ambitious on the international political stage. Projected declines of coal use in China and India are likely to reduce the growth of global carbon emissions by approximately 2-3 billion metric tons (2.2-3.3 billion U.S. tons) by 2030. Coal-fired power stations are therefore increasingly uneconomical compared to solar power. In May 2017, India abandoned planned investments in coal-fired power stations. The combined capacity of the power stations reaches 14 gigawatts, which was equivalent to the whole of the United Kingdom.¹⁷⁹ Both China and India are expected to reduce national carbon emissions in advance of target, potentially serving as significant contributors to reducing net global emissions. As already discussed, the progress on climate action is not yet matched by comparable leadership on domestic environmental policies. There are

¹⁷⁶ *The Indian National Action Plan on Climate Change Mitigation and Adaptation Framework* (adopted by the Prime Minister's Council on Climate Change 2008), <http://www.nicra-icar.in/nicarevised/images/Mission%20Documents/National-Action-Plan-on-Climate-Change.pdf> (last visited Apr. 15, 2018).

¹⁷⁷ M. Robinson, *Will China and India Lead on Global Climate Action and Environmental Protection?*, WORLD RESOURCES INST., (July 13, 2017), <http://www.wri.org/blog/2017/07/will-china-and-india-lead-global-climate-action-and-environmental-protection> (last visited Apr. 27, 2018).

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*

still deep-rooted problems of air, soil and water pollution with excessive use of pesticides and fertilizers causing chronic health impacts in both China and India.¹⁸⁰ There is increasing public pressure in China and India and governments of both countries are devoted to find sustainable solutions to these problems.

In terms of transparency and access to information on environmental matters, both China and India signed the UNEP Bali Guidelines, which was adopted in 1992 as part of the Rio Declaration. Principle 10 of the Guidelines states that:

Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.¹⁸¹

According to the 2015 Environmental Democracy Index, China performed well on the public's rights to access environmental information and to participate in the environmental decision-making processes. However, compared to India which has a robust legal and institutional infrastructure in place for enforcing its environmental laws and policies, China's performance is less satisfactory regarding the right to access justice or redress and remedy in cases of environmental violations or crimes.¹⁸² Nevertheless, China acknowledges the need to empower its citizens to access information on environmental matters and to hold officials accountable for lack of action by the environmental law courts and other means.¹⁸³

Since the introduction of the new Environmental Protection Law in 2015, Chinese courts dealt with an estimated 189 public interest environmental cases, most of which were brought by environmental non-governmental organizations.¹⁸⁴ The Ministry of Ecology and

¹⁸⁰ *Id.*

¹⁸¹ UNEP, *Bali Guidelines* adopted (1992) Principle 10, <http://web.unep.org/about/majorgroups/resources/guidelines-and-policy-documents> (last visited Apr. 27, 2018).

¹⁸² World Resource Institute, *2015 Environmental Democracy Index* (2016), <https://environmentaldemocracyindex.org/rank-countries> (last visited Apr. 27, 2018).

¹⁸³ R.Z. Qing & B. Mayer, *Public Interest Environmental Litigation in China*, 1(2) *J. OF ENVTL. L.* 202–28 (2017).

¹⁸⁴ *Id.*

Environment (formerly Ministry of Environmental Protection) is responsible for implementing the new Environmental Protection Law. The Ministry has intensified local inspections on heavily-polluting industries and has been actively gathering public complaints on environmental pollution issues.¹⁸⁵ The approach adopted by the Chinese government enables it to better understand the environmental risks and hold public officials and private entities accountable for failing to address pollution or other forms of poisoning. International leadership on climate action, ecologically sustainable development, and environmental governance means living up to the essence of public participation and regulatory enforcement on environmental matters and not just exploiting the potential economic returns.

The economic transitions in both China and India provide an exceptional opportunity to construct an innovative, inclusive and ecologically sustainable growth model. The two countries are already making significant progress towards their commitments under the international and national climate change goals.¹⁸⁶ For instance, India is on track to exceed its 2022 renewable energy targets due to the acceleration of installing wind and solar energy sources.¹⁸⁷ Similarly, China has displayed more than 40 per cent improvement toward its emissions intensity, forest stock volume, and clean energy goals in its effort to realize the sustainable development goals by 2030.¹⁸⁸ Meanwhile, both countries have sustained robust annual economic growth of 7.1 percent (China) and 6.8 percent (India).¹⁸⁹ These progress indicates a significant shift towards dynamic low-carbon economies.

The carbon trading market in China and the “Perform, Achieve, Trade” scheme in India are two potential models for controlling carbon emission and consequently climate change mitigation. The recently launched carbon trading scheme in the Chinese energy sector currently emits 3.3 billion tons of carbon dioxide annually, which makes it the largest in the world.¹⁹⁰ The carbon trading scheme in India aims to improve industrial energy efficiency by creating a

¹⁸⁵ *Id.*

¹⁸⁶ K. Ross & R. Song, *China Making Progress on Climate Goals Faster than Expected*, WORLD RESOURCES INST. (Mar. 9, 2017), <http://www.wri.org/blog/2017/03/china-making-progress-climate-goals-faster-expected>; K. Ross and R. Gerholdt, *Achieving India's Ambitious Renewable Energy Goals: A Progress Report*, WORLD RESOURCES INST. (May 12, 2017), <http://www.wri.org/blog/2017/05/achieving-indias-ambitious-renewable-energy-goals-progress-report> (last visited Apr. 27, 2018).

¹⁸⁷ *Id.*

¹⁸⁸ *Id.*

¹⁸⁹ World Bank, *GDP Growth (annual %): World Bank National accounts data, and OECD National Accounts data file*, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG> (last visited Apr. 27, 2018).

¹⁹⁰ J. Kynge et al., *China considers launch of carbon trading scheme*, FIN. TIMES (Nov. 5 2017), <https://www.ft.com/content/dc840ba6-c0c0-11e7-b8a3-38a6e068f464> (last visited Apr. 27, 2018).

trading market for efficiency certificates in energy-intensive sectors as well as setting energy consumption reduction targets on individual facilities. Other clean growth and climate change mitigation measures in India include the Rs 400 coal cess (a \$6.34 USD tax or levy) on every ton of coal produced or imported. The models in both countries provide insights for other emerging economies and developing countries. The Chinese carbon trading market serves as an important model for the scalability of trading schemes around the world. Similarly, the effectiveness of India's targeted approach provides an alternative which is less centralized for improving energy efficiency and controlling carbon emission.

The Perform Achieve Trade (PAT) is a pioneering market-based trading scheme adopted by the Government of India in 2008 under its National Mission on Enhanced Energy Efficiency (NMEEE) in the National Action Plan on Climate Change (NAPCC). PAT seeks to improve energy efficiency in industries by allowing the trading of energy efficiency certificates in energy-intensive sectors.¹⁹¹ The 2010 amendment to the Energy Conservation Act (ECA) provides a legal mandate to PAT. Participation in the scheme is mandatory for Designated Consumers under the ECA and it is implemented in three phases. The first phase started in 2012 and ended in 2015 covering 478 facilities from eight energy-intensive sectors including aluminum, cement, chlor-alkali, fertilizer, iron and steel, pulp and paper, textiles and thermal power plants.¹⁹² This accounts for roughly 60 per cent of the total primary energy consumption in India. The scheme imposes mandatory specific energy consumption targets on the covered facilities. The less energy-efficient facilities have a greater reduction target than the more energy-efficient ones. A facility's baseline is determined by its historic specific energy consumption between 2007-2010.

In terms of institutional structure, the DNA of China is located in the central planning agency which maintains its policy priorities, while that of India is located in the ministry of environment, which is less powerful compared to China.¹⁹³ The DNAs of China and India have both strengths and weaknesses in terms of their structures. In China, the National Development and Reform Commission (NDRC) is a powerful agency that formulates the national five-year plans. In India, the DNA is in the Ministry of Environment and Forests. The role of

¹⁹¹ Bureau of Energy Efficiency, *Implementation of Energy Conservation Act and BEE Action Plan* (2010), http://www.emt-india.net/Presentations2010/26-Fertiliser_30Aug2010/BEE.pdf (last visited Apr. 27, 2018).

¹⁹² Namrata Patodia Rastogi, *India's Evolving Climate Change Strategy*, *CLIMATE CHANGE & L.* 605–18 (2012).

¹⁹³ S. Ganapati & L. Liu, *The clean development mechanism in China and India: a comparative institutional analysis*, 28 *PUB. ADMIN. & DEV.* 351–62 (2008).

the Ministry in the CDM process is lackluster.¹⁹⁴ The Ministry of Coal and the Ministry of Petroleum and Natural Gas are not represented in the DNA. While China's DNA benefits from its location in a powerful state body, the arrangement leaves little room for CDM policies to be debated within a civil society.¹⁹⁵ India began its institutional preparations early. Its DNA was formed before the Kyoto Protocol came into force. Figure 1 below records the CDM projects in the pipeline in four leading emerging economies: China, India, Brazil and Mexico by 1 October 2017.

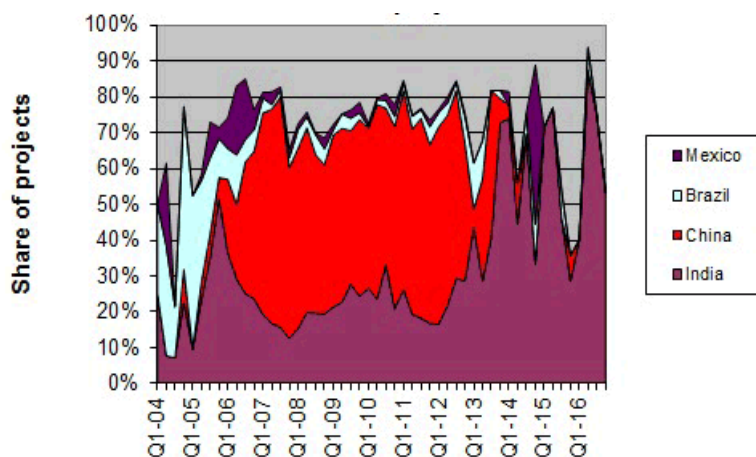


Figure 1: CDM Projects in the Pipeline in Four Leading Emerging Economies

Source: Centre for Energy, Climate Change and Sustainable Development, "CDM projects by host region" UNEP-DTU Partnership CDM/JI pipeline Analysis Database by 21 October 2017, <http://www.cdmpipeline.org/cdm-projects-region.htm>.

As shown above, China and India together account for over 70 per cent of the CDM projects in the pipeline. Both countries consume similar amount of fossil fuel. The amounts of burning coal account for 70 per cent (China) and 63 per cent (India) respectively of their total energy consumption. Therefore, China and India are the top two countries for total potential GHG reductions, which are projected to be 777 and 300 million tons of CO₂ respectively. Their average per capita emissions are around 5 and 2 tons of CO₂ equivalents. Despite being destinations for CDM projects, China and India are still the most environmentally polluted countries in the region according to current statistics. Figure 2 below shows the most polluted cities in Asia.

¹⁹⁴ A. Michaelowa, *CDM host country institutional building*, 8(3) MITIGATION & ADAPTATION STRATEGIES GLOBAL CHANGE 201–20 (2003).

¹⁹⁵ W. Koon-Kwai, *Greening of the Chinese mind: environmentalism with Chinese characteristics*, 12(2) ASIA PAC. REV. 39, 57 (2005); P. Ho, *Embedded activism and political change in a semi-authoritarian context*, (21) CHINA INFO. 187, 209 (2007); Munro, *supra* note 53.

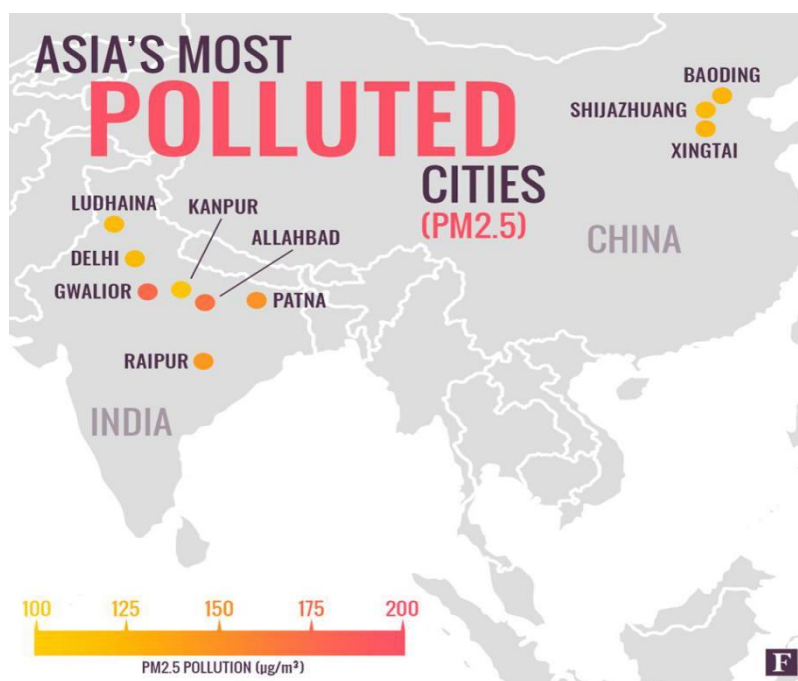


Figure 2: The Most Polluted Cities in Asia

Source: Philip J Landrigan et al "The Lancet Commission on pollution and health" The Lancet Commissions, S0140-6736(17)32345-0, 19 October 2017, <http://dx.doi.org/10.1016/>.

The figure indicates that, three of the ten most polluted cities in Asia are located in China and the rest are in India. A media report in 2014 states, "the air quality in New Delhi has hit levels twice as high as Beijing's for several winters consecutively."¹⁹⁶ In 2015, the largest number of deaths attributable to pollution occurred in India and China, with an estimated number of 2.5 million and 1.8 million respectively.¹⁹⁷ This is a clear demonstration that despite the plethora of laws and policies as well as a multitude of CDM projects in India and China, there are no corresponding benefits to the protection and sustenance of their ecological treasures. For example, Lake Tai (Taihu in Chinese), China's third largest freshwater body and ancient land of fish and rice succumbed to floods of industrial and agricultural waste.¹⁹⁸ The lake has long provided the people of the lower Yangtze River Delta with both wealth and conception of natural beauty.

¹⁹⁶ L. Kuo, *Six years of Beijing air pollution summed up in one scary chart*, QUARTZ (Apr. 10, 2014), <https://qz.com/197786/six-years-of-beijing-air-pollution-summed-up-in-one-scary-chart/> (last visited Mar. 20, 2018).

¹⁹⁷ Dennis, *supra* note 19.

¹⁹⁸ J. Kahn, *In China, a Lake's Champion Imperils Himself*, N.Y. TIMES (Oct. 14, 2007), <http://www.nytimes.com/2007/10/14/world/asia/14china.html> (last visited Oct. 27, 2017).

Currently there are over 2,800 chemical plants on the northern arc of Lake Tai and most of them are small cinder-block factories. Toxic cyanobacteria turned the big lake fluorescent green. The two million people who live along the canals had to stop drinking from or cooking with their main source of water.¹⁹⁹ This is an indication that China's thriving chemical industry was destroying its ecological treasures.

Similarly, despite multiple environmental legislation and court orders banning stubble burning and instituting fines in India, many farmers continue the age-old practice of burning 80% of rice residue undeterred without being persecuted.²⁰⁰ Apart from the health effects, the burning kills the microorganism in the soil and adversely affects the sustainability of ecological diversity.²⁰¹ Forbes cited a joint study conducted by the Energy and Resources Institute (TERI) and University of California, which revealed that over 25 per cent of particulate matter²⁰² (PM) 2.5 and 17 per cent of PM10 in New Delhi's air comes from the burning of agriculture waste in the fields around the city.²⁰³ The findings also showed that 60 per cent to 80 per cent of Delhi's bad ozone, an air pollutant, was from sources outside the city. According to WHO, PM 2.5 levels should not exceed 25 micrograms per cubic meter over a 24-hour period and 10 micrograms per cubic meter on average over a year. However, there are days when PM 2.5 levels surge to almost 1,000 in New Delhi and Beijing.²⁰⁴ These statistics are abnormally high and literally off the scales of many pollution monitoring devices. This situation is a threat to ecological life. There have been concerns about the enforcement of environmental policies and regulations by government officials in both countries.²⁰⁵ The Chinese government have tried to address environmental woes mostly through issuing command quotas on

¹⁹⁹ *Id.*

²⁰⁰ S. Pillai & V. Rambani, *A study by IIT Kanpur listed stubble burning as the third highest contributor to Delhi's winter air-pollution, after construction dust and vehicular fumes*, HINDUSTAN TIMES (Oct. 24, 2016), <http://www.hindustantimes.com/delhi-news/delhi-chokes-on-smoke-from-neighbouring-states/story-zAkXkflle5MoUXLNYfZa0H.html> (last visited Oct. 27, 2017).

²⁰¹ *Id.*

²⁰² PM2.5 and PM10 are fine particles with diameter less than 2.5 and 10 micrometers, respectively. Permissible limits of PM2.5 and PM10 are 60 and 100 micrograms per cubic meter. The smoke produced by stubble burning contains toxic substances, including PM2.5, carbon monoxide (CO), methane (CH₄), carbon dioxide (CO₂) and nitrogen oxide (NO_x). See WHO, AIR QUALITY GUIDELINES FOR PARTICULATE MATTER, OZONE, NITROGEN DIOXIDE AND SULFURDIOXIDE: GLOBAL UPDATE 2005: SUMMARY OF RISK ASSESSMENT, WHO/SDE/PHE/OEH/06.02, http://apps.who.int/iris/bitstream/10665/69477/1/WHO_SDE_PHE_OEH_06.02_eng.pdf (last visited Oct. 27, 2017).

²⁰³ L. Mangaldas, *India and China both struggle with deadly pollution - but only one fight it* (Oct. 25 2017) <https://www.forbes.com/sites/leezamangaldas/2017/10/25/india-and-china-both-struggle-with-deadly-pollution-but-only-one-is-fighting-it/#242679cc707a> (last visited Oct. 27, 2017).

²⁰⁴ D. Nath, *India's pollution levels beat China's: Study*, THE HINDU (Feb. 23, 2016), <http://www.thehindu.com/news/cities/delhi/indias-pollution-levels-beat-chinas-study/article8269631.ece> (last visited Oct. 27, 2017).

²⁰⁵ Kuo, *supra* note 195.

energy efficiency and emissions reduction, punishing corrupt officials who shield polluters, and planting billions of trees across the country to hold back deserts and absorb carbon dioxide.²⁰⁶ However, there are reports that China has begun to crack down on factories flouting their emissions regulations and has shut down about 40 per cent of its factories to combat the immense environmental pollution in that country.²⁰⁷

IV. CONCLUSION

The discussion on the CDM and environmental protection experiences of China and India provides insights into the interface regarding CDM projects and its sustainable development prospects. It underscores that ecological sustainability is a critical dimension of sustainable development and, thereby, effectively promoting it serves as leverage for the realization of broader sustainable development goals. The discussion addressed two aspects of China and India's CDM projects relating to ecological sustainability: first, their legal and policy mechanisms; second, efforts in ensuring institutional and operational compliance to normative and procedural standards set out in their environmental laws. From the discussion, it becomes clear that without a high level of commitment from the government backed by robust legislation and regulatory policies, the effectiveness of any clean development and ecologically sustaining activities will be limited. Concerning CDM project priorities, both China and India prioritize environmental sustainability and technology transfer in addition to funding. For instance, China's DNA emphasis on priority sectors in terms of the CDM project markets. Sukumar and Liu contends that this approach has been effective in lowering transaction costs in China as compared to the project-by-project approach adopted by India which results in greater project diversity but higher costs.²⁰⁸ Concerning institutional and operational compliance with green and clean growth obligations, the impacts of CDM projects on ecological sustainability can be substantial. In addition to contributing to climate change mitigation efforts, the use of clean energy as well as waste and water use can all have a significant impact on ecological sustainability. Consequently, it is vitally important that countries take environmental sustainability requirements associated with CDM projects seriously in their operations to ensure compliance at all

²⁰⁶ Kahn, *supra* note 197.

²⁰⁷ Keith Bradsher, *China's New Antipollution Push Could Cool Its Growth Engine*, N.Y. TIMES (Oct. 23, 2017), <https://www.nytimes.com/2017/10/23/business/china-pollution-economy.html> (last visited Oct. 27, 2017).

²⁰⁸ S. Ganapati & L. Liu, *supra* note 192 at 2.

societal levels especially in industrialized settings and constructions (e.g., inspections and punitive measures) so as to reduce their ecological impacts.

The article further discovered that both China and India have passed comprehensive laws and established institutions to govern the protection of the environment and other ecological treasures, as well as the adoption of policies for the implementation of CDM projects. However, both countries are yet to implement the laws and policies effectively and consequently obtain the ecological benefits associated with the commitments of the CDM. Particularly, in terms of enforcement and ensuring compliance, China is on the right path but need to persist and not back down for fear of slowdown in economic growth. The discussions reveal that the Green Court established by India to deal with environmental issues has boosted its regulatory framework for advancing clean and green development through the speedy and effective handling of environmental cases. This is something that China can learn to strengthen its regulatory framework since China and India are dealing with very similar environmental issues including water and air pollution. Again, China should allow the involvement of civil society in the governance of its CDM governance as done by India. Similarly, India can take advantage of the comprehensiveness of Chinese laws on air and water pollution to revise its existing laws. It can also learn from Chinese policies to reform and strengthen its institutional mechanism on CDM governance. Achieving clean environment and sustaining ecological treasures as an emerging industrialized countries come at cost. However, both countries need to avoid the “grow dirty now, clean later” trap and protect their environment.