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Environmental Challenges and Current Practices in China—A Thorough Analysis

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Abstract: This study presents a critical analysis of the environmental challenges regarding global environmental policies and current practices in China. The study provides imperative evidence about the current emission control strategies, environmental planning, legislation, policy instruments, and measures to provide a sustainable environment for the present and future generations. The study followed a well-defined analytical methodology to analyse the measures adopted to control emissions as a trade-balancing tool for the environment. The findings indicated that domestic as well as the international collaborations were effective in controlling the present problem of environmental pollution, and suggested a need for collaborative agreements to amend the Environmental Protection Law (EPL). The analytical findings determined that the proposed EPL considered SO₂ or NO₂ emissions while neglecting an important source of environmental pollution, i.e., CO₂ emissions. The research findings also suggested a need for to accelerate efforts in a more professional, practical, and result-oriented manner to analyse the diverse nature of environmental issues. The research highlighted some of the obstacles to the successful implementation of EPL for current and future environmental challenges.

Keywords: environmental challenges in China; emission trading; measures; environmental protection law

1. Introduction

Global environmental pollution offers the greatest challenge to sustainable industrial development and the need to meet the requirements of ever increased world population. The major sources of pollution primarily affect three components of our ecological system: air, soil, and water. An increasing number of consumers demand more industrial production units with improved technology to fulfil the requirements of society. It is very clear that socio-economic development depends on industrial capabilities or capacities; however, it is also a fact that industrial development is linked with many environmental sustainability challenges. This is the case in many countries with a large population, where better industries to cater the global needs for fertilisers, cosmetics, clothes, home appliances etc. are sought after. In this scenario, it is interesting to analyse how we can maintain a balance between meeting global needs and environmental challenges. In this regards, different States have adopted numerous strategies to meet these basic challenges. In China, various industries legally produce a certain amount of greenhouse gases. However, if an industrial unit manages to reduce air pollution, it can trade or sell the extra pollution allowance to another industry [1]. At present, nearly one-fourth of the world's greenhouse gas emissions, or almost 50% of annual emissions growth in China, requires evaluation of the environmental protection mechanism or laws for sustainable economic development [2].

The International Energy Agency (IEA) performed critical assessments of the total outcomes of energy-oriented carbon dioxide (CO₂) emissions worldwide. The results presented economic growth as a leading domestic priority for China. Fossil fuels-based energy and climate security challenges were identified as serious problems affecting sustainable economic development [3]. The assessment's findings suggested that China has applied regulatory, administrative, and political measures to control the problem of greenhouse gas emissions. Environmental protection measures are set at national, provincial, and lower district levels to meet the challenges of a sustainable environment [4]. The IEA assessments indicated regulatory measures against non-compliant industries or power plants, to maintain the desired quality environment across the country.

Analysis of various Five-Years Plans (FYPs) indicates continued Chinese government efforts to minimise the impact of industrial development on environmental sustainability. Economic development and a sustainable environment may be regarded as the key components of the development strategy of the State. The National Climate Change Programme (NCCP) was launched in 2007 to maintain sustainable economic development and environmental conditions of the country. Similar findings were presented in the white paper, such as the 'China's Policies and Actions for Addressing Climate Change' in 2008 [5]. The supreme lawmaking body, the Chinese Legislature, approved a draft resolution on climate change within the context of environmental challenges in 2009 [6].

Practical efforts produce exemplary achievements in the form of shutting down inefficient thermal power plants with an approximate capacity generation of 34.21 GWs from 2006 to 2008 [7]. Analysis of energy reforms indicates national planning for green renewable energy resources, e.g., solar, wind, ocean, and thermal energies. The Chinese Government's efforts contributed regulatory measures to overcome environmental challenges. In fact, China is now leading the world in wind power generation, with the biggest installed capacity compared to any state, and with constantly growing, new wind facilities. The FYPs for green energy indicates a forecasted amount of 250 GWs of wind power capacity by 2020 [8]. In this regard, 19.3 GWs of wind power generation capacity were added to the existing national capacity, to reach a total capacity of 149 GWs by the end of 2017 [9]. Green wind energy investments can be seen as an achievement in the collective national efforts to overcome existing challenges of environmental pollution. Analytical trends indicate a positive slope showing an upward trend in the environmental improvement graph. However, China has neither well documented its CO₂ emissions, nor published emission reports officially on a regular basis. There are only three published reports by the government of China regarding national CO₂ emission inventories: for the years of 1994, 2005, and 2012. Therefore, CO₂ emissions are being calculated by the environmental scholars and research institutes based on the logical assumptions and previously available data from different sources [10].

The emissions policy attempts to strike a balance between the industrial or public emissions and sustainable economic development. A zero tolerance policy was adopted to address environmental issues and challenges. In this regard, national efforts were made to clarify the matter; by taking rational steps, workable and result-oriented strategies to gather and implement the national environmental policies were achieved. Global concerns regarding air pollution that affects various ecosystems of the planet, e.g., smog issues in late 2016 to Jan-2017, had been affecting some provinces and cities in China, and may have affected neighbouring states. Japan and South Korea have shown their concerns regarding potentially hazardous air pollution from northern China in recent years [11]. Environmental researchers have warned about the future challenges of environmental pollution, which may give rise to public discontent, or create 'social conflicts' across the globe [12]. The efforts to meet environmental challenges can be traced back to the late 1990s, when the Chinese government devastated its interests by applying the instruments of emissions trading. The central government realised the consequences of a huge volume of emissions from inefficient power plants or factories in its FYPs and emphasised environmental protection strategies to reduce public or industrial greenhouse gases emissions. The FYPs were developed to welcome environmental sustainability as a top priority by the government, environmental researchers, and practitioners, for emissions

trading in China [7]. The EPL in China governs the national emission trading system; it considers environmental challenges, policy instruments, and measures, legislation, environmental planning, and institutional settings in the environmental governance system of China. The EPL is designed to cope with environmental challenges, highlighting the shortcomings in the present environmental protection system, and proposes better remedies for the sustainable environment.

In this research, a thorough analysis is presented concerning the emissions trading system, regulations, pilot programmes, the role of environmental organisations, e.g., environmental NGOs, as well as environmental courts and ministries, and the amendments in the environmental law at different times. The study discusses the limitations or shortcomings of China's current environmental protection system. Critical analysis also concludes the recent developments in environmental laws, offering suitable solutions with global perspectives. It is suggested that the environmental tax net should be strengthened, and CO₂ emissions be included in the tax net under newly framed Environmental Protection Tax Law. The implementation, public interest and participation, transparency, efficiency, and compatibilities of the environmental laws with thoroughly analysed results should be given more importance for sustainable future perspectives.

2. Environmental Challenges in China; Effects and limitations

Since China has become a large production house on the world map, the environmental conditions in China have been very serious, causing enormous damage to health, and doing social harm, for a long period. In the meantime, environmental and emission policies have undergone dramatic changes in the past two decades, in particular, undergoing a transition from weak to strong implementation. The recent environmental problems in China have evolved towards a matter of scale and political priority. Large-scale national policies have been initiated and implemented, such as the 2015 Environmental Protection Law, the 2017 Environmental Protection Tax Law (implemented since 1 January 2018), Air Pollution Prevention and Control Action Plan, and so on [13].

2.1. History of Environmental Pollution in China

There are numerous environmental problems in China which have serious consequences for the biophysical environment and public health of the country. Rapid industrialisation, as well as lax environmental monitoring, make the biggest contribution to these problems. The Chinese government recognised the problems and provided several answers, which resulted in some improvements; however, their reactions were criticised as insufficient [14]. In recent years, civil activism has increased over government decisions that are considered harmful to the environment [15]. The causes of environmental harm go back centuries, while the economic boom in China has dramatically accelerated the destruction of countries and resources. Natural resources were exploited by dynastic rulers, who consolidated the area and developed the Chinese economy, to contribute to famines and natural disasters [16]. The current environmental situation in China is not only the result of the today's political choices, but also of the approaches, attitudes, and institutions that have been brought forward over the centuries.

China began to develop environmental institutions through the United Nations conference on the human environment in 1972 by sending a delegation to the conference in Stockholm [17]. However, an area of the country had already reached a hopeless situation at that time. The development of rural industries, which was encouraged by economic reforms in the late 1970s, has further aggravated the problem. A series of reforms were carried out that spread over the provinces, establishing the townships and village enterprises (hereafter called TVE) [18]. In 1997, TVE produced nearly one-third of national GDP, although it has declined in relative importance for the Chinese economy [19]. However, local authorities were not good at controlling, and rarely met, environmental standards. Nowadays, the Chinese economy is fuelled by enormous state-owned companies, whereas the environmental policy remains challenging to implement at the local level, with authorities most of the time prioritising economic rather than environmental issues. Despite the declared goals of the government, a real

change in environmental policy and effective implementation will require a review of the relationship between the state, society, government markets and the Chinese bureaucratic power structure [20].

2.2. China's Environmental Health Challenges

Groundwater resources in more than 60 percent of large cities are classified as 'poor or very poor', and more than one-fourth of the major rivers in China are 'unsuitable for human contact' [21]. Lack of waste disposal and adequate treatment has aggravated these problems. The water crisis has changed a lot of arable farming land into desert; this is coupled with neglected farming practices, overgrazing, and the effects of climate change. According to the officials of the Chinese forestry administration, around 1.05 million square miles of the Chinese landmass has undergone desertification; this affects more than 400 million people [22]. Pollution and desertification are reducing China's capacity to maintain industrial production, as well as to yield food and clean water to feed its large population.

China's swift economic development has produced elevated amounts of water and air contamination, concerning both the Chinese themselves and more extensive populaces. A recent survey of the Asian logical writing on air contamination and well-being led by the Health Effect Institute's (HEI), and Public Health and Air Pollution in Asia Program, found that more than 120 investigations have been done in Chinese urban communities, representing increased air contamination and increments in respiratory side effects, hospitalisation, and untimely mortality [23]. According to the assessment of the World Health Organisation (WHO), present air contamination levels could be responsible for more than 300,000 deaths in China annually [24]. These impacts reach beyond China's outskirts; contamination created in China is transported to neighbouring nations (e.g., Japan and Korea) [11] and has had significant health impacts in these States. On the other hand, China's economic advancement can be the establishment of enhancements in environmental well-being for China and a model for the rest of the world.

2.3. Impacts of Air Pollution in China

China is still a developing country, even though an alternate impression might have flourished. Chinese individuals appear to work day and night, seven days a week, and China is the main mechanical locale on Earth which doesn't demonstrate the "end of the week impact"—lower convergences of NO₂ recognised by satellites on the end of the week when contrasted with workdays [25]. China's present air contamination circumstances can be contrasted with those of Western Europe in the 1960s. Industrialisation is continuing quickly, and the gross national product is developing by nearly 10 percent every year [26]. China's per capita energy consumption is just a ninth of that of the United States [27]. In spite of the moderately low per capita energy utilisation, its expansive populace means that China is now the largest energy consumer on the planet, while outflows of SO₂ are the most elevated on the planet, due to the use of petroleum products [28]. Because of the developing number of automobiles, emanations of NO_x and hydrocarbons are additionally expanding, and prompting more prominent centralisations of ozone.

The effect of China's mechanical and horticultural emanations on the atmosphere is hard to evaluate. On the other hand, outflows of CO₂ from consuming non-renewable energy sources, and of methane from coal mining and creature farming, clearly affect the atmosphere. In any case, the high discharges of SO₂ and ensuing sulphate molecule development will prompt a cooling atmosphere. Here we hit a difficulty: as a result of negative health impacts, emanations of air contaminations, particularly SO₂, should diminish in the future. China will have a twofold warming impact on earth's atmosphere, by (a) improved discharges of CO₂, and (b) by diminishing the vaporised loadings of the air [10], because of more prominent reflectivity of daylight back to space. This is vital for the earth's atmosphere and air quality. With its fast mechanical advancement, it is essential that China focus emphatically on natural issues.

2.4. Limitation of the Study of China's Environmental Regulatory System

China does not publish its CO₂ emissions reports officially, with the exception of three published reports by the government of China regarding national CO₂ emission inventories for the years of 1994, 2005, and 2012. Therefore, environmental scholars and research institutes have taken the responsibility of calculating CO₂ emissions based on the logical assumptions and previously available data from different sources [28]. Keeping in view the State's interests and sensitivity issues, the publication of some aspects of environmental studies is not permitted in China [29]. The institutional structure and flow of the natural administrative framework are vital to comprehending ecological arrangements. We have to depend on gathered information from the official literature of the concerned department or the ministry, to spread out the institutional and ecological administration establishment. China's environmental regulatory system is observed as an identical, comprehensive rule. During past decades, the execution and implementation of environmental regulations, in most of the cases, have been reported as being weak and questionable [30].

3. How Does China Treat Emissions?

China has emerged as the largest production house in the world over the past decades, which has made it economically strong, but at the same time, has caused numerous damages to the natural environment. The Chinese Government is, therefore, considering environmental issues as its top priority, and emissions trading have attracted vast attention in this regard. A White Paper on Chinese Climate Change Policies and Actions was released by the State Council Information Office in late November 2011, through which the government outlined a detailed plan for the gradual establishment of a carbon market in the near future [31].

The IEA has highlighted some of the main pollution contributors in China. According to the IEA, sectors which are the major emitters and which characterise key sources of greenhouse gas emissions in China include: electricity production and transportation, chemical processing and manufacturing, coal mining, oil refining or processing, coal coking, non-metallic mineral manufacturing, nuclear fuel processing, and smelting or processing of metals and non-ferrous metals [32].

Over the last two decades, a series of environmental laws have been enacted, including the Air-Pollution Prevention and Control Law, Water Law, Noise Pollution Prevention and Control Law, Water Pollution Prevention and Control Law, Marine Environment Protection Law, Promotion of Recycling Economy Law and the Environment Impact Assessment Law. Keeping these efforts in view, it is fair to comment that China has already recognised a legal regime to attain better environmental protection. However, its last amendment in the EPL is considered outdated. Therefore, a proposal to revise and modify the 1989 EPL was submitted for the first time to China's National People's Congress in 1995. In addition, 78 proposals had been submitted to the National People's Congress from 1995 to 2011 to form a cumulative legal draft. In this regard, the Environment Protection and Resources Conservation Committee of the Standing Committee of the National People's Congress conducted an assessment regarding the implementations of 1989 EPL from 2008 to 2010. The Standing Committee of the National People's Congress then finally reached a consensus to initiate the process of amending the 1989 EPL in 2011, which was a breakthrough in environmental legislation in China. A draft of the revised EPL was published by the National People's Congress in August 2012. The Standing Committee of the National People's Congress was designated to approve the amended law in 2014, which then came into effect in 2015 [33].

The new EPL consisted of 7 Chapters and 47 Articles, which include: General Standard Principles, Environmental Management, Protection and Improvement of the Environment, Prevention and Control of Pollution and other Hazards, Supervision and Inspection, Liabilities, and other Miscellaneous. As compared to the 1989 EPL, there is a new chapter added, namely 'Supervision and Inspection', which was an attempt to enhance the Government's power with regards to overall environmental protection in China [33]. It marked the end of a long road. The process of amending and preparing a draft-update was started in 2001; after due assessment, it went through three readings without result,

but was finally approved in the fourth round [34]. At each stage, the proposed changes which led to a delay in the formation of a unified draft resolution [35] were controversial. The procedural delay in the EPL caused environmental damage to China particularly, and to the world at large.

3.1. Emissions Targets

Representing a rising economy, China executes its responsibilities as applicable to developing States in the United Nations Framework Convention on Climate Change (hereinafter UNFCCC) [36] but does not undertake the necessary obligatory legal measures to limit its carbon emissions. However, the Quantified Emission Limitation and Reduction Objectives (QELROs) have been set by China in recent years. In 2006, it declared that it would reduce its energy intensity by 20% in 2010 compared 2005 levels, which was more or less successfully achieved [37]. China further announced in 2009 and 2015 that carbon emissions per unit of GDP would be decreased by 40% to 45% by 2020, and by 60% to 65% by 2030 compared 2005 levels [38]. This draws a clear picture of how China is considering and trying to target its emissions within the countryside to ultimately bring a global environmental peace. China's Intended Nationally Determined Contribution (INDC) is an optimistic lift to its ongoing efforts in international climate change development. China's concerns to formulate its national growth agenda concerning with global climate change programme is a foremost example, which reflects that a fundamental shift is required to nurture the economy [39].

As China prepares to execute its nation-wide emission trading system, Climate Change Department of the National Development and Reform Committee (NDRC) and the European Commission's Directorates for Climate Action and International Cooperation Development, hosted a conference in October 2016 titled 'EU-China Cooperation on Emission Trading in China: Achievements and Lessons' [40]. It served as a mark of acknowledgement of China's efforts for emission trading at the global level, but also fixed more responsibilities to meet its environmental issues in well-formulated and calculated protocols. The conference praised the roll-out of seven pilot emissions trading schemes throughout the country which has taken a significant part in the growth of the nation-wide carbon market. The funding for mutual aid on carbon markets was almost doubled, making ten million Euros, roughly seventy million Yuan, presented under the Foreign Partnership Instrument of EU for a three years cooperation project [41].

3.2. Emission Trading Scheme in China

Right after awakening to the environmental storm, the Chinese government launched a pilot programme for carbon emissions trading in seven provinces, as well as in different cities [42]. NDRC released Interim Regulations on Administration of Carbon Emission Trading on 11 December 2014 that will deal notably with carbon emissions trading [43]. The core objectives of carbon emissions trading may be the 'Chinese Certified Emissions Reductions' (CCER) [44] and the 'emission quotas' in these pilot areas. The trading parties including the main emission producers, individuals and agencies in the fold of trading rules, and trading agencies comprise those who are held duly competent through the NDRC [45]. Apart from the pilot programmes, the national united carbon emissions trading market was established, and the draft regulations of the Administration of National Carbon Emission Trading was also submitted to the State Council which was later published [46].

3.3. The Chinese Certified Emission Reduction

'Interim Measures on China's Voluntary Emissions Trading' were released by the NDRC in June 2012. The title of this interim measure indicates a wish to offset carbon emissions voluntarily following the usage of credits produced by certified projects. It was anticipated that the seven mandatory ETS pilots [32] in China would be greatly assisted by these interim measures through the contribution of an offset apparatus, adding to their perspective local allowance unit. This development further enhanced the capability and capacity to assist environmental challenges in China. The exceptional condition is that these interim measures may not be functional to these seven

pilots if not approved by the NDRC in each pilot ETS. All pilots will be allowed the CCER offsets in their perspective systems, but the limits on offset usage in many pilots are still not clear [47].

3.4. Monitoring, Reporting and Verification

Ideally, monitoring should be self-conducted by covered entities through direct ways in a national system [32]. Then, after the necessary formalities, finalised reports are set up for Monitoring, Reporting, and the Verification system (hereinafter MRV). China needs to take these variables into consideration: monitoring costs, practicability, appropriate parameters and the monitoring methods, to improve the disciplinary efficiency. The reporting of emissions and other subsequent emission reductions would be self-contented by the covered entities from the industrial and non-industrial sectors for carbon emissions trading [48]. The report has to be verified by a third party, ensuring the inclusion of the relevant necessary documents, particular an activity-log containing required information and data; it must also be followed by a straight reporting period [49].

Verification is the most important part of the MRV system. It is required to conduct verification under the command of a third-trusted verifier, followed by a detailed verification report, which further refers to the covered entities for necessary adjustments and double-checks over it. It is prerequisite of the Market Readiness Proposal (MRP) to examine the qualification requirements and standards of the verification sector [50].

3.5. Environmental Impact Assessments

It is mandatory to conduct an Environmental Impact Assessments (hereinafter EIA) and obtain an EIA approval certificate for all the construction projects that may have an impact on the environment [51]. According to Article 9 of the amended Regulation on the Administration of the Construction Project Environmental Protection, a new EIA and its approval statement, after obtaining the EIA approval, are the obligatory requisites for any modification including renovation or expansion of the said project. It is also worth mentioning here that approval, once granted, can also be disapproved later by the Environmental Protection Administrative Department, [6] on breaching any of the rule bindings by the party. Therefore, to achieve EIA approval prior to commencing the construction project is not the only single pre-requisite but is also required to maintain and meet the terms of pertinent rules and regulations thereafter. It is the sole mandate of the government to administrate the EIA for construction projects in a true sense of exercising a unique power and responsibility at the same time. The construction unit should produce the required environmental impact registration forms, environmental impact reports or statements duly compiled according to the degree of the environmental impacts of the construction project.

The State Council has delegated powers to the environmental protection department, which examines and then approves, if required criteria are met, EIA certificates and documents of construction projects including: construction projects, approved by the State Council or by the departments authorised by the State Council, or which cross the boundaries of various provinces, autonomous regions and municipalities directly under the central government, and any other special construction projects, for example some secret projects and nuclear facilities [51]. Beyond the decorum mentioned above, the provinces, autonomous regions and municipalities, i.e., directly controlled municipalities, also influence the scope of authority for examination and approval of EIA certificates for the projects relating to construction [52].

3.6. Environmental Insurance

The environmental insurance affixes environmental pollution liabilities as required by environmental protection law. Obtaining environmental pollution liability insurance was not a compulsory regulation but a pilot project. Consequently, it had not been common practice to obtain environmental insurance, but rather, it was considered as an important available tool to all stakeholders. On 21 February 2013, the China Insurance Regulatory Commission (CIRC) with the coordination of

the Ministry of Environmental Protection (MEP) mutually promulgated *'The Guiding Opinions on Pilot Scheme for Compulsory Environmental Pollution Liability Insurance'*. It is also called the 'green insurance', which demands that all the companies dealing with the extraordinary environmental risks process should necessarily purchase pollution liability insurance [53]. It also puts the moral responsibility on the government for rendering ample services to facilitate and encourage the polluters for the environmental insurance.

4. Establishment of Environmental Courts and Ministries

4.1. Establishment of Ministry of Environmental Protection

In July 2008, the State Environmental Protection Administration (SEPA) was upgraded to the Ministry of Environmental Protection (MEP), and gained huge importance as an essential department of the State Council [54]. The MEP is responsible for establishing and implementing domestic policies associated with pollution and environmental issues. It holds a mandate to evaluate and implement environmental policy throughout China, whereas the NDRC looks after the issues related to development and reduction of greenhouse gases (GHG) [55].

4.1.1. Recent Salient Reforms by MEP

Since the establishment of the Ministry of Environmental Protection, it has been targeting a couple of overwhelming environmental issues. Of those, the key proposals or latest reforms by the MEP include: (i) the implementation of the measures for trial programme pertaining to the establishment of public interest litigation by the People's Procuratorate, enforced in July 2015; (ii) the guiding opinions on pilot reforms of vertical management system for supervision, observing, monitoring; and (iii) law enforcement mechanism of environmental protection agencies within the provinces, which were enforced in September 2016 [38].

The developments mentioned above reveal the scope of environmental reforms taking place in China at present. China is improving and streamlining its environmental policies as a whole by revising EPL framework for the sake of promptly enhancing enforcement strategies aimed to introduce a countrywide ETS and launching a new emission permitting system [52].

4.1.2. Criticism on the Establishment and Working of MEP

SEPA initiated a series of raids against law-breaking companies who were polluting more than they were permitted, which was later called the 'environmental storm', penalising even the country's largest electricity company. It stopped illegal workings at Beijing's Old Summer Palace and held a public hearing on the project, supporting public contribution and setting an example for public decision-making. Nevertheless, in recent years, MEP has gained the power to approve environmental impact assessments, although it has relaxed its approach towards sanctioning the main projects that have caused harm to the environment. It was regarded as a helpful hand for various polluting steel plants and chemical projects nearby Beijing, Hebei, and Tianjin, which are responsible for the dangerous air pollution suffered by the people of the affected region in recent years [34].

4.2. Creation of the Ministry of Ecology and Environment

The senior cabinet cadre has authoritatively revealed the nameplate of China's recently made Ministry of Ecology and Environment [56]. After performing functions originally under other ministries, the staff of this mega-department will be increased from nearly 300 to 500 personnel [57]. In spite of the fact that a more itemised upgrade design is yet to be declared, the new MEE is intended to settle those issues by initiating new functions including emission reduction and climate change strategies, currently under the NDRC, underground water contamination regulations, which are currently under the Ministry of National Land and Resources, watershed ecological protection, currently under the Ministry of Water Resources, agricultural contamination control, currently under

the Ministry of Agriculture, marine protection, currently under the State Oceanic Administration, environmental protection amid project execution, currently under the State Council's South-to-North Water Diversion Project Construction Committee [56].

4.3. Creation of Specialised Environmental Courts

Beginning in the 1980s and continuing through the 1990s, experiments to establish specialised environmental courts began in China [58]. These attempts failed, however, when the Supreme People's Court of China deemed that there was no legal standing for the existence of environmental courts [59]. Environmental tribunals intruded in fields that should be the responsibility of government agencies. But then between 2007 and 2013, more than 130 environmental courts were successfully established in China [60]. In a recent study, Rachel E. Stern, a political scientist at the University of California, Berkeley, explored this issue by analysing the general political context and court documents in three Chinese cities: Guiyang, Wuxi, and Kunming [61]. For starters, the changing attitude towards the environment among Chinese leaders during the 2000s presented a favourable political context for the environmental courts. During this period, President Hu Jintao introduced the term 'ecological civilisation' [62]. For the first time, meeting pollution targets was included in evaluating local governmental officials' political performance [63]. Leaders in all three Chinese cities were referred to the establishment of environmental courts as a visionary step and claimed political credit for it.

There may be three salient functions of environmental courts which fit comfortably with the political traditions and needs of local governments in China. First, environmental courts were flexible. They gave the appearance of responsiveness to central government's environmental concerns while still enabling local governments to pursue business-as-usual strategies to promote economic growth. Second, the environmental courts fit a tradition of socialist courts as consciousness-raising institutions. Third, social instability created by environmental disputes had become a major concern. To local officials, environmental courts provided a platform to arbitrate the dispute and dissipate social unrest. The environmental courts in China were established because they fulfilled the political needs of the government. Understanding the political logic underlying the courts' establishment helps us to both better understand the limited roles environmental courts play in addressing environmental problems in this context, and to think about how to improve China's environmental court system in the future.

5. Measures Taken to Enforce Environmental Laws and Counter Environmental Challenges

The Chinese government has mapped out ambitious environmental initiatives in recent FYPs, although experts regarded that the follow-through has not been worked as it was projected [64]. In December 2013, China's NDRC issued its first national blueprint for climate change, followed by a long list of environmental targets for 2020 [65]. The central government has required 15,000 factories since January 2014 to openly report actual figures on air emissions and water discharges, which also include large state-owned enterprises. The government has also planned to spend 275 billion US Dollars in the next five years for the sake of cleaning up the air, and 333 billion US Dollars for water pollution respectively [66].

5.1. Environmental Laws and Standards

Different discharge and condition quality guidelines in the natural laws give a quantitative outline of the advancement of China's contamination control targets and measures. China has numerous environmental laws at various authoritative levels. In 1978, the third Chinese constitution was issued with the incorporation of an ecological commission [12]. The EPL was issued on a preliminary premise in 1979, and formally launched in 1989. Later, China issued around 30 laws about the environment, such as the Law on the Prevention and Control of Atmospheric Pollution, EPL and also EPTL, and also many other administrative regulations, as well as much more detailed models [67].

Ten Specific Conventional Regulatory Measures

In the previous decades, ten particular customary administrative measures were set which are mentioned hereunder. These measures are frequently referred to as ‘Old Three, New Five, Target Response and Total Emission Control’ (serial no. 1 to 3 represent the ‘old Three’ and were set in the vicinity of 1972 and 1979, whereas ‘New Five’ alludes to no. 4 to 8 and are cemented in the vicinity of 1980 and 1989).

1. Construction project environmental impact assessment (EIA): Construction projects are required to go through EIAs before initiating the construction. It was extended to include planning the EIAs in 2003.
2. ‘Three Simultaneously’ (3S): In a construction project, installations for the prevention and control of pollution is essential to be built and designed together with the main part of the project.
3. Pollution fees: A fee is payable for excessive discharge above than that of discharge standards. Pollution fees became collectable on all the discharges in 2003.
4. Comprehensive quantitative evaluation of urban environment: It is weighted as a grading system with indicators covering all aspects of environmental protection.
5. Pollutant discharge permit: Polluting units are bound to discharge pollutants within the limits they have allowed in their permits. Pollutants are required to attain certificates of pollutant discharge permit.
6. Undertake treatment within a prescribed limit of time: The pollutants shall discharge and dispose of the pollution within the timeframe as prescribed by law. The government has decided that the companies which are identified as heavy polluters, must dispose of the pollution sources within the stipulated time.
7. Centralised pollution control: It is designed for the polluting units in a particular area to be mutually planned and operated.
8. Cleaner production: The polluters should monitor the consumption and generation of wastes through conducting audits for cleaner production and then submit the reports to the concerned administrative departments thereafter.
9. Environmental protection target responsibility system: The possible assessment and evaluation shall be done at the local government or the county level which have due jurisdictions and are responsible for their perspective environmental protection.
10. Total emission control: Aggregated emission quotas, however, less than a certain cap are allocated to targeted enterprises or local governments within a limited time and area [12].

5.2. China’s New Environmental Protection Law

In December 2016, when a wave of polluted air in the form of smog was spread in different parts of China, the government then realised its responsibility to introduce further environmental reforms [68]. Several steps were taken in this regard to overcome the situation. It was decided to close about 30% of aluminium smelting volume of coal-consuming and aluminium-producing provinces around Beijing, Shandong, Shanxi, and Henan during the period from November to March every year to reduce smog levels [69].

Chinese environmental researchers claimed that approximately sixty percent of China’s underground water is either ‘relatively poor’ or ‘very poor’ [70]. Another official report which stated that sixteen percent of the land in mainland China is contaminated stimulated the stakeholders to introduce some immediate reforms [71]. Finally, China fortified environmental laws; these amendments to its environmental protection law were first in the last 25 years and ought to remove limits of fines on pollutant units [72]. Momentous progress in the area of public interest litigation has been brought by the updated environmental law, which also strengthened the legislative apparatus to discipline the polluters by suggesting penalties. However, it is still a long way away from a response to a key problem, i.e., how to get local officials to implement the rules efficiently and to hold them accountable

for their failure? [34] Environmental protection officers have also been granted greater powers to supervise as well as sanction polluters more efficiently. Before the new amendments, environmental officials did not have the power to seize property; however, now they are accredited to impound instrumentation that permits amerceable discharge of pollution. Earlier, environmental officials were provided with toothless fines to discourage production from the illegal discharge of pollution [38]. Under the new law, they will be capable of imposing fines on the firms on a day-to-day basis. However, the consequences of poor execution and failure to hold officials answerable for widespread pollution as well as ecological damage still continue [73]. China published its first Environmental Protection Tax Law in December 2016, which aimed to fortify the social control of environmental regulations. It imposes several taxes on production units that emit air and water pollution, noise pollution, and solid waste. It was enforced on 1 January 2018 [74]. Taxes levied and collected will support the amount of the pollutants discharged [75].

China, the world's leading greenhouse gas emitter [76], felt shared-responsibility to limit its total emissions for the first time by the end of this decade. According to a prime government consultant, an absolute cap on carbon emissions is going to be introduced soon. For this purpose, the government will use two methods to normalise the emissions within the next five-year plan setup, by intensity associated degree and an absolute cap [77]. The following is a list of the key measures introduced in the newly amended EPL adding to more systemised, controlled, and sustainable environment:

Five Key Measures Introduced in the New EPL

- i. Day to day fines imposition on the violators;
- ii. Authority to seize polluting equipment;
- iii. Power to make an order to limit or stop production in case of excessive pollution is found;
- iv. Administrative detention for serious violations;
- v. Polluters may also be transferred to judicial sanctions found suspected environmental crimes [78].

In 2016 alone, there were 22,730 cases in total, reported in the context of these five key measures addressed in the new Environmental Protection Law. Details of these cases, as mentioned in Figure 1, may include: forty-fourpercent of the seizure of equipment or facilities accounted for, twenty-five percent production limits and stoppage, four percent of daily fines, eighteen percent of administrative detentions, and nine percent criminal charges [79].

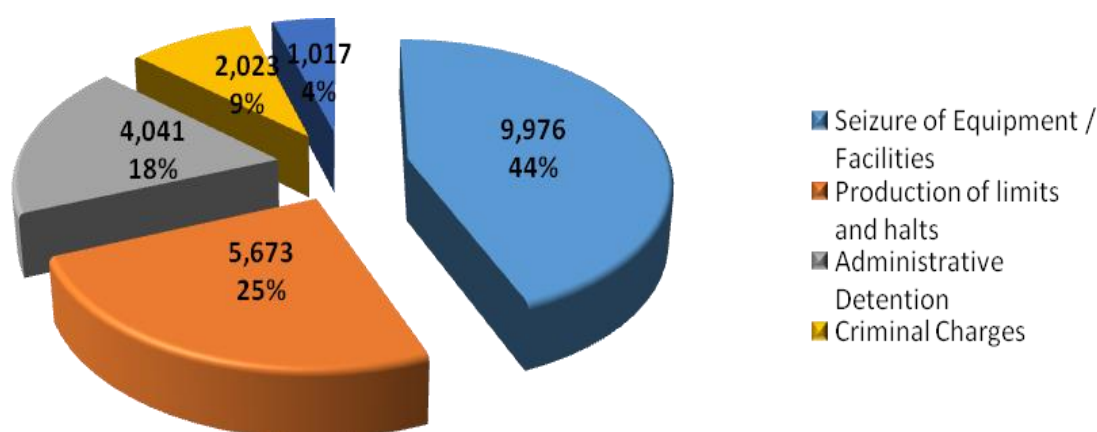


Figure 1. Breakdown of Environmental Cases in 2016. Source: China Water risk base on IERL report [48].

5.3. Environmental Regulatory Framework

The main parts of the environmental legislation and the regulatory authorities may consist of the laws which are promulgated by the National People's Congress and its Standing Committee,

departmental rules framed by ministries and commissions beneath the State Council, local or territorial regulations outlined by apiece province and municipality, and other administrative regulations articulated by the State Council. In contrast, the major environmental laws include: Environmental Protection Law, Cleaner Production Promotion Law, Circular Economy Promotion Law, and Law on Environmental Impact Assessment. Various other Laws concerning the explicit areas of environmental protection comprise: Atmospheric Pollution Prevention and Control Law, Water Pollution Prevention and Control Law, Water Law, Marine Environment Protection Law, Forestry Law, and Grassland Law. It is worth mentioning here that the Marine Environment Protection Law, and the Water Pollution Prevention and Control Law have been amended by the National People's Congress. However, the Soil Pollution Prevention and Control Law is scheduled to be amended later [38].

5.4. Environmental NGOs

There has been significant growth in environmental law cases in China for many years. Since 2015, environmental NGOs and public prosecutors have filed more than one hundred lawsuits, which reflect that public interests have gained a strong legal grounding within the country. Amended EPL has allowed the environmental NGOs to sue polluting corporations for the best of public interests. The impact of these public interest cases is set out to produce the required results, i.e., significant damages and punishments have awarded to the polluters in many cases. Itsends a transparent message to polluters who are polluting beyond their sanctioned quotas on the risks of non-compliance [80].

After the implementation of the EPL on 1 January 2015, the Chinese environmental NGOs become active [81]. They take part in numerous activities, primarily holding teamwork in public environmentalinterests legal proceeding, encouraging the formulation process of environment friendly policies and legislation, and leading public environmental education programs. Environmental NGOs are executing a more intensive part in environmental public interests litigation than ever before. Almost ten environmental NGOs brought forty-eight lawsuits in 2015 and have become an inspiring public participant [82]. The environmental NGOs are playing quite a vital role in endorsing environmental legislation too. The paramount environmental NGOs, such as the Friends of Nature, the Green Development Foundation, and the China Biodiversity Conservation have dedicated themselves to promoting legislation since 2014. These efforts have resulted in some legal structures such as the Environmental Protection Law, Environmental Impact Assessment Law, Atmospheric Pollution Prevention and Control Law, Wild Animal Conservation Law, and Water Pollution Prevention Law [38]. Besides these efforts, environmental NGOs are also facing some hindrances in their conducts and operations, which need to be addressed by the various stakeholders.

Obstacles for Environmental NGOs

The principal obstacle for the NGO sector is a lack of monetary resources. Besides this, some NGOs are facing the acute problem of having their cases filed in local courts and technical challenges in its proceeding and litigation, such as the fact that establishing a relationship between the cause and effect of environmental problems can be challenging in some cases [83]. This is explicitly true for air pollution, or where there multiple polluters are involved in a case. If environmental NGOs are given some financial and legal assistance from the government, they may perform even better as a helping hand to attain a healthier environment [84].

5.5. Environmental Police Force

The Deputy Chief of the country's ruling party and Mayor of Beijing, Cai Qi, confirmed that China is going to announce strategies to set up an 'Environmental Police Force', which will be empowered and responsible for enforcing pollution constraints across the capital. It is said to be a zero-tolerance policy to improve the city's unhealthy air quality caused by biomass burning, garbage incineration, open-air barbecues, dust from roads and other pollutants [85]. On compliance with environmental

laws, lack of supervision and weak law enforcement pushed the government in Beijing to consider this kind of techniques to maintain and improve the overall environmental quality [86].

5.6. The Environmental Protection Tax Law

China has emerged as the largest emitter of greenhouse gases worldwide, and it has to rely mainly on coal to meet the energy requirements of approximately 1.37 billion people [87]. Another exhaustible energy resource 'fuel' has also contributed to the country's severe smog case [88]. MEP disclosed that about 173 Chinese steel enterprises have been breaching environmental protection laws. The world's largest aluminium producer "Hongqiao", whose Binzhou city production house was ordered to shut down by the local environmental protection officials, is a living example of this effort [89]. The National People's Congress presented the first Environmental Protection Tax Law (EPTL) of China in December 2016, replacing the prevailing Pollutant Discharge Fees (PDF) system for tuning the implementation strategies of environmental laws. Present taxpayers and new market entrants are required to adopt the new tax plans to compliance with EPTL regulations [90].

China has amended its EPL for the first time in the last three decades, which is due to its war against pollution. These recent amendments will ultimately result in a higher level of environmental protection standards and compact penalties for violators of environmental regulations; the environmental authorities are going to be more empowered from January 2018 [89]. Since January 2018, manufacturers have an obligation to pay environmental protection taxes on pollutant discharge for air, water, solid waste, and noise [91]. The Chinese government decided to name and charge it as an environmental protection tax rather charge the polluters with any fee. There are specific taxable emissions under the amended EPTL. However, additional emissions will also be taxed according to the local government regulations, ending the tax-free structure. This reflects the government's intention to strengthen the tax-net, and to withdraw some exemptions in the best interests of environmental protection. For instance, Beijing elevated the fee charges up to 15 times since 2014. Though the four main pollutants emissions reduced abruptly, the pollution fee revenue of Beijing still extended five to nine times [92]. The exemption for manufacturing units that emit less than fifty percent of the threshold will also be withdrawn and treated as taxable now. Fifty percent of the tax for the firms emitting less than half of the threshold and seventy-five percent of the tax for the factories that will emit thirty percent less than the threshold is recommended and applicable since January 2018, resulting in a tax-gain in each emission unit [93]. The calculus of the new EPTL represents that the cost of production will be increased, but it will certainly leave a considerable impact to improve environmental customs in China [94].

6. Criticism and Recommendations

6.1. No Tax on CO₂ Emissions Included

Although the amended environmental law in China has got tough on 'environmental crimes', it overlooks carbon dioxide. Information released by China's uppermost legislative body indicates that a newly-passed Environmental Tax Law which imposes taxes on emissions regarding water, air, and noise, ignores carbon dioxide, which is amongst the most important contributors to global warming [88]. The aforementioned situation was largely criticised by various environmental stakeholders both at the global and domestic levels. The smog conditions resulting in thick haze during the late 2016 and early 2017 in about twenty cities of China pushed the National People's Congress Standing Committee to amend the Environmental Law to cope with the matter in a timely manner. According to a draft available on the official website of NPC, the polluters are supposed to pay taxed-amount for noise and water pollution from January 2018 [95]. However, CO₂ including pollutants, namely sulphite and sulphur dioxide, are not the part of the list in this EPTL, which are taxed at the rate starting from 1.4 RMB (0.20 USD) per unit for sulphite and 1.2 RMB (0.17 USD) per

unit for sulphur dioxide, and also accumulates 350 to 11,200 RMB (50 to 1612 USD) per month for the noise pollution [88].

6.2. No Punishment for the Government Personnel on Their Failure

The situation in 2016 showed a downward slope on the environmental graph, indicating the failure of an environmental approach to tackling environmental challenges. Still, sufficient penalty-decorum has not been proposed for the government personnel on their failure in implementation, even after giving enormous powers to impose fines on a daily basis and further legal actions with free justified authorities to seize the polluting equipment. It raises questions about the efforts made by the government on its efficiency calculus [96].

6.3. Key Failings of the SO₂ Emissions Trading Market

Sulphur dioxide (SO₂) has notorious impacts, not only on human beings, but also on plants and other species. The following are the main reasons which caused the failure of the SO₂ emissions trading in the market [32]. There are insecure emissions rights found owing defective design which include: poor implementation becomes the cause of asymmetric information, lack of enthusiasm in government administrative department concerning regulating emissions trading, participation in the trading emission programme is comparatively low, poor market structure leads to less emission exchange, the policy is not realistic and leads towards linkage, determination of emissions trading price should be more systematic to reach an acceptable settlement, and last but not least, the concept of emissions trading is yet not known by most enterprises; it needs to be explored further, and a vigorous awareness campaign should be launched indicating the benefits of emissions trading.

6.4. How Can the New EPL Be Implemented Even Better?

Although the amended EPL has already met the required environmental standards in China, there is still much room for enhancements. Here are some recommendations observed during this research that may be useful [79]:

- i. Ongoing legislation procedure to elevate the legal system, focussing on the implementation strategy of the EPL;
- ii. An environmental database sharing system between different government departments should be established to bring out the most efficient harmonisation followed by necessary measures, and to establish an inter-regional environmental enforcement mechanism;
- iii. Improve the environmental intelligence for pollution acknowledgement and better law enforcement;
- iv. Sustainable and environment-friendly industries should be encouraged by the state's economic departments, eliminating backward approaches to production capabilities;
- v. Environmental NGOs should be encouraged to play their unique critic role in environmental protection. Special attention should be paid to their capacity building and to strengthen their channels up to the maximum possible levels;
- vi. Strict implementation should be ensured on the polluters to install the required environmental monitoring instruments and to record emissions as they actually emit; and
- vii. Public awareness campaigns regarding different aspects of environmental laws should be fortified, and polluters should be encouraged to join hands to ensure ultimate environmental protection standards;
- viii. Take insurance to manage the inevitable carbon tax. A carbon tax will convey transformations to the worldwide economy and reshape the universal exchange structure. It is essential for the Chinese government to step up with regards to defining related strategies and measures, and grab the open door for a universal low-carbon economy;
- ix. Develop a low-carbon economy and construct a far-reaching low-carbon society. Since a carbon duty is unavoidable, it is smarter to look for points of interest and stay away from drawbacks

at the beginning. Firstly, the administration should give more help to the innovative work of low-carbon innovation and help partnerships to expand their production of energy consumption. Secondly, continue reshaping and improving traditional industries and advance innovative low-carbon environmental-friendly manufacturing. Thirdly, produce, develop and deliver low-carbon goods which may support breaking trade hindrances, and improve the market share as well as industry overall.

7. Conclusions

Although numerous efforts and vigorous schemes at district, provincial, and central government levels have been launched at different times, China, being the world's leading manufacturing industry, still faces critical environmental challenges. An uncontrolled or unplanned giant of SO₂ and CO₂ are affecting Chinese society in particular and the world at large. Therefore, the formation of new, updated, and neutral environmental policies is inevitable to cope with the matter before it is too late. The matter of emissions trading was picked up as a balancing tool to tackle pollution and smog consequences in the country, and it has also brought an important agenda to the country's five-year plans. There is an acute need to bring an equitable assessment between the genuine environmental problems and measures taken to meet them; environmental NGOs may be helpful in this regard. The rapid growth of emissions contributed to environmental damage, which is relatively higher than the formulation of the legal framework; the creation of environmental courts and ministries places a serious question mark over the efforts made by the Chinese Government. An efficiency gap between the enforcement agencies was found during this study, even though government departments have been given more discretion to take legal actions against environmental rules violators. It is suggested that the environmental tax net should be strengthened and should include CO₂ emissions in the tax net under newly framed Environmental Protection Tax Law. A carbon duty is unavoidable. However, the government should prioritise attaining a low-carbon economy and an environment-friendly society. In addition, focus should also be given to ensure implementation with contrast to the analyses of the outcomes, public interest and participation, transparency, efficiency suggesting penalties on the responsible, and then to review compatibilities of the environmental laws with thoroughly analysed results in order to achieve the ultimate environmental goals for a better environmental future for China and the world at large.

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