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University College Cork, Ireland

Regulatory quality of water pollution control: A comparative case study of India and China

Thesis presented by

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for the degree of

Doctor of Philosophy

University College Cork

School of Law

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List of Abbreviations

Abbreviations of Variables in the Econometric Models:

CivC+ CrimC	number of Civil or Criminal judgements for environmental cases resolved per year
CO2	emissions Carbon di-oxide emissions
Corr	Corruption
Emi	emissions per dollar of value added
FM	Free Media
GE	Government Effectiveness
IETP	investment in effluent treatment plants per year
Indst	Industrialisation
Invstindwater	investment in treatment of industrial wastewater
LGEE	environmental expenditure by the local government
NGT	National Green Tribunal
No.T	number of trainings for inspectors conducted at the state level for maintaining water quality per year under GAP
NRR	Natural Resources Rent
PCNSDP	per capita Net State Domestic Product
Pop	population
Popgrowth	Population Growth
Propindstry	as percentage change in industry
RL	Rule of Law
RQ	Regulatory Quality
VAP	voice and accountability
waterpoll	River pollution

Other abbreviations:

AIWPS	Advanced Integrated Wastewater Pond System
AP	Andhra Pradesh

BOD	Biochemical Oxygen Demand
CAG	Comptroller and Auditor General of India
CCP	Chinese Communist Party
CEA	Central Electricity Authority
CETP	Common Effluent Treatment Plants
CGA	Central Ganga Authority
CGWB	Central Ground Water Board
CNCEP	National Conferenc e on Environmental Protection
CPCB	Central Pollution Control Board
CPD	Central Propaganda Department
CPI	Corruption Perception Index
CPIA	Country Policy and Institutional Assessment
CSE	Centre for Science and Environment
CWC	Central Water Commission
CWC	Central Water Commission
DO	Dissolved Oxygen
DOE	Department of Environment
DST	Department of Science and Technology
DV	Dependant Variable
DVC	Damodar Valley Corporation Act
EAEL	Economic Analysis of Environmental Law
EAER	Economic Analysis of Environmental Regulations
EAL	Economic Analysis of Law
EIA	Environment Impact Assessment
EIA	Environmental Impact Assessment
EPA (China)	Environmental Protection Agency
EPA 1986 (India)	Environment (Protection) Act
EPB (India)	Environment Protection Board
EPB (China)	Environment Protection Bureaus
EPI	Environmental Performance Index

EPRCC	Environmental Protection and Resources Conservation Committee
ERIA	Economic Research Institute for ASEAN and East Asia
ERIA	Economic Research Institute for ASEAN and East Asia
EU WFD	EU Water Framework Directive
FCRA	Foreign Contribution Regulation Act
FEM	Fixed Effects Model
FGLS	Feasible Generalized Least Squares
FYP	Five Year Plan
GAP	Ganga action Plan
GDP	Gross Domestic Product
GHG	Greenhouse gas
GRBEMP	Ganga River Basin Environment Management Plan
GSI	Geological Society of India
ICMR	Indian Council of Medical Research
IIB	India's Intelligence Bureau
IIT	Indian Institute of Technology
IMF	International Monetary Fund
IPCC	Inter-governmental Panel on Climate Change
ISI	Indian Standards Institute
IV	Independent Variable
MEP	Ministry of Environmental Protection
MEP	Ministry for Environmental Protection of the People's Republic of China
MEPL	Marine Environmental Protection Law
MHURC	Ministry of Housing and Urban and Rural Construction
MOA	Ministry of Agriculture
MoEF	Ministry of Environment and Forests
MOT	Ministry of Transportation
MoWR/MWR	Ministry of Water Resources
MPC	Municipal People's Congress
MPCC	Municipal People's Political Consultative Conference

NCEP	National Committee on Environmental Planning
NCEPC	National Committee on Environmental Planning and Coordination
NDRC	National Development and Reform Commission
NEA	National Environment Appellate
NEAA	National Environment Appellate Act
NGO	Non-Governmental Organisations
NGRBA	National Ganga River Basin Authority
NITI Aayog	National Institution for Transforming India Aayog
NMCG	National Mission for Clean Ganga
NPC	National People's Congress
NRC	National Research Council
NRCA	National River Conservation Authority
NRCD	National River Conservation Directorate
NRCD	National River Conservation Directorate
NRCP	National River Conservation Programme
NRCP	National River Conservation Plan
NSDP	Net State Domestic Product
NWP	National Water Policy
OECD	Organisation for Economic Co-operation and Development
OEPC	Office of Environmental Planning and Coordination
OLS	Ordinary Least Squares
PIL	Public Interest Litigation
PM	Particulate Matter
PMG	Program Management Group
PPP	Purchasing Power Parity
RBC	River Basin Commission
RBI	Reserve Bank of India
RBM	River Basin Management
RBO	River Basin Organisation
REM	Random Effects Model

RPM	Resale Price Maintenance
RTI	Right to Information
SANDRP	South Asia Network on Dams, Rivers and People
SC	Supreme Court
SGRCA	State Ganga River Conservation Authority
SIWI	Stockholm International Water Institute
SMF	Sankat Mochan Foundation
SPCB	State Pollution Control Board
SPMG	State Program Management Group
TBMR	Taihu Lake Basin Management Regulation
TVA	Tennessee Valley Authority
UK	United Kingdom
UMP	Uniform Monitoring Protocol
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGEMS	UN Global Environmental Monitoring systems
UP	Uttar Pradesh
UPCB	Uttar Pradesh Pollution Control Board
US	United States of America
WB	West Bengal
WGI	World Governance Indicators
WHO	World Health Organisation
WQAA	Water Quality Assessment Authority

Declaration of Academic Integrity

This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the contents. I have read and understood the regulations of University College Cork concerning plagiarism.

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Thesis Abstract

Ecosystems constitute resource stocks that are regenerative but exhaustible when they are overused. To prevent ecosystems from collapsing, government intervention takes place through pollution control policies namely: regulation, effluent charges and subsidies, contract and redefinition of property rights and organisation. Of these four policy approaches, this study will concentrate on regulation.

The management of water pollution has been challenging on multiple levels, particularly in developing countries like India and China, which risks undermining not only the economic growth of these countries but also the health and quality of life of billions of people. Therefore, an econometric analysis has been conducted in this study in order to examine the effect of strategic regulatory measures in both these countries. In addition, a comparative analysis of the regulatory measures of India and China has been done which would assist in identifying and quantifying the impact and shortcomings of pollution control policies in these two countries.

The rest of the thesis is structured as follows:

Chapter 1 is the introductory chapter which presents the motivation for this research and the rationale behind the development of this thesis.

Chapter 2 outlines the analytical and theoretical methodology used in this thesis.

Chapter 3 examines the effectiveness of regulatory measures for river pollution at the micro-level in India under the Ganga Action Plan (GAP). The GAP is India's first river action plan (launched in three phases) which focuses on the country's national river, the Ganges. The results indicate that the GAP has a weak legal basis. In addition, the institutions established under the GAP are also suffering from institutional failure. However, India's civil society organizations appear to contribute towards Ganges river pollution abatement.

Chapter 4 conducts a country level analysis for understanding river pollution regulatory measures in India. The results demonstrate that, at the macro-level, India's regulatory measures are only slightly effective. Although India's water law suffers from many legislative gaps, the low effectiveness of the regulatory measures could be due to the country's judiciary which acts as an educator for polluting industries and encourages legal activism. A free media has contributed

towards a rise in legal activism, as well. Institutions suffer from implementation failure at the macro level in India. Moreover, the civil society organisations fail to contribute towards river pollution abatement at the national level.

Chapter 5 studies the effectiveness of river pollution regulatory measures in China. The results show that environmental regulation suffers from many legislative gaps. Furthermore, the country also suffers from a weak institutional structure for river pollution abatement. The effectiveness of regulatory measures are further weakened by corruption and restrictive media.

Chapter 6 conducts a comparative analysis of India and China. The analysis demonstrates that China has a comparatively better legislative framework for river pollution abatement as compared to India, at least in terms of establishing river basin commissions (RBCs). Nonetheless, the former still fails to improve river water quality because of substantive legislative gaps. On the other hand, India, despite having poorer water legislation specifically aimed at river pollution, has still managed to reduce pollution levels, largely due to a better judiciary. The country's judiciary has often stepped in to make-up for the Executive's inefficiencies in the context of water pollution management. Both countries suffer from institutional failure of the Executive in terms of implementing river pollution abatement measures.

Chapter 7 is the concluding chapter which summarises the key findings of this study. It also suggests a few policy recommendations.

Chapter 1: Introduction

Declining water quality is a global challenge. Along with water pollution, increasing population and expanding agricultural and industrial activities also present grave challenges to current and future water security. Global water demand is expected to increase by 55 per cent by 2050, including a 400 per cent increase in water demand in manufacturing, 140 per cent in electricity and 130 per cent in domestic use[1], which would intensify pressure on existing water resources and contribute to further worsening of river water quality.

However, as a result of increased societal attention and political action, many developed economies have experienced a significant improvement in water quality during the last few decades. On the other hand, developing regions of Asia, Africa and Latin America have seen a rise in river pollution because of economic and demographic changes, posing a serious risk to public health and ecosystems[2].

Increasing pressure on water resources leads to an expanding gap in access to water supply and sanitation. Accompanied by growing population and pollution, it is one of the greatest obstacles to sustainable development and economic progress. The significance of water pollution abatement for sustainable development was addressed by the UN in its 2030 Agenda.

In 2015, the United Nations (UN) published its 2030 Agenda for Sustainable Development. It consisted of 17 Sustainable Development Goals and 169 targets. Of these 17 goals, Goal 6 states the aim to '*Ensure availability and sustainable management of water and sanitation for all*[3]'. One of the Goal 6's targets also emphasizes the need to address water pollution abatement efforts for freshwater systems:

> '*By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally*[4] *'.*

---

[1] OECD, *OECD Environmental Outlook to 2050: The Consequences of Inaction* (OECD Publishing 2012)
[2] UN-Water, 'Towards a Worldwide Assessment of Freshwater Quality' [2016] < file:///C:/Users/e805123/Desktop/UN_Water_Analytical_Brief_20161111_02_web_pages.pdf >
[3] UN General Assembly, 'Resolution adopted by the General Assembly on 25 September 2015' (21 October 2015, 70th session)
[4] Target 6.3 (Ibid 18)

This Goal and the corresponding targets are very significant as they come at a time when freshwater systems are facing unprecedented threat from human activities. Freshwater is critical not only for sustainable economic growth but also for human sustenance. Only 0.01 per cent of world's water is made up of freshwater, which is approximately 0.8 per cent of the Earth's surface. This tiny share of the Earth's water supports 100,000 species[5] and, hence, it is critical to ensure that efficient water pollution measures are adopted, especially by the emerging economies such as China and India.

Consequently, this thesis examines the effectiveness of institutions and the formal regulatory quality of river pollution regimes in India and China. The methodology used for this purpose is that of 'economic analysis of law', employing both aggregate and disaggregated level analyses. The methodology is discussed in further detail in Chapter 2.[6]

The subsequent sections present the motivation behind this research as well as the structure of the thesis.

1.1 Motivation of the research

1.1.1 **Importance of water**

Water is a very critical natural resource, upon which various economic and social activities and ecosystem functions rely. Water is required for various industrial and agricultural processes, generating power and for transporting people and goods, all of which are critical for the functioning of the modern society[7]. In short, water is essential for life.

However, the amount of freshwater resources available is limited and its distribution varies continuously as a result of various natural cycles such as, thawing, freezing, fluctuations in precipitation and water runoff patterns. Alongside natural causes, human activities have also

[5] D. Dudgeon et. al, 'Freshwater biodiversity: importance, threats, status and conservation challenges' (2006) 81(2) Cambridge Philosophical Society 163

[6] Explained in detail in Chapter 2.

[7] UN-Water report, 'Managing Water Report under Uncertainty and Risk' [2013] The United Nations World Water Development Report 4

become primary 'drivers' affecting the water systems. More often than not, these pressures are related to economic growth and human development[8].

Unsustainable economic development, along with governance failures, have caused enormous pressures on water resources, affecting their quality and thereby compromising their ability to generate economic and social benefits[9].

During the time period 1960 to 2012, global gross domestic product (GDP) increased at an average of 3.5 per cent per year[10] but much of this growth came at a considerable economic and social cost. At the same time, population growth, urbanization, industrialization, migration, and a rise in production and consumption have generated an increasing demand for freshwater resources. This increase in demand, in turn, has led to pollution of water resources, which has further reduced the accessibility of water resources[11].

1.1.2 **River pollution in developing countries**

As mentioned above, global water quality is deteriorating, particularly in the case of the rivers and lakes. However, it should be noted that this trend is not universal. For instance, in many developed countries, water quality has improved markedly,[12] whereas, in developing countries, water pollution seems to be increasing significantly[13].

In an examination of global water security, the UN identified water quality as one of the primary concerns for Asia in the next century. The notable evidence for this phenomenon in most Asian countries are the human health issues resulting from dumping untreated wastewater in rivers and the widespread eutrophication of rivers, along with algae blooms and fish kills, occurring as a result of point and non-point sources discharging nutrients. Furthermore, due to lack of reliable data, surface water quality management has been very challenging[14]. The severe water quality

[8] UN-Water report, 'Water in a changing world' [2009] The United Nations World Water Development Report 3
[9] UN-Water report, 'Water for a sustainable world' [2015] The United Nations World Water Development Report 2015
[10] The World Bank, 'Development and the Environment' [1992] World Development Report
[11] Ibid 10
[12] Although some issues such as water contamination by micropollutants and eutrophication still remain [UNEP 2016, 'A Snapshot of the World's Water Quality: Towards a global assessment' [2016] United Nations Environment Programme, Nairobi, Kenya 162]
[13] Ibid 31
[14] Food and Agriculture Organisation of the United Nations (FAO), 'Water Quality Management and Control of Water Pollution' [2000] Proceedings of a Regional Workshop Bangkok, Thailand 26-30 October 1999

degradation in many Asian countries is also placing serious constraints on their respective economic growth.

The problem of water quality management is even more severe in countries like India and China, where sizeable parts of the country suffer from water deficits. Furthermore, the linkage of water with food security also results in severe consequences for water quality management[15].

1.1.3 Water management and governance

One of the issues facing developing countries in terms of river pollution is that of managing water efficiently. Key challenges include institutional and territorial fragmentation, poorly drafted legislation, badly managed multi-level governance, limited capacity at the local level and unclear allocation of roles and responsibilities[16].

The issue of future water quality management is complex, as it requires re-examination of a number of important factors, which include technical, legal, institutional and governance issues[17]. This thesis examines the legal and institutional issues of river water quality management in both India and China.

1.1.4 Why India and China have been chosen as case studies?

During the past thirty years, there has been a significant shift in the global economy. China and India, two of the most populous countries on earth, have rapidly emerged as powerful countries[18]. Being the emerging economic giants of the world, both countries are expected to play a substantial, even dominant, role in determining global environmental outcomes in the 21st century. Over the last two decades, both the Chinese and the Indian economies have expanded at a rapid pace, with average annual growth rates of about 9.2 per cent and 7.1 per cent respectively (World Bank, 2018)[19]. Even when the global economy experienced recession and consequently a negative

[15] Ibid 10
[16] OECD, 'Water in OECD countries: A multi-level approach- Highlights' < https://www.oecd.org/governance/regional-policy/48885867.pdf >
[17] FAO (n 14) 10
[18] S. Naseem, 'Economies of Two Asian Giants India and China: A Comparative Study' (2017) 8(9) International Journal of Business and Social Science 42
[19] World Development Indicators (WDI), 2018, World Bank.

growth rate of -2.2 per cent in 2009, China and India respectively grew by 8.4 per cent and 6.2 per cent[20].

The development of these two economies are driven not only by the natural capital within the countries, but also by imports of raw materials from other countries, particularly the South-East Asian countries[21]. For instance, both countries import approximately 9 million tonnes of crude palm oil primarily from Malaysia and Indonesia, which is almost one quarter of global production[22].One of the consequences of this continuous economic growth in these countries is environmental degradation with rising pollution levels[23].

Given the importance of these two economies in driving global economic output, it can be safely concluded that the degree to which India and China utilise their natural resources will largely govern environmental, social and economic outcomes, not only of Asia but also of the entire world.

However, given that this study also compares the countries' water law regime, it must be acknowledged that India and China have very different constitutional frameworks.

Being a centralized state, China's constitutional governance framework is modeled after the soviet system. China's legislature, the National People's Congress (NPC) is the highest body of state power, unchecked by the other forms of government. As the NPC functions at the top of the state pyramid, it creates and interprets law – and also have significant authority over the Judicial and Executive branches of government. In addition, the NPC's Standing Committee is also empowered to supervise and execute the implementation of the Constitution[24].

The Indian constitution on the other hand has a federal arrangement, whereby the judicial branch is entirely independent of the other branches of the government. However, it should also be noted that the constitution also provides the Central/Federal government with overarching financial and

[20] World Bank, Global Economic Prospects 2010: Crisis, Finance, and Growth (Washington, 2010) 10

[21] K.S. Bawa et. al., 'China, India, and the Environment' (2010) 327 (5792) Science 1457

[22] Food and Agriculture Organization of the United Nations (FAO), FAOSTAT Online Statistical Service (Food and Agriculture Organization of the United Nations, Rome, Italy, 2009).

[23] For instance, J. Nandi, 'India, China account for over half of global deaths due to air pollution: Report' (The Economic Times, 19 April 2018); A. Gowen, 'As China cleans up its act, India's cities named the world's most polluted' (The Washington Post, 2 May 2018)

[24] T. E. Kellogg, 'Constitutionalism with Chinese characteristics? Constitutional development and civil litigation in China' (2009) 7(2) International Journal of Constitutional Law 215

administrative powers in its hand. At the same time, the Federal and the states also share certain powers and resources amongst themselves[25].

However, despite the different constitutional frameworks of China and India - a comparison of their water law regimes[26] is a very valid one. This is because of the similarity in their water law regimes. In both the countries, water is a 'state' subject. Apart from that, the governance structure for water management is also fragmented at different levels, such as at the Federal, state/province and at the local level. As a result, although both the countries have very different forms of government where one is a democracy and the other is an authoritarian regime, nonetheless they provide a very good basis for a comparative study because of the similarity in water law regimes and water management structure.

Therefore, India and China were chosen as case studies for the purpose of understanding river pollution governance in developing economies.

Consequently, this thesis analyses the roles of regulatory quality (RQ) (which has been considered as a proxy for understanding legal[27] as well as institutional issues[28]), rule of law (RL) and government effectiveness (GE) (both of which have been considered as proxies for understanding institutional issues) in the context of river pollution abatement in China and India. The concepts of RQ, RL and GE have been derived from the Worldwide Governance Indicators (WGI)[29]. The WGI arose from a long-standing research project which developed cross-country indicators of governance from 1996 to 2016[30]. It consists of six composite indicators of governance, which includes RQ, RL and GE. For the purpose of this thesis, however, the above-mentioned three measures of governance have been adapted to river pollution/environmental issues.

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[25] P. Karat, 'Federalism and the political system in India' (2004) 20(03) The Marxist 1

[26] A detailed discussion about 'legal comparability' and ' what makes a valid legal comparison between states' can be found in: M. V. Hoecke, 'Methodology of Comparative Legal Research' (2015) 12 Law and Method 1; Jan M. Smits (Ed), *Elgar Encyclopedia of Comparative Law, Second Edition* (Edward Elgar Publishing 2012) 20

[27] Such as implementation of statutory law

[28] The terms RQ, RL and GE are discussed in detail in the next section.

[29] The WGI are produced by D. Kauffman and A. Kraay < http://info.worldbank.org/governance/wgi/index.aspx#home >

[30] D. Kauffman et. al., 'The Worldwide Governance Indicators: Methodology and Analytical Issues' [2010] Global Economy and Development

1.2 Governance

Despite the fact that 'governance', as a concept, has been widely discussed amongst policy-makers and scholars, there is no consensus regarding a single definition of governance. Some are too broad, such as that provided by the World Development Report *which regards governance as the* '*rules, enforcement mechanisms, and organizations*[31]'. Other definitions narrowly focus on public sector management issues, *e.g.* '*the manner in which power is exercised in the management of a country's economic and social resources for development*[32]'. The WGI draws on the prevailing notions of governance and attempts to define governance as:

> 'The traditions and institutions by which authority in a country is exercised. This includes (a) the process by which governments are selected, monitored and replaced; (b) the capacity of the government to effectively formulate and implement sound policies; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them[33]'.
>
> As seen above, the WGI composed six dimensions of governance corresponding to three areas as follows[34]:
>
> (a) The process by which governments are selected, monitored, and replaced
> (b) The capacity of the government to effectively formulate and implement sound policies
> (c) The respect of citizens and the state for the institutions that govern economic and social interactions among them

In this thesis, only (b) and (c) have been considered for understanding the effectiveness of river pollution governance in India and China. RQ and GE lie in category (b) and RL lies in category (c).

1.2.1 **Governance for the environment**

There is increasing consensus that aspects of governance have a huge impact on environmental actions and outcomes. Environmental governance is 'cross-cutting' and involves many actors.

[31] The World Bank, 'Building Institutions for Markets' [2002] World Development Report 20
[32] The World Bank, 'Development and the Environment' [1992] World Development Report 15
[33] D. Kauffman et. al. (n 30) 3
[34] Ibid 4

While the public sector plays a key role in environmental governance by formulating and implementing governance mechanisms, such as, regulation and policies, accountability and integrity are equally crucial for improved environmental outcomes[35].

There is an extensive range of potential environmental governance mechanisms and the particular circumstances in each country determine what is required to be strengthened and in what order. Examples of conditions which show significant country-specific variance include monitoring capacity, integrity of the judicial system, government effectiveness, financial resources and voice and accountability. A country- specific analysis, therefore, aids in identifying the steps that could be taken to improve governance not only in the short term, but also in the medium and long term[36].

Regulatory quality (RQ)

The WGI has defined regulatory quality as something that '*captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development[37]'*. Although many scholars have worked on 'regulation', very few papers have attempted to define it[38]. One of the key papers[39] defines regulation as '*sustained and focused control exercised by a public agency over activities that are valued by a community*'[40]. Baldwin et al. have attempted to categorize the definition of regulation as follows[41]:

(1) Specific commands: Regulation here could be defined as a binding set of rules to be applied by the body responsible for that particular purpose. An example of such command is India's Water (Prevention and Control of Pollution) Act 1974.
(2) Deliberate government influence: In this context, the term 'regulation' encompasses all state or government actions which influence business or social behavior. Therefore,

[35] G.O Wingqvist, 'The role of governance for improved environmental outcomes' [2012] Report No. 6514 Swedish Environmental Protection Agency
[36] Ibid 10
[37] World Bank (n 19) 10
[38] Regulation is defined differently in law and economics. But this thesis would consider the meaning of 'regulation' as defined in Law.
[39] P. Selznick, 'Focusing Organisational Research on Regulation', in R. Noll (ed.), *Regulatory Policy and the Social Sciences* (University of California Press 1985) 56
[40] R. Baldwin, M. Cave and M. Lodge, *Understanding Regulation: Theory, Strategy and Practice* (2nd edition, Oxford University Press 2012) 2
[41] Ibid 3

command-based regimes would be under this category. For instance, the Montreal Protocol of 1989.

(3) All existing forms of social or economic influence: Regulation under this category would include all forms of mechanisms, whether state-based or other sources, which affect business or social behavior. It includes regulations not only by state institutions but also by other bodies such as voluntary organisations, professional or trade bodies and corporations. An example of this is 'private ordering'[42].

In other words, regulation is often considered as anything which restricts behavior so as to prevent undesirable activities [43] (for instance, regulating pollution through command and control mechanisms). But regulation could also facilitate certain activities, for instance, when airwaves are regulated it allows broadcasting operations in a well-ordered manner[44]. Along the same lines, 'regulation' has also been defined as statutory law by Cento Veljanovski[45]. The author will adopt Veljanovski's definition of regulations for the purpose of this study and RQ therefore could be interpreted as, 'the quality of implementation of statutory law'.

Government Effectiveness (GE)

The WGI report defines GE as, '*capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy, formulation and implementation, and the credibility of the government's commitment to such policies[46]'*. Unfortunately, it is difficult to quantify many of the above aspects of GE because of data limitations. Therefore, as per data availability, the proxy for GE in India's case has been modified and taken as 'expenditure made by the river conservation authority'. A similar measure has also been considered for China[47].

[42] The establishment of regulatory standards by non-State actors, such as business confederations or standard-setting bodies, e.g. ISO

[43] In such cases, regulation is usually considered as a 'red light' concept. For further details: C. Harlow and R. Rawlings, *Law and Administration (Law in Context) (*3rd edition, Cambridge University Press 2009) 79

[44] Ibid 3

[45] C. Veljanovski, 'The Economics of Law' [2006] Institute of Economics Affair Hobart Paper No. 157

[46] D. Kauffman et. al. (n 30) 4

[47] Explained further in Chapter 4

Rule of Law (RL)

The RL captures '*perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence*[48]'. Due to data limitations, various measures from the corruption perception index (CPI) have been considered as proxies for RL for both the countries.

Given all the governance variables used to measure governance in one or other dimension, it cannot be assured that these three dimensions of governance are completely independent of each other. For instance, a more effective government can result in a better regulatory environment; similarly, respect for rule of law would result in less exploitation of public space for private gain. These potential inter-relationships imply that the task of assigning proxies to various measures of governance is far from easy. Besides taking extra precaution while allocating proxies, the author has also run appropriate econometric tests to ensure that the obtained regression results are unbiased, which would help in identifying the underlying issues relating to the regulatory quality, government effectiveness and rule of law of the river pollution regimes of India and China and also in envisaging specific policy recommendations.

1.3 Rationale behind the thesis topic

The reason for choosing the two largest developing country economies, India and China, for a comparative analysis is not only limited to them being the current biggest influencers in terms of environmental outcomes; it goes beyond that.

Initially, the study focuses only on conducting an analysis of India's Ganga Action Plan (GAP). The GAP was formulated and launched by the Government of India for the purpose of cleaning up one of its most significant rivers (in terms of size as well as economic importance). However, it failed miserably in its objectives. Thus, this study initially analyses the reasons behind the failure of the GAP using the 'economic analysis of law' methodology.

[48] Ibid 4

The results however reveal that the failure of the GAP is not only limited to just one river action plan, it epitomizes a failure of India's environmental regulatory quality. Therefore, there was a need to go beyond this particular regulatory regime to try and understand the broader issues of governance (particularly, the regulatory and institutional framework) with respect to river pollution in India.

After conducting a comprehensive analysis of the river pollution abatement framework across India, there was also a need to conduct a comparative analysis with a country that is on a similar economic growth trajectory as that of India and hence is facing the same environmental consequences. As a result, China was chosen for the purpose of comparative analysis. The aim of this exercise is to identify the particular issues faced by these countries in tackling river pollution and what regulatory lessons may be learned.

1.4 Structure of the thesis

The structure of the thesis therefore moves on from a narrow analysis of one river action plan in India to a more broad-based analysis of India and China's river pollution abatement measures and finally on to a comparative policy analysis using the EAL methodology.

The rest of the thesis is structured as follows. Chapter 2 explains and justifies the usage of the EAL methodology for this study. Chapter 3 examines India's GAP and identifies the shortcomings of the same (using EAL). Chapters 4 and 5 explore India and China's complete river pollution abatement framework (both legal and institutional) and identify the drawbacks in each by conducting an econometric analysis (using EAL). Chapter 6 conducts a comparative policy analysis of India and China by drawing on the econometric results obtained in Chapters 4 and 5. Chapter 7 summarizes the key findings obtained in this thesis and presents some policy recommendations.

Rationale for Chapter 2

Ecosystems constitute resource stocks that are regenerative but exhaustible, when overused. In addition to the fact that ecosystem degradation tends to be long lasting and often irreversible, ecosystems can collapse abruptly without prior warning. To prevent ecosystems from collapsing, government intervention is usually considered necessary. For the purposes of curbing environmental degradation (specifically pollution), government intervention takes place through various pollution control policies, namely: (1) regulation, (2) effluent charges and subsidies, (3) contract and redefinition of property rights and (4) organisation[49]. Of these four policy approaches, this study will concentrate on regulation[50].

One recent development in understanding the effects and complexities of environmental regulation involves building mathematical environmental models. In other words, these models play an integral role in assisting understanding of law and policy in many jurisdictions. Although these models are generally considered as only serving the purpose of providing technical inputs in environmental decision-making, in reality, they are formulated on the basis of relevant policy assumptions, which aids in understanding the impact of the environmental regulations on other aspects of an economy besides the environment[51].

A model has been defined by the American National Research Council (NRC) as:

> 'A simplification of reality that is constructed to gain insights into select attributes of a particular physical, biological, economic, or social system. They can be of many different forms. They can be computational. Computational models include those that express the relationships among components of a system using mathematical relationships. They can be physical, such as models built to analyse effects of hydrodynamic or aeronautical conditions or to represent landscape topography. They can be empirical, such as statistical

[49] G. Majone, 'Choice among policy instruments for pollution control' (1976) 2(4) Policy Analysis 589
[50] Regulation has been defined in a detailed manner in section 3.2
[51] E. Fisher, P. Pascaul and W. Wagner, 'Understanding Environmental Models in Their Legal and Regulatory Context' (2010) 22(2) Journal of Environmental Law 251

models used to relate chemical properties to molecular structures or human dose to health responses'[52].

Although models can take many different forms, the underlying reason for the need to formulate models is the same-to understand multifaceted and poorly accessible social, physical or economic systems[53].

The process of developing a model begins with a rudimentary conceptualization of the system to be analysed. This implies that a general structure of the system and the relationships within that system that are significant in answering the research question are represented theoretically. Similarly, in mathematical analysis of environmental regulations, the conceptual model developed offers a critical understanding of the factors that influence the effectiveness of the policy or law, thereby assisting in analyzing the efficacy of the regulations[54].

Models have multiple functional roles in environmental regulation; Fisher et. al[55] have categorized these functions as follows:

(1) 'Policy-catalysts' models: These models aid in decision-making where there is a lack of a well-established regime for environmental regulations. Therefore, they are relied upon for formulating new laws and resolving legal disputes. An example of this would be the use of models in climate change policy. For instance, the United Nations' Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC) was established as 'a single intergovernmental negotiating process under the auspices of the General Assembly Framework' on the basis of the Intergovernmental Panel on Climate Change's (IPCC) first assessment report which became the main basis for negotiations under the United Nations General Assembly on a climate change convention. Therefore, these models function as a foundation for the new regimes.

(2) 'Institutional mandate' models: These models assist in accomplishing the legislative mandate of a regulatory regime by establishing the rationale for a particular action and play an important background role in policy making, thereby directly informing decisions. For

[52] National Research Council (NRC), *'Models in Environmental Regulatory Decision Making'* (National Academies Press,Washington DC 2007) 45
[53] Ibid 32
[54] National Research Council (n 52)
[55] Fisher, Pascaul and Wagner (n 51) 254

instance, models conducting environmental impact assessments would be categorized under this category.

(3) 'Regulatory strategy' models: These models are used for collaborative decision-making and as a tool for collaborative negotiations between multiple sets of parties (e.g. lawyers, economists, policy advisors, etc.). These models go beyond the disciplinary divide. In some cases, these models could be a part of the formal regulatory regime, such as the process of formulating River Basin Management Plans (RBMPs) to fulfill the requirements of the EU Water Framework Directive (WFD), and in other cases, it could be a part of informal forms of environmental regulatory regime (private/collective actions).

One common subset of all the aforementioned types of models employ mathematical relationships to yield quantitative outputs. These models are known as computational models. The NRC has defined computational models as follows:

> 'A model that is expressed in formal mathematics using equations, statistical relationships, or a combination of the two. Although values, judgment, and tacit knowledge are inevitably embedded in the structure, assumptions, and default parameters, computational models are inherently quantitative, relating phenomena through mathematical relationships and producing numerical results'[56].

Computational models are used extensively in environmental regulation studies[57]. 'Economic analysis of law' is one such methodology of formulating computational models. In order to comprehend how EAL can aid in devising models that examine the effectiveness of existing formal environmental regulatory quality, it is important to understand it's origin, history and use (as well as the associated advantages and disadvantages) in understanding regulation. Consequently, Chapter 2 provides a brief overview of EAL and how this methodology will be used for the purpose of this study.

[56] National Research Council (n 52) 33

[57] K. John Holmes, J. A. Graham, T. McKone and C. Whipple, 'Regulatory Models and the Environment: Practice, Pitfalls, and Prospects' (2009) 29(2) Risk Analysis 159; W. E. Wagner, E. C. Fisher and P. Pascaul, 'Misunderstanding Models in Environmental and Public Health Regulation' (2010) 18 NYU Environmental Law Journal, Energy Center Research Paper No. 11-10

Chapter 2: Methodology of Law and Economics

2.1 Introduction

'*Economics allows us to perceive the legal system in a new way, one that is extremely useful to lawyers and to anyone interested in issues of public policy. If economists will listen to what the law has to teach them, they will find their models being drawn closer to reality*[58]'

Since the earliest interactions between law and economics (known as economic analysis of law), this methodology has faced much criticism.[59] But it cannot be denied that economics has contributed towards providing an improved understanding of the legal system. For instance, contract and tort law were earlier thought to belong to different universes but economics helped identify that both fields of law use very similar analytical methods while dealing with different activities[60].

The '*economic analysis of law*' (EAL) can be defined as an approach which employs economic and econometric methods (by formulating models) to examine the functioning, structure and effectiveness of law, legal institutions, legal systems and regulatory systems[61]. It considers the legal institutions or legal rules as variables in the economic system and then analyses the effects of change in one or more variable on the other variables in the system[62]. In doing so, EAL attempts to elucidate and forecast the behavior of the participants and the people regulated by the law concerned. EAL also tries to comprehend the undesirable consequences of laws on other economic variables, such as, economic efficiency or distribution of income, which further contributes

[58] R. Cooter and T. Ulen, *Law and Economics* (Scott, Foresman and Co. 1988)
[59] For a detailed study refer to: D. M. Kahan, 'The Theory of Value Dilemma: A Critique of the Economic Analysis of Criminal Law' [2002] John M. Olin Center for Studies in Law, Economics, and Public Policy Working Papers 208; A. Bernstein, 'Whatever Happened to Law and Economics?' (2005) 64(1) Maryland law Review 303
[60] For a detailed discussion refer to: D. G. Baird, 'The Future of Law and Economics: Looking Forward' (1997) 64(4) The University of Chicago Law Review 1132
[61] C. K. Rowley,'Public Choice and the Economic Analysis of Law' in N. Mercuro (ed), *Law and Economics, Boston* (Kluwer Academic Publishers, 1989) 67
[62] E. Mackaay,'History of Law and Economics' [1999] University of Montreal

towards improving the existing laws[63]. The EAL approach of formulating models and deriving answers can be considered as a four-stage process[64]:

(1) The existing complex reality is transformed into a simplified reality using assumptions;

(2) On the basis of this simplified reality, models are formulated;

(3) Answers are derived from these formulated models by studying the relationships between the variables in the models; and

(4) The derived answers aid in devising policy recommendations.

Using an EAL methodology provides mathematical validity and flexibility in terms of adapting to the research questions by adding/removing variables or relaxing/modifying the assumptions of the formulated models. Employing the EAL methodology also allows one to control for the differences in different legal systems, geographical borders and cultures, which increases the likelihood to understand the accurate relationships amongst the variables in question[65].

According to Judge Richard Posner[66], one of the greatest benefits of using economic analysis is that it makes law simpler and challenges one to defend their values. He cites two examples which assist in understanding how economic analysis helps in doing so. In 1911, in the antitrust case of *Dr. Miles v John D. Park*[67], the legality of a resale price maintenance (RPM)[68] contract under the Sherman Act (1890) was questioned. Dr. Miles (a supplier of patent medicines) entered into a contract with his dealers which forbade them to charge a price lower than the retail price fixed by the company. The Supreme Court found this practice illegal as it had the same effect as that of an equal price agreement amongst the dealers for selling a particular medicine i.e. a dealer's cartel. Posner points out that, as opposed to a dealers' cartel, the customers' welfare is enhanced in RPM.

[63] R. A. Posner, 'Values and Consequences: An introduction to Economic Analysis of Law' [1998] Coase-Sandor Institute for Law & Economics Working Paper No. 53

[64] E. Salzberger, 'The Economic Analysis of Law – The Dominant Methodology for Legal Research' [2007] University of Haifa Faculty of Law Legal Studies Research Paper No. 1044382 6

[65] Ibid 216

[66] Posner (n 63) 4

[67] Dr. Miles Medical Co. v. John D. Park & Sons Co., 220 U.S. 373 (1911)

[68] For a detailed understanding of RPM, refer to: C. W. Dunn, 'Resale Price Maintenance' (1923) 32(7) The Yale Law Journal 676

If the dealers are not able to compete in price (as price is fixed in RPM)[69], then they would switch to competing in non-price dimensions (for instance, providing the customers with better informed sales people or retail services). In RPM, if these services were crucial to the manufacturer's marketing strategy (for instance, if Dr. Miles's patent medicines require better informed sales people), they would use RPM to conjure these services indirectly. Therefore, as consumers value these retail services (as they need better informed sales people for the patent medicines), this makes them better off[70]. Similarly, in a dealers' cartel, members of the cartel would also like to increase their sales. Given the fixed price set by the cartel, the dealers in this case would also offer additional services to attract customers away from other dealers (similar to the RPM case)[71]. However, the difference between RPM and a cartel is that in the latter case the dealer may be providing more services than the customers actually require (i.e. as medicines sold in the cartel are not patented medicines they do not require better informed sales people), thereby not affecting the consumer's welfare in any way. This would eventually force the suppliers to provide less services and hence lower prices (as per the customers' demands), or else the supplier would lose business to a competitor[72].

Similarly, when deregulation took place in the airline industry service became inferior (for instance, less legroom, poorer food and more crowded aircraft) compared to when it was regulated, as was predicted by economics[73]. When the airlines industry was a government regulated cartel, there was non-price competition (additional services were provided like better food, more legroom etc.) and prices were kept high. But when deregulation occurred, the prices fell along with the additional services as this was what the customers demanded, evidenced by an enormous growth in air travel since deregulation. Though the RPM of patent medicines and deregulation of airline industry are completely different scenarios, they raise the same economic issues, even though the former involves judicial interpretation of antitrust laws and the latter legislative reform of common

[69] But would earn more if able to sell more i.e. in RPM, price is set so the only way the dealers can earn more is by selling greater quantity of the same product (As the dealers' total revenue = price x quantity, where price is already fixed)

[70] This raises the question then, that if consumers value retail services, would the dealers' have not provided it without the manufacturer forcing them to (through RPM)? The answer is no that would not have happened. For a detailed study of the reason for the dealers not doing so refer to: K. G. Elzinga and D. E. Mills, 'The Economics of Resale Price Maintenance' (2008) 3 Issues in Competition Law and Policy 1841 (ABA Section of Antitrust Law)

[71] Refer (n 69)

[72] Posner (n 63) 5

[73] Federal Reserve Bank of San Francisco '*Airline Deregulation'* (9 March 1984, Weekly letter) 10

carrier regulations. This is the rationale behind using the EAL methodology; bodies of law, institutions and practices that are completely dissimilar from the perspective of legal analysis, seem interchangeable when viewed through the lens of economics. In Judge Posner's words, '*when I was a law student, the law seemed an assemblage of completely unrelated rules, procedures, and institutions. Economics reveals a "deep structure" of law that exhibits considerable coherence*[74]*'*.

In Veljanovski's [75] view, these advantages of the EAL methodology are self-explanatory, evidenced by the fact that over the years it has evolved into a substantial field of study with its own pool of specialist scholars and journals. In fact, an attempt was made by Richard Posner in 2003 to develop a unified economic theory of law. His theory demonstrates that law assists in the smooth functioning of free markets. In markets, where prohibitive transaction costs[76] exist, law aids in creating a smooth functioning market by directing the outcome towards what it would have been in the absence of such transaction costs[77].

Over the years, two approaches to EAL have developed, namely the 'old' and the 'modern' approach. The former approach analyses how certain characteristics of specific legal fields (anti-trust law, corporation law and competition law) are associated with traditional market economics. It only deals with the legal fields where traditional economic considerations are central. On the other hand, the latter approach deals with the whole legal system, including those legal fields which do not directly deal with economic issues such as, private law, public law, procedural law, etc. It extends the application of traditional economic models to non-economic fields such as that of markets of crimes[78], environmental goods markets, or that of conflict resolution.

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[74] Posner (n 63) 5

[75] Veljanovski (n 45) 134

[76] Any costs involved in making an economic transaction are termed as transaction costs. For instance, when buying/selling foreign exchange there exists transaction costs (in addition to the price of the good paid for). In economics, it is assumed that prohibitive transaction costs results in market failure. For instance, if banks are left to make their own policies, individuals from the economically weakened sections might not get access to it because of prohibitive transaction costs (e.g. as the economically weakened sections might demand services on a small scale, providing these services while making a profit is difficult because each transaction would also require an administrative cost etc.) and that would result in inefficient outcomes or market failure.

[77] R. A. Posner, *Economic Analysis of Law* (6th ed. ASPEN 2003); R. A. Posner, 'Law and Economics in Common-Law, Civil-Law, and Developing Nations' (2004) 17(1) Ratio Juris 69

[78] For a detailed understanding of the markets for influencing crimes, refer to: W. K. Viscusi, 'Market incentives for criminal behaviour' in R. B. Freeman and H. J. Holzer (eds), *The Black Youth Employment Crisis* (University of Chicago Press, 1986); S. Mackenzie, 'The Market as Criminal and Criminals in the Market: Reducing Opportunities

2.2.1 'Old' EAL approach

Economics side

On the economics side, the EAL movement had a European origin (specifically the German Historical School) which later reached the United States through the institutionalist movement[79]. This methodology can be traced back to the works of Cesare Bonesara[80], Adam Smith[81], Jeremy Bentham[82], Karl Marx[83] and John R. Commons[84]. There also exists writings and legal judgements by the intellectual circles of the eighteenth century consisting of political economists, politicians and judges appreciating this methodology[85]. However, after World War II, the EAL methodology gained particular disrepute amongst economists as it was felt to be excessively descriptive and deficient of a consistent theory, especially when there was a visible shift in economics research from *a priori* to empirical science[86].

Later, in the 1960s and 70s, there were a number of related efforts in economics to understand regulation as part of an attempt to reformulate the basic structure of economics[87]. It was during this period that economists began modelling public utility regulation using quantitative methods for understanding the impact of these laws[88]. In addition, questions regarding how property rights were determined and how they functioned across different societies were also addressed, as it was

for Organised Crime in the International Antiquities Market' in S. Manacorda and D. Chappell (eds), *Crime in the Art and Antiquities World: Illegal Trafficking in Cultural Property* (Springer Science, 2011)

[79] Heath Pearson, '*Origins of Law and Economics - The Economists' New Science of Law, 1830-1930*' (Cambridge University Press, 1997)

[80] Cesare Bonesara, *An Essay in Crime and Punishment* [1764]

[81] A. Smith, *The Wealth of Nations* [1776]

[82] J. Bentham, *An Introduction to the Principles of Morals and Legislation* [1789]

[83] K. Marx, *Das Kapital* [1861]

[84] J. R. Commons, *Legal Foundations of Capitalism* (Macmillan, 1924)

[85] Posner (n 63) 6

[86] Veljanovski (n 45) 29

[87] In the 1960s, economists studying the fiscal policy began questioning the orthodox economics' approach regarding market failure, as it usually failed to yield the policies followed by the government or explain the behavior of the politicians and the regulators. Drawing on the work of the likes of Wickshall and Lindahl, economists attempted to incorporate government regulation and bureaucracy into their model.

[88] H. Averch and L. Johnson, 'Behavior of the firm under regulatory constraint' [1962] American Economic Review 1052; R. Caves, *Air Transport and Its Regulators: An Industry Study* (Harvard University Press, 1962); G. J. Stigler and C. Friedland, 'What can regulators regulate?: the case of electricity', (1962) 5(1) Journal of Law and Economics, 16

assumed that property rights are dependent on economic conditions[89]. Apart from this movement that was taking shape in Germany, scholars from other European countries, such as Austria[90], Belgium[91], England, France[92]and Italy,[93] also contributed to EAL's development[94].

Legal side

In the nineteenth century, the legal side of the EAL movement gained many enthusiasts[95]. One of the most defining pieces of that period is a monograph on Tort law[96] which identified the central idea of the American law and economics movement (almost a century before the movement) by recognizing tort law's incentive effects. Although this monograph was successful in raising interest in the EAL approach amongst legal scholars and in policy debates, it was unable to influence legal analysis. One of the reasons for this was that, in the German speaking countries at that time, legal scholarship remained strongly inspired by the 'Historical School'. This school of thought did not consider policy arguments as a part of legal scholarship. They firmly believed that economic factors alone could not explain the '*tendencies and aspirations of the human soul*'[97] in the functioning of law, hence misconstruing the essence of the EAL methodology. On the other hand, the liberal school of thought, embodied by the 'Free Law School' which encouraged interdisciplinary legal studies, shifted their focus from EAL to legal realism and sociology of law, leading to the decline of the former in the 1930's[98].

[89] Pearson (n 79) 33
[90] Eugen von Böhm-Bawerk [1881] Rechte und Verhaltnisse vom Standpunkte der volkswirthschaftlichen Gilterlehre, Kritische Studie
[91] Émile de Laveleye [1872] De lapropriete et des ses formes primitives
[92] Société d'Économie Politique [1885]Des fondements du droit de propriété
[93] R. Faucci [1967] Revisione del marxismo e teoria economica della proprieta in Italia, 1880-1900: Achille Loria (e gli altri)
[94] Ibid 170
[95] For more details: M. Gelter and K. Grechenig, 'Juristischer Diskurs und Rechtsökonomie' (2007) 15(1) Journal für Rechtspolitik 30 and K. Grechenig and M. Gelter,'The Transatlantic Divergence in Legal Thought: American Law and Economics vs. German Doctrinalism' (2008) 31(1) Hastings International and Comparative Law Review 295. Both these papers have referred to works by Kleinwächter, Mataaja, Menger, and Steinitzer on economic analysis of law.
[96] V. Mataaja, *Das Recht des Schadenersatzes vom Standpunkt der Nationalökonomie* (Verlag Von Duncker & Humblot 1888)
[97] Pearson (n 79) 144
[98] Mackaay (n 62) 7

2.2.2 'Modern' EAL approach

The current law and economics movement can be traced back to as early as 1957. Several events resulted in breaching the traditional EAL boundaries. One of the chief influences was Gary Becker's doctoral dissertation[99] which attempted to analyse non-market behavior using economic tools, which in later years was extended to the economics of markets for influencing crime[100], family[101], human capital[102] and irrational behavior[103]. However, it was only after he was awarded a Nobel Prize in 1992 that his contribution was finally acknowledged by the economists. During the same period, a number of other studies[104] were published which contributed towards the transition from the old approach to the modern EAL (for instance, Scott Gordon's publications[105] on the economics of common property management which laid down the foundations of environmental economics[106]).

However, from an institutional perspective, the basis of the modern EAL approach was laid down in the 1940s and 50s at the University of Chicago.

The Chicago School

The Chicago group's approach to EAL involved conducting empirical research and generating testable outcomes for different legal hypotheses[107]. The Chicago School's philosophy was that simple market economics could be employed to elucidate all fields of human and institutional activities. It includes applying rational maximizing behavior in determining the way people and

[99] G. S. Becker, '*The Economics of Discrimination'* (University of Chicago Press, 1957) 9
[100] Refer to (n 78)
[101] G. S. Becker, *'A Treatise on the Family'* (Harvard University Press, 1981) 5
[102] G. S. Becker,'*Human Capital - A Theoretical and Emplrlcal Analysis with Special Reference to Education*' (National Bureau of Economic Research, 2nd edn, 1975) 14
[103] G. S. Becker, 'Irrational Behavior and Economic Theory', (1962) 70 Journal of Political Economy 1
[104] A. Downs, '*An Economic Theory of Democracy*' (Harper and Row, 1957); Charles M. Tiebout,'A Pure Theory of Local Expenditures'(1956) 64 Journal of Political Economy 416
[105] H. Scott Gordon, 'The Economic Theory of a Common Property Resource: The Fishery' (1954) 62 Journal of Political Economy 124 and H. Scott Gordon, 'Economics and the Conservation Question' (1958) 1 Journal of Law and Economics 110
[106] Mackaay (n 62) 73
[107] Ibid 72

institutions would respond to changes in their environment and also applying the concept of economic efficiency for constructing proposals for legal reform[108].

The Chicago Law School's association with economics was initiated by the appointment of an American economist, called Henry Simon, as a faculty member. He was succeeded by Aaron Director in 1949[109]. Director firmly believed in transdisciplinary research and hence encouraged EAL discussions both inside and outside of the class, especially in anti-trust law. He was also the first editor of the *Journal of Law and Economics*. He also found support at the Department of Economics in Chicago from the likes of George Stigler, Frank Knight and Milton Friedman. Director's efforts led to a variety of legal studies with direct economic implications, especially in corporate law, bankruptcy, public utility regulation, labour law, income tax and tort law[110].

Acceptance of the 'Modern' EAL approach

In the 1960's, three influential articles[111] encouraged economists to employ the EAL methodology in legal fields where traditional economic considerations were not central. The first was Ronald Coase's article '*The Problem of Social Cost',*[112] which was published in 1960 and drew attention towards the concept of 'transaction costs'. This article encouraged research using economic methods in legal fields where application of economic principle was not obvious[113]. Since then, the concept of 'transaction costs' has been extended to the operation of governments and in the context of regulations. The second influential article[114] of this period was by Alchian on the underlying principle of property rights. It examined the difference between private and public property rights by considering them as economic variables and modifying them to understand their individual effects. The third fundamental article of this period, which influenced the modern EAL approach, was written by Guido Calabresi on tort law. This paper[115] attempted to formulate a

[108] Veljanovski (n 45) 16
[109] Ibid 71
[110] Mackaay (n 62) 8
[111] Ibid 74
[112] R. H. Coase, 'The Problem of Social Cost' (1960) 3 The Journal of Law and Economics 1
[113] For instance, see Martin Gelter and Kristoffel Grechenig,'History of Law and Economics' (2014) Preprints of the Max Planck Institute for Research on Collective Goods Bonn 2014/5; Harold Demsetz, 'When Does the Rule of Liability Matter?' (1972) 1 Journal of Legal Studies 13
[114] A. A. Alchian,'Some Economics of Property Rights' (1965) 30 Il Politico 816
[115] G. Calabresi, 'Some Thoughts on Risk-Distribution and the Law of Torts' (1961) 70 Yale Law Journal 499

model in tort law which considered both the cost of the damage incurred and the cost of administering the system.

Although many economists were inspired by these three articles to conduct research in torts, procedure and contracts[116], it was not until 1972 before EAL caught the lawyer's and legal scholar's attention following three events[117] . The first was the establishment of Henry Manne's institution, the 'Economics Institute for Law Professors', which conducted economics seminars especially catering to judges, lawyers and legal practitioners. The second was Richard Posner's publication of '*Introduction of the Economic Analysis of Law*[118]*'*. This book was written by a lawyer, especially for lawyers. It did not use any economic terminology and applied fundamental economic price theory to analyse legal doctrines across all fields of law, thereby making it accessible to the lawyers. The third was the founding of the *Journal of Legal Studies.* The existence of a law journal, catering to interdisciplinary academic research involving the EAL approach, provided an indication of this methodology's credibility, a much-needed substantiation for the lawyers. These three developments ensured EAL's arrival into the work of the legal scholars of the United States[119].

2.3 EAL in the US and Europe

The EAL approach has enjoyed a long-established tradition in the US, unlike in Europe. Although this approach has gained attention from European scholars, it has been narrowly incorporated into their research studies and has not been an integral part of the European academic curriculum.

[116] For instance, A. A. Alchian and H. Demsetz,'The Property Rights Paradigm' (1973) 33 Journal of Economic History 16; G. Calabresi,'The Decision for Accidents: An Approach to Nonfault Allocation of Costs' (1965) 78 Harvard Law Review 713; R. A. Posner, 'A Theory of Negligence' (1972) 1 Journal of Legal Studies 29; Richard A. Posner,'An Economic Approach to Legal Procedure and Judicial Administration'(1973) 2 Journal of Legal Studies 399; H. G. Manne,*'An Intellectual History of the School of Law*' (George Mason University, Rapport, Law and Economics Center, School of Law, George Mason University, 1993); N. Duxbury, '*Patterns of American Jurisprudence*' (Clarendon Press, 1995)

[117] Mackaay (n 62) 9

[118] Posner (n 77) 65

[119] Mackaay (n 62) 76

United States

The EAL approach in the US has contributed significantly not only to the legal academia but also towards the development of the country's legal system. This is evidenced from the fact that supporters of EAL have been appointed to the Federal bench. For instance, appointment of Judges Frank Easterbrook and Richard Posner at the Court of Appeals and that of Stephen Breyer and Antonin Scalia as Supreme Court Justices[120].

One of the underlying reasons for EAL approach enjoying a long-established tradition in US could be that American culture is synonymous with the individualism and autonomy of classic liberalism, which holds that citizens are self-interested. In fact, liberalism urges citizens to pursue their own targets and views. These features of American culture make the US a perfect environment for applying the EAL approach as key assumptions of the neoclassical economic analysis (i.e. individual, rational decision making) fit well with the ideology of liberalism and individualism. Also, the US has a common law system where the judiciary holds significant power in terms of evaluating legislation and striking down what might be unconstitutional, which permits American judges to be far more influential than their European counterparts. In fact, even when compared to European common law judiciaries, such as British judges, American judges are '*considered far more adventurous'*[121]. This relative power and flexibility of the American judiciary seem to have offered another opportunity for EAL to have prospered in the American legal system[122].

Furthermore, during the rise of EAL in the 1940s, the American legal academy faced a void of legal theory. During the twentieth century, the logic of legal formalism was replaced by the empirical demands of legal realism in America. Rather than deducing the logic of the law, scholars became increasingly concerned with documenting the reality of legal practice.

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[120]Veljanovski (n 45) 41

[121] R. D. Cooter & T. Ginsburg, 'Comparative Judicial Discretion: An Empirical Test of Economic Models' (1996) 16 International Review of Law and Economics 295; N. L. Georgakopoulos, 'Discretion in the Career and Recognition Judiciary' (2000) 7(1) The University of Chicago Law School Rountable 205 (These studies used comparative empirical analysis to establish that American judges exercise greater discretion than their European counterparts).

[122] K. G. Dau-Schmidt and C. L. Brun, 'Lost in Translation: The Economic Analysis of Law in the United States and Europe' (2006) Articles by Maurer Faculty Paper 213 602

In Arthur A. Leff's words:

> Once upon a time there was Formalism. The law itself was a deductive system, with unquestionable premises leading to ineluctable conclusions. …… Then, out of the hills, came the Realists. What their messianic message was has never been totally clear… they were much more interested in the way law actually functioned in society. There were men in law, and the law created by men had an effect on other men in society. The critical questions were henceforward no longer to be those of systematic consistency, but of existential reality. You could no longer criticize law in terms of logical operations, but only in terms of operational logic[123].

This decline in legal formalism paved the way for adoption of the EAL approach by legal scholars in 1940s. During this period, the American legal academy not only borrowed disciplinary perspectives from economics, but other disciplines as well. Moreover, legal scholarship is published in student edited journals in the US, implying that legal scholars are not required to convince their fellow colleagues, who may be deeply entrenched in their respective legal philosophies, of the EAL approach's significance[124].

Europe

Although the EAL approach has drawn the attention of European legal scholars, its impact on the legal environment has been relatively less, especially in the civil law countries, as evidenced by the existence of a limited number of journals dedicated solely to EAL in Europe[125]. Apart from the EAL approach not being included in traditional law courses in European universities, very few, if any, offer specialist courses on EAL[126]. Furthermore, this methodology is rarely used in European legal cases apart from antitrust cases and there are no comparable judicial appointments of scholars (generally, and particularly of law and economics) in Europe, as that in the US. Of the

[123] A. A. Leff, 'Economic Analysis of Law: Some Realism About Nominalism' (1974) 60 Faculty Scholarship Series. 2820
[124] Ibid 609
[125] Posner (n 77) 66
[126] In Germany, for instance in 1993 only four universities offered courses on the EAL approach. [T. Henne, 'Environmental Policy in Germany and the United States' (2003) 51 The American Journal of Comparative Law 207

common law countries in Europe, the EAL approach has been most successful in the United Kingdom (UK)[127].

United Kingdom

One of the potential reasons for the lack of popularity of the EAL approach in the UK as compared to that in the USA could be the fact that though the UK is a common law country, parliamentary sovereignty reigns there[128]. As a result, the legislature is comparatively stronger compared to the executive and the judiciary. Consequently, the judges only have a limited role in the interpretation of law, thereby reducing the scope of EAL's application by the British judiciary. With an unwritten constitution, there is much less scope for the British judiciary to declare any statute as unconstitutional[129].

On the other hand, as far as academia is concerned, UK follows a traditional method of legal education which dissuades transdisciplinary studies. Therefore, unlike their American counterparts, UK professors are unfamiliar with other disciplines which prevents them from adopting transdisciplinary approaches to teaching law[130]. Lastly, formalism did not suffer the same fate in Europe as in the US. Although European legal scholars do recognize that strict formalism is not an accurate way to view the development of law, it did not suffer a decline and there was no void created, unlike in US legal scholarship. There was therefore no need to borrow ideological perspectives from other disciplines. This, in turn, also ensured less flexibility amongst European legal scholars in adopting interdisciplinary methods in the application of law[131].

2.4 Economic Analysis of Environmental law (EAEL)

Environmental law is a non-systematic collection of statutes, regulations and decisional law. As it is rapidly evolving over time and is not based on any distinct common law doctrines in countries

[127] Dau-Schmidt and Brun (n 122) 611
[128] A.V. Dicey, *Introduction to the study of the Law of the Constitution* (10th ed. Macmillan and Co. 1959)
[129] Lesley Dingle and Bradley Miller, 'A Summary of Recent Constitutional Reform in the United Kingdom' (2005) 33(1) International Journal of legal information 72
[130] Dau-Schmidt and Brun (n 122) 615
[131] Ibid 615

like India, Ireland and UK, environmental law requires a theoretical framework for systematizing questions regarding the relevant law and policy[132].

What does environmental law scholarship entail?

To understand why environmental law lacks a theoretical framework, it is important to comprehend what environmental law scholarship entails. Fisher et.al [133] have defined environmental law as a subset of legal scholarship which includes a variety of interdisciplinary/transdisciplinary approaches for studying law. According to Feldman, legal scholarship '*is a conception which results from the application of the concept of scholarship to the special kinds of problems that are discovered in the study of laws and legal systems*[134]*.'* These 'special kinds of problems' are not required to be entirely legal in nature, but the focus should be analysis of the law, internal analysis of the law or in the context of law. The 'special kinds of problems' can also vary with research questions, disciplinary outlook and subject matter. The research questions, on the other hand, include organizing and categorizing the law, addressing policy or legal questions, etc[135].

Feldman further adds that the following conditions need to be satisfied for the existing scholarship to amount to legal scholarship [136]:

(1) Using methods of investigation and analysis which best suit the research question/s;
(2) The researcher should be open-minded, so as not to presume the desired result is the answer and use the methods only to verify it; and
(3) Publish the work for fellow scholars, students or the general public and permit it to be criticized and evaluated by others[137].

Therefore, environmental law scholarship is based on the above-mentioned conditions and the 'special kinds of problems' in the study of law/legal institutions are related to environment. However, it is important to note that environmental law scholarship can take several forms-

[132] J. Krier and R. B. Stewart, 'Using Economic Analysis in Teaching Environmental Law: The Example of Common Law Rules' (1980) 1(1) UCLA Journal of Environmental Law and Policy 13
[133] E. Fisher, Bettina Lange, Eloise Scotford and Cinnamon Carlarne, 'Maturity and Methodology: Starting a Debate about Environmental Law Scholarship' (2009) 21(2) Journal of Environmental Law 213
[134] D. Feldman, 'The Nature of Legal Scholarship' (1989) 52 The Modern Law Review 498
[135] Fisher et. al (n 133) 213
[136] Feldman (n 134) 503
[137] Fisher et.al (n 133) 216

jurisprudential, socio-legal or doctrinal. Also, environmental law scholarship is only a part of environmental law as a subject. It is crucial to understand that environmental law, as a subject, includes contributions from practitioners, administrators and legislators and that it has a completely different identity than that of environmental law scholarship and the corresponding academic discipline. Though environmental law and environmental law scholarship are interrelated, failure in differentiating between the two often results in ambiguous research studies. This usually occurs when scholars habitually overlook the fact that the accomplishments of environmental law scholarship are not directly dependent on environmental law's (as a body of law) success in upholding or attaining certain values/outcomes[138].

'Immaturity' of environmental legal scholarship

Regardless of the above-mentioned issues, it cannot be denied that environmental law scholars have produced notable legal scholarship. Despite this, environmental law scholars consider environmental law scholarship as 'immature' for numerous reasons[139]:

(1) *Incoherent as a subject*: One of the foremost reasons for environmental law scholars considering their discipline to be immature is the fact that environmental law as a subject is incoherent. This implies that environmental law has '*no single guiding logic, no overarching doctrinal framework or no constitutional grounding*[140].' This view is echoed by, among other, Westbrook [141] who said the following-'*Despite being a burgeoning area of practice, environmental law is not a discipline, because it lacks the professional consensus on a coherent internal organization of materials a discipline requires*[142]'.

(2) *Inferior quality*: Though the overall quality of the existing environmental law scholarship is excellent, one cannot deny that some of papers/articles of inferior quality do exist, even if these are few. Some of the studies are inferior simply because they are mislabeled as scholarship (for instance, informative commentary of environmental law aimed at practitioners). Further, there

[138] Ibid 217
[139] Fisher et.al (n 133) 218
[140] Ibid 219
[141] Other papers which have justified the reasons for considering environmental law scholarship as incoherent are: L. Heinzerling, 'The Environment' in P. Cane and M. Tushnet (eds.) *The Oxford Handbook of Legal Studies* (Oxford University Press 2003); S. Coyle and K. Morrow, *The Philosophical Foundations of Environmental Law: Property, Rights and Nature* (Hart Publishing 2004)
[142] D. A. Westbrook, 'Liberal Environmental Jurisprudence' (1994) 27(3) U.C Davis Law Review 619

exists a body of scholarship which can be categorized, in Feldman's[143] words, as '*resolutely single-minded pursuit of an end*' and '*dilettantism*'. Examples of the former category include impassionate commentaries which are justified by an impending environmental crisis or by the requirement to promote an ideology. These types of scholarship fail to deal with the actual legal and socio-legal issues faced by the courts, decision-makers or legislature. The latter category would include scholarship that comprises of everything labelled as 'environmental' or 'sustainable' without making an allowance for the fact that these concepts might mean different 'things' across different disciplines/contexts. For instance, the label 'precaution-spotting' is presumed to mean the same across jurisdictions[144].

(3) *Difficulties of environmental law scholarship*: As environmental law regimes are a complex amalgamation of non-legal regulatory principles, legal concepts and policy norms across different jurisdictions, studying environmental law therefore presents its own set of challenges. These range from limitations in the available methodologies to the eternal conflict of whether to treat environmental law questions as a distinct subject or as part of general legal issues. It must be kept in mind that environmental law as a research subject cannot be simplified to a single example, explanation or methodology.

Given the shortcomings of environmental law scholarship, Professors Findley and Farber have concluded:

> On one level, environmental law appears to be a hodgepodge of statutes, cases and regulations dealing with matters as diverse as automobile design, bottle deposits and dam construction. Seen at this level, the field changes so rapidly that meaningful analysis is almost impossible. At a much higher level, environmental law presents broad problems of social policy which may be analysed more usefully by economists and ecologists than by lawyers[145].

Therefore, despite all it's limitations, EAEL is one of the most powerful tools available for providing environmental law with a consistent organizing framework. As values are recognized in environmental law under regulatory statutes, EAEL permits quantification of outcomes

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[143] Feldman (n 134) 503

[144] E. Fisher, 'Precaution, Precaution Everywhere: Developing a "Common Understanding" of the Precautionary Principle in the European Community' (2002) 9(7) Maastricht Journal of European and Comparative Law

[145] Westbrook (n 142) 624

corresponding to those values and of the relevant impact of various factors on those outcomes. In effect, the quantitative tools of EAEL help in establishing the reality of what is happening in the sector or sectors to be regulated as well as in analysing interactions within that sector and between regulatory rules and outcomes. In addition, *'[b]eyond providing a provisional organizing framework, economic analysis serves as a useful pedagogical foil for identifying and dissecting values or considerations, other than efficiency, that are relevant to environmental law and policy.*[146] *'*

An example of the relationship between economics and environmental law

At times, even the production of an apparently beneficial good (such as, a pharmaceutical company producing medicines) can make some people worse off. For instance, it is undeniable that medicines benefit millions of people but the production of these medicines can potentially harm a third party by polluting their land, water or air. In economics, this phenomenon is termed as externalities[147]. Considering pollution as an externality, environmental economics assumes that the pharmaceutical company would not internalize their externality when they take decisions regarding the firm's production as the company (management) is not affected by the pollution produced. For instance, even if the production process of a particular medicine emits poisonous gases the company, unless bounded by law, would not invest in treatment facilities to ensure those gases are treated before emission. This is where environmental law comes into effect. In the absence of law, no polluter would ever internalize the pollution externality. Therefore, the economic goal of environmental law is to persuade the polluter to internalize the costs of pollution through a variety of legal instruments[148].

Example of using economic analysis in environmental law:

An example of how basic economic analysis can be used in answering simple legal questions [example, why regulations work better than liability rules (two of the traditional legal instruments)

[146] Krier and Stewart (n 132) 14

[147] For details refer to, B. Caplan, 'Externalities' (2008) The Concise Encyclopedia of Economics. Library of Economics and Liberty < http://www.econlib.org/library/Enc/Externalities.html> accessed 3 March 2017

[148] M.G. Faure, 'Economic aspects of environmental liability: an introduction' (1996) 4 European Review of Private Law 85; M.G. Faure, 'Economic Analysis of environmental Law: An Introduction' (2001) 7 Économie publique/ Public economics [En ligne] 127

for deterring pollution in certain circumstances?] has been provided by Michael G. Faure[149]. Existence of the following conditions ensures that regulation is superior in deterring environmental harm as compared to liability rules[150]:

a) *Information Asymmetry*: Information asymmetry is considered one of the reasons for market failure, and is also used as a justification for governmental intervention through regulation. One of the pre-requisites for efficient liability rules to deter environmental harm is perfect information (or the absence of information asymmetry) on accident risk, existing rules and effective measures taken to prevent accident. But according to Shavell[151], in reality, the parties, involved in causing the accidents, possess more information (information regarding the benefits and costs of the activities or knowledge about the optimal ways of accident prevention) on the accident risk than the regulatory body. As a result, regulations are more effective than liability rules in the presence of information asymmetry[152].

b) *Damages exceeding wealth*: If potential damages exceed the individual wealth of the injurer then optimal incentives are not provided by liability rules. The underlying cause for this is that the costs of care are directly affected by the magnitude of the expected environmental damages. It is assumed that in cases where the expected environmental damages exceed the individual wealth of the injurer, they consider the costs of those damages to be equivalent to their wealth. As a result, the potential injurer would take only as much care necessary to avoid environmental damages equal to their wealth, which could be lower than the care required to prevent the total accident risk[153]. This is an application of the principle which states that tort liability's deterrent effect only works when the injurer has to fully pay for the damages he/she causes[154].

c) *Lack of incentives*: Despite some activities resulting in considerable environmental damage, a law suit might never be brought to recover those damages. This usually occurs when the harm is thinly spread amongst many victims and, as a result, the damage incurred by each victim is very small. Therefore, they have no incentive to bring a suit which allows the injurer to escape

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[149] Ibid 127

[150] S. Shavell, 'Liability for Harm versus Regulation of Safety' (1984) 13(2) The Journal of Legal Studies 357

[151] Ibid 359

[152] Although, the assumption of information asymmetry would be reversed when certain risks are not completely appreciated by all the parties in an accident setting. In such a situation, it would assessed that whether for every activity information could be attained by the government or the parties involved at the lowest cost possible.

[153] Shavell (n 150) 360

[154] S. Shavell, 'The judgment proof problem' (1986) 6 International Review of Law and Economics 43

liability. For instance, if a river is polluted unlawfully by an injurer, though every individual of the population is affected by it but the environmental damage caused per person is so low that no one usually has any incentive to bring a suit. In addition, sometimes environmental harm takes a number of years to actually result in environmental damage (e.g., climate change). In such a scenario, the deterrent effects of liability rules are ineffective[155]. One remedy for this lack of incentives in liability rules is 'class action', which is used in USA particularly. 'Class actions' are one of the significant examples of how the EAL approach is utilised in environmental law[156].

Though the above discussion focuses only on the advantages of regulation over liability, liability rules do have certain benefits over regulations as determined by other EAEL scholars[157]. However, this study will concentrate only on the former given the data limitations.

2.5 Review of the literature on EAEL

Quite a few studies on environmental economics have addressed the significance of legal instruments[158] to reduce pollution[159].

The EAEL literature has mainly dealt with the role of common law and legal institutions in environmental policy to accomplish efficiency and redistribution goals[160]. This approach has been specifically utilised in analysing liability both in terms of its ability to provide incentives to avoid environmental damage (ex-ante) and its capacity to guarantee enough compensation to victims if

[155] Shavell (n 150) 363
[156] J. Langenfeld (ed.), *Volume 26 - The Law and Economics of Class Actions* (Emerald Publishing Limited, 2014); J. G. Backhaus, A. Cassone and G. B. Ramello (eds.), *The Law and Economics of Class Actions in Europe Lessons from America* (Edward Elgar Publishing, 2012)
[157] M. J. White and D. Wittman, 'A Comparison of Taxes, Regulation, and Liability Rules under Imperfect Information' (1983) 12(2) The Journal of Legal Studies 413; S. Shavell, 'A Fundamental Enforcement Cost Advantage of the Negligence Rule over Regulation'(2013) 42(2) The Journal of Legal Studies 275; S. Shavell, 'Corrective taxation versus liability' (2011) 101(3) American Economic Review: Papers and Proceedings 2011;
[158] B. Ackerman et al., *The Uncertain Search for Environmental Quality* (Free Press, 1974); W. Baumol and W. Oates, 'The Use of Standards and Prices for Protection of the Environment' (1971) 73 Swedish Journal of Economics 42; E. Eide and R. Van den Bergh (eds), *Law and Economics of the Environment* (Juridisk Forlag 1996)
[159] A. R. Germani, 'Environmental Law and Economics in US and EU: A common Ground' (2004) SOAS University of London Discussion Paper 45
[160] G. Calabresi, *The Cost of Accident* (Yale University Press 1970); S. Shavell, *Economic Analysis of Accident Law* (Harvard University 1987); W. Landes and R. Posner, *The Economic Structure of Tort Law* (Harvard University Press 1987)

the need arises (ex-post)[161]. In fact, one paper[162] has also tried to determine how costs determine the choice between prior regulation and post liability. One of the issues identified in this paper was that when an injurer's liability exceeds their wealth, additional liability does not deter them. Regulations on the other hand, are costlier to administer as these need to be tailored to specific situations and have to be used even when there is no injury. This paper further demonstrates that regulations and liability rules should be used together for pollution abatement[163].

Another paper[164] demonstrates how the choice between the different types of entitlements protected by the property rights, liability rules and rules of inalienability is determined by the relative costs of markets and courts for protecting the environment. The paper argues that there are two possible entitlements (i.e. whether a polluter has the right to pollute or whether the victim has the right to a clean environment) and two possible means of protecting those entitlements (i.e. liability rules or property rights) and then creates four possible scenarios out of the above to demonstrate why one method is preferred over the other. (This paper also exhibits the unity of law by showing that the same issues arises in completely different areas of laws (for instance, property, criminal and tort law).

Many studies have examined the effectiveness of environmental regulations specifically. In one of these studies,[165] a problem of enforcement has been recognized as a limitation of effective regulation[166]. Another study has attempted to formulate an optimal penalty structure, specifically for corporate environmental crimes[167].

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[161] Ibid 6

[162] S. Shavell, 'Liability for Harm versus Regulation of Safety' in D. A. Wittman (ed.), *Economic Analysis of the Law* (Blackwell Publishers 2003)

[163]Ibid 359

[164] G. Calabresi and A. D. Melamed, 'Property Rules, Liability Rules, and Inalienability: One View of the Cathedral' in D. A. Wittman (ed.), *Economic Analysis of the Law* (Blackwell Publishers 2003)

[165] S. Shavell, *Economic Analysis of Accident Law* (Harvard University 1987)

[166] K. Hawkins, *Environment and Enforcement* (Oxford University Press 1984); C. Russell, W. Harrington and W. Vaughan, *Enforcing Pollution Control Laws* (Resources for the Future 1986)

[167] K. Segerson and T. Tietenberg, 'Defining Efficient Sanctions' in T. Tietenberg (ed.), *Innovation in Environmental Policy, Economic and Legal Aspects of Recent Developments in Environmental Enforcement and Liability* (Edward Elgar 1992); A. Ogus and C. Abott, 'Pollution and Penalties' (Symposium on Law and Economics of Environmental Policy, University College London, September 2001) < http://www.cserge.ucl.ac.uk/Ogus_and_Abbot.pdf > accessed 17 May 2017; M.G. Faure and G. Heine (coordinators), 'Criminal Penalties in EU Member States' Environmental Law' [2002] (Maastricht European Institute for Transnational Legal Research, Maastricht University and Institute for Criminal Law and Criminology, University of Berne); For a detailed literature review, refer to Germani (n 159) 6

As discussed earlier, there are two ways in which law can internalize environmental risks- regulations and liability rules[168]. This thesis will concentrate on the former.

2.6 Environmental Regulation

What is Regulation?

Regulation and its various definitions have been discussed in Chapter 1. As mentioned earlier, for this thesis, we would consider Veljanovski's definition of regulation which he has characterized as 'statutory law'[169].

2.6.1 **Economic analysis of environmental regulations (EAER)**

The growth, nature and effects of regulations are dependent on the interaction between politics, law and economics. This is one of the underlying reasons why modelling regulations is difficult. Also, regulations are often a result of bureaucratic and political reasoning and, therefore, their effects are not easy to quantify or understand[170].

Theories of EAER

Veljanovski has attempted to model regulation under the following categories[171]:

Normative Theory of Regulation

The normative economic theory of regulation is based on the traditional economics of the market failure framework. Under this framework, regulation promotes public interest or efficiency and the government is responsible for the production of public goods such as law and order, defence and any other good that the market cannot supply. In economics, the policy benchmark is considered to be a perfectly competitive market [172] model. Any deviation from a perfect competition market indicates market failure. As externalities comprise one of the most prominent

[168] Faure (n 148) 128
[169] Veljanovski (n 45) 143
[170] Ibid 145
[171] Veljanovski (n 45) 145
[172] Perfect competition model is a market model which is based on the assumption that there exists a large number of firms producing identical goods to a larger number of buyers. This model also assumes that it is easy for new firms to enter the market and old firms to leave the existing market. Lastly, it assumes that sellers and buyers have compete information about the market conditions.

examples of market failure (discussed in detail above), regulation is therefore considered as a remedy for market failure.

However, use of government intervention through regulation to correct market failure has been criticized by some scholars.[173] In other words, an alternative view held amongst economists suggests that regulation is not an apt remedy for market failure. In fact, it was widely believed in the US during the 1980s that regulations have often caused market failure rather than responding to it[174].

Positive Theory of Regulation

Though the positive theory of regulation accepts that regulation should be in the public interest, it is not considered as an adequate motive. This theory employs the conceptual framework of economics to model regulation so as to predict the effects and forms of regulations in practice. Usually, these models reveal that regulation is inefficient given its demand and supply in the '*political market of legislation*'[175]. One of the main features of this model of regulation is that it is able to explain regulatory processes through employing market concepts of supply and demand to a political or legislative framework.

The methodology of employing models by generating a set of testable predictions, which can be established by empirical evidence, is one that lawyers find incomprehensible. The main criticism directed at these models is that they are too simplistic and, as a result, are not able to capture the complexities of the legal phenomena in question. This is usually aimed at the unrealistic assumptions of the models formulated (the four-step process of model formulation is explained in detail above). In response, economists contend that models by their nature are unrealistic. They are mere abstractions and not a perfect description of reality. Therefore, it is not the model's

[173] J. Kay and J. Vickers, 'Regulatory reform in Britain' (1988) 3(7) Economic Policy 285

[174] For instance, '*By the early 1970s the overwhelming majority of economists had reached consensus on two points. First, economic regulation did not succeed in protecting consumers against monopolies, and indeed often served to create monopolies out of workably competitive industries or to protect monopolies against new firms seeking to challenge their position. Second, in circumstances where market failures were of enduring importance (such as environmental protection), traditional standard-setting regulation was usually a far less effective remedy than the use of markets and incentives (such as emissions taxes or tradable emissions permits).'* R. G. Noll, 'Regulation after Reagan' [1988] 3 Regulation 20.

[175] Veljanovski (n 45) 147

assumptions which need to be verified but instead whether it demonstrates precise predictions of the existing relationships between the variables[176].

2.7 Application of EAL in this study

This study will use the positive theory of regulation for understanding the effect of regulatory quality on water pollution in India and China.

This study attempts to quantify legal rules and the effectiveness of institutions by employing appropriate proxies[177] and then quantitatively analyzing the correlation between these proxies and economic variables. This method allows us to focus on a more narrowly defined subset of rules (in this context, regulatory quality of water pollution, government effectiveness and rule of law). It should be noted that this quantitative analysis is not superior over other qualitative analysis but, instead, it helps in analysing the same issue from a completely different perspective by helping one to quantify the correlation between the concerned variables which further allows one to formulate the appropriate policy recommendations.

2.7.1 **The process of formulating models**

The models employed in this study are ad-hoc models where the variables have been selected after a thorough review of the existing literature.

To understand '*de jure'* regulatory stringency, ex-ante aspects of decision-making are usually considered, which include analyzing the existing environmental legislation. However, focusing solely on de jure environmental measures, such as, the legislated levels of emission standards for certain industries, fails to consider the intensity of actual regulatory enforcement[178]. This is because environmental regulation in developing economies might only amount to a paper tiger and, when applied in practice, it might face considerable institutional and structural barriers[179].

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[176] C. G. Veljanovski, 'The Economic Approach to Law: A Critical Introduction' (1980) 7(2) British Journal of Law and Society 158

[177] Proxies or a proxy variable is a variable that is not in itself directly relevant, but that serves in place of an unobservable or immeasurable variable. In order for a variable to be a good proxy, it must have a close correlation, not necessarily linear, with the variable of interest

[178] C. Carraro et.al, 'Environmental Policy and Technical Change: A Survey' (2010) 4(2) International Review of Environmental and Resource Economics 163

[179] Green Growth Knowledge Platform (GGKP), 'Measuring Environmental Action and Economic Performance in Developing Countries' [2015] Working Paper 01 <

'*De-facto'* stringency, on the other hand, considers the ex-post aspects. That is, once the environmental legislation is in place, how strictly is it being enforced and the measures adopted to enforce it. The enforcement measures can range from advisory forms involving cooperation from local government and media to the amount of money invested by the government[180]. As both 'de jure' and 'de-facto' aspects are crucial in understanding how a jurisdiction deals with its environmental issues, this study has considered variables of both kinds and formulated two models accordingly.

Model 1 is formulated to determine the impact of each river pollution control regime (RQ, RL and GE) on pollution abatement. In this model, at time 't' and in state 'i[181]', river pollution (waterpoll) is expressed as a function of the regulatory quality (RQ), government effectiveness (GE) and rule of law (RL)[182]. In addition, a few other variables (for instance, Y1, Y2, etc.) have also been added for each case study, as applicable (within reason). The model is expressed as follows:

$$waterpoll_{it} = \beta_0 + \beta_1 RQ_{it} + \beta_2 GE_{it} + \beta_3 RL_{it} + \beta_4 Y1_{it} + \beta_5 Y2_{it} + u_{it}$$

where, u is the error term.

The aim of this model is to establish a correlation between the concept of 'regulatory quality' and the results in terms of pollution abatement. The coefficients of the $\beta's$[183] help quantify the exact relationship between the dependent variable (waterpoll) and the independent variables (RQ, GE, RL, Y1, Y2).

Model 2 is formulated to comprehend the impact of the river pollution control regime's regulatory quality on the decision-making of the institutions/public at large. In this model, the regulatory quality (RQ) is taken as the dependent variable (DV). The independent variables (IVs) were case

https://sustainabledevelopment.un.org/content/documents/2096GGKP_Trade_Measuring_Environmental_Action.pdf >

[180] Ibid 4

[181] In the River Ganges case study, as panel data was used therefore it included states 'i', in the other cases that is, in China and India's case as a time series data was used, therefore it include only at time 't'.

[182] Different case- specific proxies were also considered for each case study site

[183] β' s in econometric equations usually represent the strength of the relationship between the dependent and the independent variables. For instance, in model 1, β_1 represents the mathematical relationship between RQ and water pollution, that is, by how many units or how much percentage water pollution will increase or decrease with one percent or one unit increase in RQ.

specific and different for each case. To explain how the model can be expressed, the IVs are taken as Y1, Y2 and Y3. The model is expressed as follows[184]:

$RQ_{it} = \beta_0 + \beta_1 Y1_{it} + \beta_2 Y2_{it} + \beta_3 Y3_{it} + u_{it}$

where, u is the error term.

Selection of variables in the econometric model

The variables and proxies for RQ, RL and GE are case specific. Therefore, they are mostly different for each case study. The variables and proxies in each of the studies have been selected after a thorough review of the existing literature.

Quantifying RQ, GE and RL

The process of quantifying the quality of legal rules and effectiveness of institutions raises the question of whether correct proxies have been selected and whether this may result in measurement errors. However, it should be noted that the criterion for formulating such models is not whether the legal measure/institutional measure is accurate and detailed, but whether the model is capable of detecting the existing correlation between the variables, given the available information. In fact, it is well established that research models should not consider tangential information and if there exist minor inaccuracies in the model they should be ignored, provided it does not affect the main hypothesis[185].

Quantitative methods are inevitably required when analysing information from large samples, especially in comparative studies. That is because qualitative methods would not be efficient in such huge samples. The hypothesis is probabilistic, instead of deterministic, in comparative studies and hence verifying it requires calculating the given data's average. For instance, if one needs to analyse whether legal investor protection in UK encourages financial market development a qualitative study can indicate that it is not a necessary condition because the country's financial market developed up to the middle of twentieth century without any such protection. But

[184] Ibid

[185] G. Hadfield, 'The Strategy of Methodology: The Virtues of Being Reductionist for Comparative Law' (2009) 59 University of Toronto Law Journal 223 ; H. Spamann, 'Large-Sample, Quantitative Research Designs for Comparative Law?' [2009] John M. Olin Center for Law, Economics and Business Fellows' Discussion Paper Series No. 32

quantitative studies might show that, despite this evidence, a financial market thrives, on average, more in the presence of better legal investor protection, which would aid policy makers in deciding what resources need to be allocated for improving the concerned rules. Secondly, conducting a quantitative study would also help to quantify the effect of the presence of legal investor protection on financial markets. In addition, there are other factors which affect the financial market (such as distribution of wealth or national growth rate), and quantitative methods assist in separating the effects of these factors from that of legal investor protection. Quantitative methods acknowledge the simple relationships between non-binary factors, besides assessing the patterns in such data. In turn, this helps in quantifying the existing relationship between two variables[186].

Quantifying law or legal rules is certainly not easy and, in reality, the likelihood of creating sensible measures of legal concepts is controversial. However, one cannot deny that quantitative methods are widely used in social sciences and measures are also formulated for such goods as culture or welfare with very fruitful results. Statistics argues that the numerical measures (or proxies) need not always be perfect, as long as unbiased results are obtained.[187] Therefore, one may hope that though numerical legal measures might be imprecise, the results obtained may help in identifying the underlying issues of regulatory quality and institutional effectiveness of the selected river pollution regimes and, in turn, may assist in identifying precise policy recommendations.

As explained in detail in the previous chapter, EAL contributes to legal analysis by emphasizing the unintended or undesirable consequences of existing or proposed Laws. Therefore, it is useful for the purposes of this thesis.

The following chapter involves analyzing the regulatory quality of GAP at the level of Indian States with the aid of two econometric models, as discussed in Chapter 2.

[186] Ibid 9
[187] Ibid 9

Chapter 3: Effective environmental protection and regulatory quality: A case study of Ganga Action Plan (GAP)

3.1 Introduction and Background

3.1.1 **Ganges**

The Ganges or Ganga (as it is locally referred to in India) is one of the most important river systems in the world. It is the fourth largest river basin in the world, covering an area of 861,404 square kilometers. The basin is home to half a billion people (approximately one tenth of the world's population), which is projected to increase to over one billion by the year 2030[188]. It supports 29 Tier-1 cities, 23 Tier- 2[189] cities and 48 towns in India. This river basin provides more than one-third of India's surface water and over forty per cent of the country's GDP is generated in this region. Ironically, this fertile region is also home to the poorest sections of India's population, with more than 200 million people living below the poverty line[190].

Apart from its economic and social importance in India, the Ganges also holds religious significance. Regarded as sacred by Hindus (according to 2011 census data on India, 79.8 per cent of India's population are Hindus), this river is personified as a 'Goddess' in ancient texts and art. Ritual bathing in the Ganga is an important aspect of the Hindu religion and ashes of the cremated are often spread over its waters[191]. The Hindus also believe that Lord Shiva purifies the Ganga and that it has the power to self-cleanse. Scientifically speaking, the Ganga has a reasonable self-purifying capability due to fairly high Dissolved Oxygen (DO) levels[192]. However, given the sheer

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[188] A. Markandya and M.N Murty, 'Cost–benefit analysis of cleaning the Ganges: some emerging environment and development issues' (2004) null Environment and Development Economics 61

[189] The Reserve Bank of India (RBI) classifies centres (city/towns/ village) into 6 tiers based on population (as per 2011 census). Tier 1 corresponds to cities with a population of 1, 00,000 and above. Centres with a population of 50,000 to 99,999 are classified as Tier 2 (https://rbidocs.rbi.org.in/rdocs/content/pdfs/100MCA0711_5.pdf).

[190] World Bank, 'The National Ganga River Basin Project' (2015) < http://www.worldbank.org/en/news/feature/2015/03/23/india-the-national-ganga-river-basin-project> accessed 12 April 2016

[191] Ibid 1

[192] For further details, refer to: D. Mukherjee, M. Chattopadhyay and S.C. Lahiri, 'Water quality of the River Ganga (The Ganges) and some of its physico-chemical properties' (1993) 13(3) Environmentalist 199

extent of overuse and abuse of its waters over a prolonged period of time, it no longer sustains its self-purifying capability.

The Ganges is amongst the world's most polluted rivers. Nearly 1.3 billion litres of sewage, runoff from 6 million tons of fertilisers, 9000 tons of pesticides utilised in agriculture, 260 million litres of industrial and solid waste, including thousands of animal carcasses and human corpses are released into the river every day. This has inevitably led to an erosion of the river water quality to the extent that, by the 1970s, a stretch of over 600 kilometers of the river was ecologically dead. Furthermore, people living along the river use the Ganga water for drinking, religious bathing and other household purposes, posing a considerable public health threat[193].

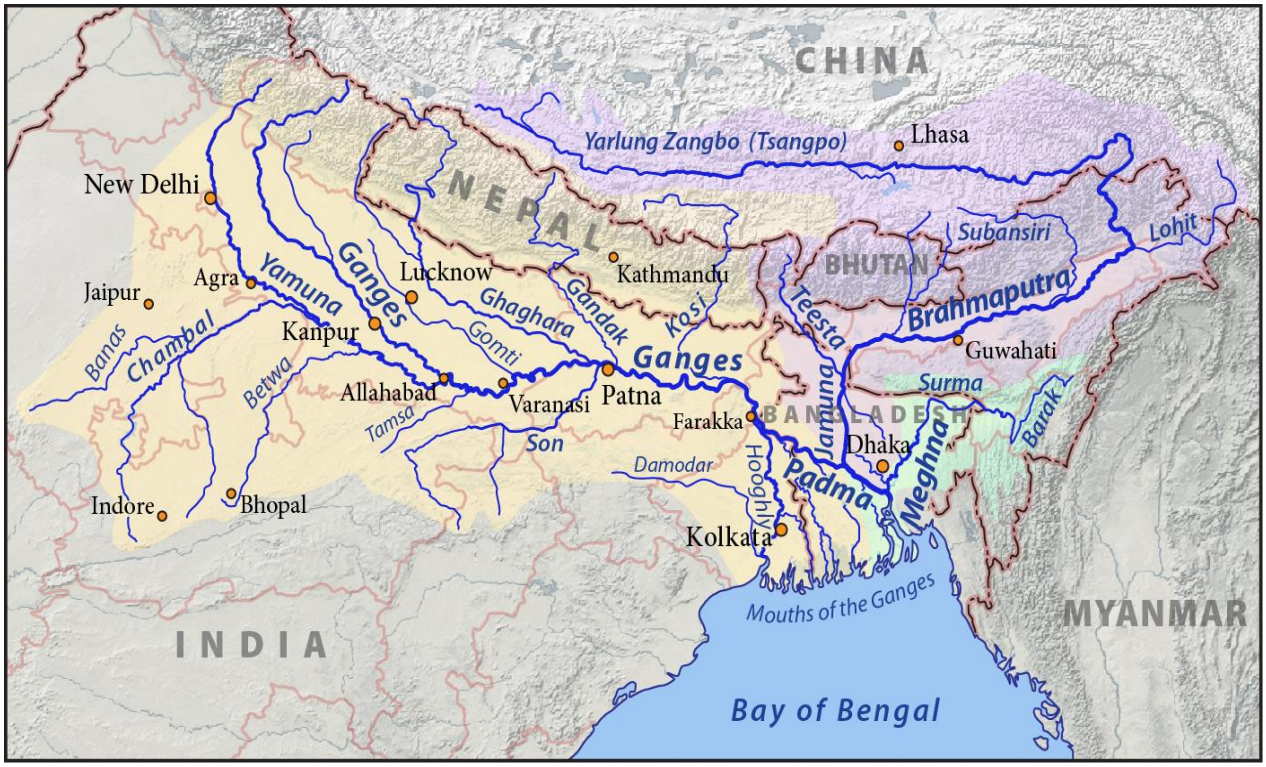


Figure 3.1. The Ganges river course in India (source: South Asia Network on Dams , River and People)

To understand why Ganges water quality deteriorated during the 1970's, it is important to review India's progress in environmental management over time.

[193] Markandya and Murty (n 188) 62

3.1.2 **Progress of environmental management**

Immediately after India's independence in 1947, the federal policies concentrated solely on promoting heavy industrialization and, later in the 1960s, the focus shifted to agricultural policies. However, during this entire period, policies and regulations for environmental quality were non-existent which encouraged industrial and agricultural processes that were unfavorable for ecosystems. This led to significant decline of the Ganga River water quality in the 1970s.

The Water (Prevention and Control of pollution) Act of 1974 was the first act introduced in India explicitly for the environment in pursuance of clause (1) of Article 252[194] of the Constitution. It was followed by the Air Act in 1981 and the comprehensive Environment (Protection) Act in 1986. In September 1974, the Central Board for Prevention and Control of Water Pollution, now known as Central Pollution Control Board (CPCB), was established as a statutory organization under the Water (Prevention and Control of Pollution) Act, 1974 and was also entrusted with the regulatory powers and functions under the Air (Prevention and Control of Pollution) Act, 1981. Furthermore, the Department of Environment (DOE) was established in 1980 to evaluate the environmental aspects of development projects, to monitor air and water quality, to promote environmental research and to coordinate activities between the federal, state and local governments[195].

Although India does not yet have a comprehensive legislative framework for water management[196], a national water policy has been adopted on three different occasions. The first one dates back to 1987. Ideally, a national water policy should have paved the way for the adoption of legislation by the Parliament. Instead, the process has, in practice, remained entirely driven by the executive. Although this provides more flexibility in adapting to new circumstances, it also

[194] Article 252(1) gives the power to the States to make Laws for the matters regarding which the Parliament has no power to make the laws except as provided in the Articles 249 and 250 should be regulated in such states by Parliament by law. If resolutions are passed by all the House of legislatures by those states, it would be lawful for Parliament to pass an Act for regulating that matter accordingly. Any Act so passed would apply to any other states by which it is adopted afterwards by resolution passed in that behalf by the House or the two Houses of that state.
[195] S. Managi and P.R. Jena, 'Environmental productivity and Kuznets curve in India' (2008) 65(2) Ecological Economics 432
[196] In the context, where water is a state subject state legislative assemblies should adopt a framework for water legislation, that has not been done so far.

bypasses the various safeguards that the '*constitutionally established process for the adoption of legislation provides'*[197].

With a shift in India's policy regime towards promoting privatization during the 1980s, the environmental quality deteriorated further. The DOE failed to function efficiently due to lack of political and financial support against the influential private actors. Therefore, the Ministry of Environment and Forests (MoEF) was set up to curb pollution. Despite MoEF's efficient monitoring system, lack of enforcement capabilities at the Central (Federal) and state levels and ineffective coordination amongst Ministries and institutions deterred satisfactory control of environmental pollution (Economic Survey of India, 1998-99)[198].

3.1.3 **Creation of the Ganga Action Plan (GAP) and its different phases**

The deteriorating water quality of the Ganges prompted the CPCB to conduct a survey under the direction of the DOE in order to guage the extent of Ganges water pollution. Based on this survey, the GAP was formulated in 1985 as a centrally sponsored scheme. This massive river program was designed with the objective of controlling pollution in the Ganges and its tributaries. During the same year, the Central Ganga Authority (CGA) was set up within the DOE. It was responsible for the GAP's implementation along with establishing its future policies and programs. The GAP was introduced with the objective of restoring the entire river's water quality to 'Class B' or the 'Bathing Class'[199](for reference, see Table A.1 in appendix).

The GAP was launched in three phases, namely GAP Phase I, GAP Phase II and Mission Clean Ganga (referred to as Phase III here). The initial objective of this river action plan was to establish sewage treatment plants in major urban centers, refurbish existing sewage pumping and treatment stations and install wastewater sub-pumping stations. Later, after the Ganges was declared to be

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[197] P. Cullet, 'Water regulation and public participation in the Indian context' in Mara Tignino and Komlan Sangabana (eds), *Public Participation and Water Resources Management- Where do we stand in International Law?* (Paris: UNESCO, 2015)

[198] G. Mythili and S. Mukherjee, 'Examining Environmental Kuznets Curve for river effluents in India' (2011) 13(3) Environment, Development and Sustainability 627

[199] V. Tare, B. Bose and S.K Gupta, 'Suggestions for a Modified Approach Towards Implementation and Assessment of Ganga Action Plan and Other Similar River Action Plans in India' (2003) 38(4) Water Quality Resource Journal Canada 607

India's 'National River' in 2009, the GAP was relaunched with the objective of implementing a river basin approach instead[200].

3.2 GAP Phase I

3.2.1 Legal Framework[201]

In 1985, the MoEF set up the Central Ganga Authority (CGA) to oversee implementation of the GAP. As mentioned above, the CGA's objective was to improve the water quality of the Ganga and its tributaries to acceptable standards through mobilizing state governments, local bodies, voluntary agencies and other organizations interested in this task. The CGA was under the Chairmanship of the Prime Minister of India[202].

In the latter part of 1985, the apparent ineffectiveness of the efforts to clean up the Ganga under the Plan prompted M.C Mehta, an environmental activist, to file a petition[203] against the public authorities under Article 32 of the Indian Constitution[204]. The petition claimed that, despite the strides made in the legal code with respect to the GAP, the government authorities failed to take effective steps to prevent pollution. The Court ordered the Central (Federal) Government, Uttar Pradesh Pollution Control Board and the District Magistrate (Kanpur) to restrain leather tanneries and Kanpur's[205] municipal corporation from dumping industrial and domestic effluents in the river Ganga.

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[200] River Basin Approach is an integrated water resources management approach. This concept involves promoting changes in practices which are considered fundamental to improved management of the river water. For instance, in the case of river Ganga, apart from managing industrial and sewage discharge, efforts would be made for conservation of aquatic life and biodiversity, promoting tourism and shipping in the river basin, restoration and conservation of wetlands etc.

[201] It has been very difficult to trace the GAP's legal framework. The reason for this is not only a non-existent literature for the same, but also the fact that the GAP does not have a well-defined legal basis, which has been explained in detail, quoting evidences for the same.

[202] The Gazette of India(16 February, 1985)

[203] M.C Mehta v Union of India & others [1988] AIR 1115 (SC)

[204] Article 32(i) of the Indian Constitution allows an aggrieved person to move the Supreme Court for a legal remedy in case of an alleged infringement of his fundamental rights. In such a scenario the Court protects his/her fundamental rights with the aid of the constitutional weapon 'writs'. However, clause (4) mentions an exception. If the President proclaims an emergency under Article 352 of the Constitution the provision for guaranteed remedy of fundamental rights is suspended. [N.B Rakshit, 'Right to Constitutional Remedy: Significance of Article 32' (1999) 34(34) 2379

[205] The largest city in the state of Uttar Pradesh

This case is the most significant water pollution litigation in the history of Indian environmental law. The petition was bifurcated into two parts by the Court, namely Mehta I and Mehta II. The first dealt with Kanpur tanneries and the second with the Municipal Corporation. Eighty-nine respondents were named in the petition, which included not only the tanneries of Kanpur city, but also the Union of India, the Chair of the CPCB, the Chair of the Uttar Pradesh Pollution Control Board (UPCB) and the Indian Standards Institute (ISI)[206].

Treating this case as a representative action during its preliminary hearing, the Supreme Co directed, by publishing a summary of the petition in the newspapers, that notice be given to all the industrialists, municipal corporations and town municipal councils in the jurisdictions through which the river flows. The newspaper petition also instructed the defendants to appear before the Court to explain why untreated sewage was being released in the Ganges. Following this, numerous industrialists and local authorities (Kanpur Nagar Mahapalika) appeared before the Court and filed counter-affidavits[207].

The Court found that the pollution and its impact on public health outweighed the inconvenience that might be faced by the management and labour employed in the polluting tanneries should they be shut down. As a result, all those tanneries which failed to take the minimum steps required for primary treatment of industrial effluents were closed. The Kanpur Nagar Mahapalika (Municipal Authority) was also instructed to relocate polluting dairies outside the city. The local bodies were ordered to build a sufficient number of latrines to prevent people from defecating near the river. Furthermore, the Central (Federal) Government was instructed to introduce weekly classes on the importance of the protection and improvement of the natural environment across all educational institutions in India[208].

One thing which is worth noting in this case is that it was filed under Article 32 of the Indian Constitution and not under the CGA legislation. This clearly points towards a weak legal basis for the GAP from the very beginning.

[206] A.K Singhal, 'Some Legal Cases on Ganga River Pollution' (2012) 4(2) Researcher 61
[207] Auburn University, *The Enviro-Litigators: Environmental Law and Activism in India (*2015)
[208] M.C Mehta v Union of India [1999]

3.2.2 **Institutional Structure**

The CGA was formed with the Prime Minister of India as its Chairman and the Government of India represented by the Ministers of Finance, Planning and Urban Development, Water Resources and Environment and Forests. The states were represented by the Chief Minsters of the three states through which the river Ganga flows[209]. The implementing agency was the Central Steering Committee which had the Secretary of the Ministry of Environment and Forests (MoEF) as Chairman and the Secretaries of other relevant central ministries as its members, including the three chief secretaries of the corresponding three states through which the river Ganga flows. The executing agencies were the respective State Public Health Engineering Departments who had previous experience of implementing similar schemes. Implementation of GAP (Phase I) began in 1986 with city-based schemes and, five years later, an extensive review of progress was conducted[210].

From the beginning, there was a dispute between the states and the Centre regarding who would bear the cost of the Plan. In India, as water is a state property, the state is responsible for the protection of its water resources. But since the Ganga is an inter-state river, the Central Government, along with the state government, has a concurrent responsibility for its clean up. Therefore, to make the river action plan's implementation acceptable to the state governments, the Central government decided to bear the entire implementation cost (which excludes the maintenance costs)[211]. GAP Phase I was launched at an estimated cost of 37,320,800 US Dollars (at the current exchange rate; 2500 million Indian Rupee) for the first ten years.

Table 3.0-1 Central Ganga Authority (CGA) organizational structure[212]

S. No.	Body	Functions	Chairman	Members
1.	Central Ganga Authority(CGA)	Policies, programs, approval and review	Prime Minister	Central Ministers of Finance, Planning, Urban Development, Water Resources and Environment and Forests

[209] Before 1998, the state of Uttarakhand was merged with the state of Uttar Pradesh. In the year 2000, Jharkhand was carved out of the state of Bihar.
[210] N. Chaudhuri, 'Cleaning of the river Ganga: Planning,Methodology and Progressive Implementation' (*Managing Water Resources for Large Cities and Towns - Report of Beijing Water Conference* ,1996)
[211] Ibid 399
[212] Source: MoEF, 1985

				Chief Ministers of the states through which river Ganga flows
2.	Steering Committee	Fund allocation and programme formulation	Central Secretary of Environment and Forests	Central Secretaries of Finance, Planning, Urban Development and Water Resources Chief Secretaries of states through which river Ganga flows Specialists in social science, environment engineers and economics
3.	Implementing agencies	State level executing agencies	Execution of schemes	Public Health Department and Urban Development Department
4.	Ganga Project Directorate(GPD)	Served as Secretariat to the CGA and Apex Nodal Agency for implementation, coordinating different ministries involved and administering funds, supervising the state level executing agencies		

3.2.3 **Outcomes and Difficulties**

Besides lacking a legal framework, the GAP also faced certain institutional issues. There was a clear lack of planning in the first phase of the GAP. For instance, schemes were prepared without any appropriate survey of the locations, along which the intercepting sewer would be laid. Sewage loads were also not estimated correctly which resulted in installation of more sophisticated systems than required. This in turn resulted in implementation delays and cost escalations. Moreover, the plan did not concentrate on treatment and resource recovery systems. There was no emphasis on the maintenance and proper operation of the assets, or on training of personnel for this purpose. Maintenance requires annual recurring expenditure but no provisions were made for this in the annual budget[213].

[213] Ibid 399

3.3 GAP Phase II

The second phase of GAP was introduced to include other cities and towns through which Ganges flows, which were not previously included in GAP I. GAP Phase II was launched in stages between 1993 and 1996. Pollution abatement programs for important tributaries of the river Ganga, such as the Yamuna, the Gomati and the Damodar, were also integrated in the second phase of GAP. Later in 1995, river action plans for other major rivers (for instance, Godavri, Krishna, Mahanadi, Mandakini, etc.) were subsequently launched under the National River Conservation Plan (NRCP). GAP Phase II and NRCP were merged on December 5, 1996[214], following which the NRCP was introduced and sponsored by the Central (Federal) government. Under NRCP, the CGA was renamed as the National River Conservation Authority (NRCA) and it came to cover all the programs supported by the National River Conservation Directorate (NRCD)[215].

3.3.1 **Legal Framework**

Though GAP Phase II was launched after making modifications in the earlier phase of the GAP, it was probably not any more efficient than the previous plan and therefore did not lead to any improvement in the water quality of the Indian rivers. This is evidenced by the fact that Gopeshwar Nath Chaturvedi, a social activist, filed a petition[216] under Article 32[217] of the Indian Constitution in 1998 against the Government of India, the State Government of Uttar Pradesh and municipal bodies of Mathura and Vrindavan for failing to clean up the river Yamuna under GAP Phase II. It is currently an ongoing case before the High Court of Allahabad, Uttar Pradesh. The petition claims that, despite the Uttar Pradesh Jal Nigam (local water authority) spending an enormous amount of money (30155021 USD at the current exchange rates) in Mathura and Vrindavan,[218] the authority has failed to clean up the river. As a matter of fact, the directions issued by the Supreme Court in the Mehta cases[219] regarding setting up of sewage treatment plants by the municipalities were also

[214] Ministry of Environment and Forests (MoEF), *Regeneration and Development* (2003)
[215] NRCD is the implementing agency for Centrally sponsored schemes of NRCP and National Plan for Conservation of Aquatic ecosystem(NPCA)
[216] Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others [1998] WRIT 1644
[217] Refer to n 204
[218] Cities in the state of Uttar Pradesh. Mathura city has a lot of small scale saree (Indian traditional female garment) dying units which discharge highly toxic untreated waste in the river.
[219] Refer to (n 204)

not followed up even though more than ten years have passed since the issuance of court orders. After the filing of this petition, a Supreme Court order instructed MoEF to present a detailed report regarding which schemes were being implemented under GAP and, furthermore, which departments could be held liable for lapses in the GAP's implementation[220].

The above discussion illustrates that not only did the GAP have a vague legal framework, but it also lacked clarity about the roles of the various stakeholders involved in its implementation[221].

3.3.2 **Institutional Structure**

The Chairman of the Steering Committee for GAP Phase II was the Secretary of the Ministry of Forests and Environment (MoEF). Other members of the Committee included the chief secretaries of the states through which river the Ganga flows, the secretaries of the concerned Central (Federal) ministries, the Chairman of the CPCB, Directorate General Health Services, the Directorate General Indian Council of Medical Research (ICMR) and other experts[222].

At the state level, state governments and agencies were assigned with the responsibility of preparation and execution of projects related to treatment of municipal wastes. The Urban Development Department in the State of Uttar Pradesh was identified as the nodal department for this purpose. Other state government agencies were assigned with the preparation and execution of other individual schemes under the supervision of the nodal department. An inter-departmental committee was set up as well, with the convener as the secretary of that committee[223].

GAP Phase II's monitoring mechanism included a multi-tier monitoring system. At the state level, it included regular monitoring by a team of engineers and review of monthly progress by the implementing agency. At the Federal (Central) level, monitoring comprised of frequent site visits conducted by the NRCD and quarterly progress reviews by the Supreme Court and the Monitoring Committee[224].

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[220] Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh (n 216)
[221] Indian Institutes of Technology, *SWOT Analysis of Ganga Action Plan* (2011)
[222] R. K. Jaiswal, 'Ganga Action Plan: A critical analysis' (2007) < http://www.ecofriends.org/main/eganga/images/Critical%20analysis%20of%20GAP.pdf> accessed 13 February 2016
[223] Ibid 5
[224] R. K Jaiswal (n 222) 6

Despite the GAP having an elaborate institutional structure, the leadership and staff lacked commitment and vision towards cleaning the river Ganga. Although monitoring and review of the Plan were conducted regularly, the problems identified were never addressed and, even if they were, the decisions taken were never enforced. Furthermore, officials responsible for implementing the GAP at the lowest tier were often not kept informed about the future courses of action to be taken[225].

3.3.3 **Outcomes and Difficulties**

GAP Phase II has also been criticized for lack of planning and implementation. For instance, the operation of sewage treatment plants relied heavily on increased supply of electricity, even in cities/towns, which faced a shortage of electricity supply[226]. Selection of towns and cities was inconsistent and the funds were allocated on the basis of imprecise estimates of sewage loads[227].

The Plan also encountered administrative incompatibilities. Firstly, the decision making powers were under the district magistrates and Commissioners, whereas the jurisdiction for cleaning the sewers was under the municipal authorities, which led to conflict of interest between the two. Secondly, the respective state governments were not willing to cooperate with other states or the Central (Federal) government if they had different political parties in power[228]. Thirdly, despite multiple agencies being involved with the Plan, there was no single coordinating body with corresponding powers to give directions (as evidenced by the *Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh* case)[229].

Finally, the local government institutions were not included in the organizational structure of the GAP and neither were they consulted to assess their readiness for taking on the responsibilities in a timely fashion. As a result, due to lack of necessary human resources and on-site knowledge and training, the local governments were unable to ensure efficient implementation and monitoring[230].

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[225] Ibid 4
[226] V. Upadhyay, 'Ganga at Varanasi: Lessons from Environmental Abuse' (2009) 44(37) Economic and Political Weekly 64
[227] P. Das and K. R. Tamminga, 'The Ganges and the GAP: An Assessment of Efforts to Clean a Sacred River' (2012) 4(8) Sustainability 1647
[228] Ibid 65
[229] P. Singh, 'Bridging the Ganga Action Plan: Monitoring failure at Kanpur' (2006) 41(7) Economic and Political Weekly 590
[230] Das and Tamminga (n 227) 1648

Although the GAP on paper professed to be a 'people's program' including broad public participation, it was supported mainly for political expediency by exploiting the religious sentiments of the Hindus. People's participation was limited to infrequent 'ghat'[231] clean ups. Though the local governments/ Non-Governmental Organizations (NGO's) were expected to promote public participation they did not receive any financial support from the government for this purpose[232].

3.4 Namami Gange/Phase III

The Mission Clean Ganga was an initiative launched by the National Ganga River Basin Authority (NGRBA) from 2009 to 2014. With the change in the Central Government in 2014, Mission Clean Ganga was replaced in 2015 by Namami Gange, an integrated conservation mission. The estimated budget for this project is 30 trillion US $ (at current exchange rates). It is launched with a changed and comprehensive approach to overcome the challenges faced by the river Ganga in four different sectors namely, wastewater management, solid waste management, industrial pollution and river front development.

3.4.1 **Legal Framework**

On February 20, 2009, in exercise of the powers conferred by 3(1) of the Environment (Protection) Act 1986[233], the Central (Federal) Government established the National Ganga River Basin Authority (NGRBA). Under this Act, the Ministry of Environment and Forests (MoEF) and the Central Pollution Control Board (CPCB)/ State Pollution Control Boards (SPCBs) have been entrusted with the responsibility to administer the legislation[234].

The jurisdiction of the Authority was extended to states through which the River Ganga flows and other states through which its tributaries flow. In addition, the concerned State Governments (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal) were authorized to constitute a State Ganga River Conservation Authority (SGRCA) under the Chairmanship of the Chief

[231] River front steps leading to the banks of river Ganges
[232] Das and Tamminga (n 227) 1666
[233] Section 3(1) of the Environment (Protection) Act 1986 bestows the Central (Federal) Government with the power to take all necessary measures for the purpose of protecting and improving the environmental quality and preventing, controlling and abating environmental pollution.
[234] National Ganga River Basin Authority Ministry of Environment and Forests (MoEF), *Volume II Environmental and Social Management Framework (ESMF)* (2010)

Ministers of respective states. To this effect, in exercise of the powers conferred by 3(3) of the Environment (Protection) Act, 1986 [235] the Central Government (Federal) constituted the SGRCAs[236].

The Environment (Protection) Act 1986

As in several other countries, India's constitutional articles on environment were adopted in response to commitments the country entered in international conferences and conventions. The first provision for environmental protection in law was made through the Forty-Second Amendment to the Indian Constitution. This Amendment was passed in 1976, in response to the Stockholm Declaration adopted by the United Nations Conference on Human Environment in 1972[237].

Later in 1986, the Environment (Protection) Act was enacted[238]. This Act was formulated to lay down a general legislative framework for environmental protection and to account for the uncovered gaps in areas of major environmental hazards. It provides an umbrella legislative measure with a single focus on protection of the environment[239]. Objects of legislation include co-ordination of the activities of the regulatory agencies for the purpose of environmental protection, creation of authorities with adequate powers, regulation of handling hazardous substances and discharge of environmental pollutants, provision for deterrent punishments and for accidents threatening the environment. Section 2(a) of the Act defines the environment as '*including water*

[235] Section 3(3) of the Environment (Protection) Act 1986 provides the Central(Federal) Government to constitute an authority/authorities by such name/names as specified in the order (as published in the Official Gazette) for the purpose of this Act.

[236] The Uttarakhand State Ganga River Conservation Authority was constituted on 14th May 2010. The Uttar Pradesh State Ganga River Conservation Authority was established on 30th September 2009. On 8th February, 2010 the Bihar State Ganga River Conservation Authority was set up. In the state of Jharkhand and West Bengal, their respective Ganga River Conservation Authorities were set up on 30th September 2009.

[237] K. D. Alley, 'Legal Activism and Pollution Prevention' [2009] Georgetown International Environmental Law Review 1

[238] Under provisions of Article 253 in the Constitution. This article provides power to the Parliament to make any law for the whole or any part of India for implementing any agreement, treaty or conventions with other country/countries or any decision made at any international conferences/seminars, association or body.

[239] S.R Wate,'An Overview of Policies Impacting Water Quality and Governance in India' (2012) 28(2) International Journal of Water Resources Development 265

and interrelationships existing between water and human beings, plants, animals and other living beings'[240]. This Act clearly extends to control water pollution and water quality.

One of the main features of this Act is concentration of power is in the hands of the Central Government. Section 3(1) provides the central government with the power to '*take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution*'[241]. The measures include issuing direct written orders, including orders to shut down or regulate any industry, operation or process or stop the supply of water, electricity or other services. These powers can be exercised directly by the central government or through its agencies. However, one of the flaws of this provision is that the federal government or its delegated authorities might overlook critical environmental considerations when approving developmental projects[242].

Under this Act, the rule-making powers are exhaustive and they might reach wide and varied dimensions[243]. For instance, the powers and functions provided to the Central government under the Environment Act are similar to those vested under the Water and Air Act. In fact, the rule-making powers under this Act does not provide the Central government with new tools for preventing environmental degradation. It only allows the Central Government to make rules relating to any of the matters referred to in Section 3 of this Act, which includes maximum allowable concentration limits of various environmental pollutants, prohibition and restrictions on handling of hazardous substances and restrictions with respect to the location of industrial operators[244].

However, this Act has not been invoked even in the most deserving cases. It has turned out to be at best a "paper tiger" meant to alleviate the 'feeling of the environmentalists' as it has been invoked in very few cases[245]. A detailed criticism of the EPA (1986) is provided in Chapter 4.

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[240] K. Abhijeet, 'Governing water pollution effectively: A comparative study of Legal frameworks and their implementation in India and Sweden' (Master's Degree, Royal Institute of Technology(KTH) Sweden, 2013)
[241] Section 3(1), EPA (1986); Shodhganga, 'Environmental Protection and Ecological Development- Constitutional Imperatives and Legislative Frameworks' (2011)
[242] P. R. Kalas, 'Environmental Justice in India' (2000) 97(1) Asia-Pacific Journal on Human Rights and the Law 97
[243] For further details, refer to Chapter 4.
[244] Shodhganga (n 241)
[245] P. Cullet, Suhas Paranjape et al.' Water Conflicts in India: Towards a New Legal and Institutional Framework' (Forum for Policy Dialogue on Water Conflicts in India, Pune 2012)

3.4.2 **Institutional Structure**

The NGRBA is chaired by the Prime Minister and its members comprise of key Government of India ministers and the Chief Ministers of the five basin states (Uttarakhand, Uttar Pradesh, Jharkhand, Bihar and West Bengal). It is the governing body responsible for managing the Ganga River Basin Project, the successor of the GAP. Its implementation wing is the National Mission for Clean Ganga (NMCG) which is a registered society under the Societies Registration Act 1860 and its general body is chaired by the Minister of Environment & Forests (MoEF)[246].The NGRBA constitutes five wings for the efficient discharge of its duties, namely:

1. Information and Communication wing
2. Environmental Monitoring and Impact Assessment wing
3. Investigation wing
4. Research and Development Wing
5. Policy, Planning and Advocacy Wing[247]

State Ganga River Conservation Authorities (SGRCAs)[248] have been established by the five member states of NGRBA. These SGRCA's also acted as the decision-making body with matters pertaining to river Ganges at the state level. These conservation authorities have state level nodal departments which are responsible for program implementation in their respective states. The Program Management Group (PMG), on the other hand, is a registered society responsible for ensuring effective implementation of the overall NGRBA program at the national level. Similarly, the SGRCAs have set up the State Program Management Group (SPMG) to ensure effective implementation at the state level (except Jharkhand, as a relatively small stretch of Ganga passes through this state). Instead, Jharkhand has a dedicated cell within the Urban Development Department[249](Detailed organizational structure of PMG and SPMG in the Appendix (Figure A.1 and A.2).

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[246] National Mission for Clean Ganga website http://envfor.nic.in/sites/default/files/nmcg-ad-05062014.pdf accessed 8th March 2016

[247] Indian Institute of Technology, *'Implementation of Ganga River Basin Management Plan: Recommendations on Legal and Institutional Aspects'* (2013)

[248] Under the Environment Protection Act(1986)

[249] Ministry of Environment and Forests(MoEF), 'NGRBA Programme Framework' (2011)

Unlike that in GAP Phase I and II, provision has been made in NGRBA for post-implementation management of assets. According to the NGRBA's framework, each Detailed Project Report (DPR) requires a detailed plan for operation and maintenance of assets created under the NGRBA program which includes institutional responsibilities as well as funding that would be essential for their long term sustainable operations[250].

One of the important functions of the NGRBA includes preparation and implementation of the Ganga River Basin Environment Management Plan (GRBEMP). The responsibility for preparing the GRBEMP was given to a consortium of the seven Indian Institute of Technology (IIT's) (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee) (Detailed organization structure for preparing GRBEMP has been provided in the Appendix: Figure A.3) on 10 July, 2010. After a detailed study of the existing condition of the river Ganga, seven important missions were identified for a focused intervention and they were named as follows: Mission Aviral Dhara, Mission Nirmal Dhara, Mission Ecological Restoration, Mission Geological safeguarding, Mission Disaster Management , Mission Sustainable agriculture and Mission Environmental Knowledge Building and sensitization. Based on the findings, action plans were formulated under NRGBA to counter harmful anthropogenic activities and promote helpful activities[251].

3.4.3 **Outcomes and Difficulties**

Though multiple institutions or agencies were set up for cleaning the Ganges, overlapping and conflicting jurisdictions of government agencies could be identified as the underlying cause of institutional failure of the Plan. This led to many disputes regarding decision-making and implementation of GAP, as discussed in this section[252].

3.5 Literature Review

Government intervention is necessary in the resolution of pollution problems. Lack of government restraints in terms of pollution would permit individuals and firms to pollute freely because market imperfections in most cases would allow them to do so without internalising the cost imposed upon

[250] Ibid 10
[251] Consortium of seven Indian Institute of Technology's(IIT's),*'Ganga River Basin Environment Management Plan'*(2013)
[252] Indian Institutes of Technology (n 247) 18

others through their polluting activities[253]. To correct for these market imperfections, the government can intervene only through its agencies namely the executive, administrative, legislative and judicial bodies[254]. Therefore, one of its major tools to control pollution includes the regulatory mechanism.

In the global context, there exists a number of case studies which try to examine the effect of formal regulatory quality on river pollution. For instance, a case study of Huai River Valley in China examines the implementation of the major provisions of the Interim Regulations, which form the legal framework for water pollution control in this valley. The study finds that, despite unsuccessful implementation of the water pollution control measures, the regulations did achieve a few successes, including that of educating a large proportion of the population living in this valley about the existing environmental law framework, which would aid in controlling pollution in the long run. The study suggests that there is a need for continuous supervision of the operation and for severe punishment and prosecution of the enterprises discharging sewage illegally into the Huai River for effective implementation of this regulation[255]. Another case study on China conducted by the Economic Research Institute for ASEAN and East Asia (ERIA) analyses the existing environmental laws, regulations and policies relating particularly to water pollution. The study infers that, though China's environmental legal system is comprehensive, implementation is a major cause for concern. Although the Ministry for Environmental Protection of the People's Republic of China (MOEP), the provincial Environment Protection Bureaus (EPBs), municipal EPBs and county EPBs play a crucial role in environmental protection, the presence of a dual leadership system[256] limits the effectiveness of the local EPBs[257].

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[253] Market imperfections in pollution usually result when pollution imposes a negative externality, which further leads to market failure. Negative externality occurs when a product or decision of an individual or group of individuals imposes a cost on another group of individuals or the society, as a whole. For instance, if an individual buys an energy inefficient car he would use it as much as he wants without internalising the costs imposed by him on the society through pollution (increased health expenditure). In such cases, the government intervenes to prevent market failure (levying fines on that individual, imposing automobile or energy taxes).

[254] J. E. Krier, 'The Pollution Problem and Legal Institutions: A conceptual Overview' [1970-71] 18 UCLA L. Rev. 429

[255] Wang Xi and Xu Zhengxian, 'Legal Control of Water Pollution in Huai River Valley, China: A Case Study' (Conference Paper for Sixth International Conference on Environmental Compliance and enforcement, San Jose, Costa Rica, April 2002)< http://www.inece.org/conf/proceedings2/25-Legal%20Control.pdf > date accessed on 17 June 2016

[256] Under the dual leadership system, each local Bureau or office is under the coequal authority of the local leader and leader of the corresponding office, bureau or ministry at the next higher level.

[257] Yao Qi and Xin Zhou, 'Water Pollution Control in China: Review Of Laws, Regulations And Policies And Their Implementation' (2009) 4 Institute for Global Environmental Strategies(IGES) <

Despite massive investment to curb water pollution in China, the government has been unable to tackle it. To aid China in identifying its capacity to manage regulatory frameworks for the water sector, the OECD conducted a study using a multidisciplinary approach. This study was conducted as part of the series of country reports under the OECD's 'Regulatory Reform Programme' and it also included a comparative review of the water regulatory frameworks of China and UK. This study establishes that, though the UK's water regulatory framework may appear complex, the role of each governing body has been set out clearly in the primary legislation (Water Resources Acts and Environment Acts). As each organisation operates within this guidance, the system works perfectly well. In fact, in terms of both structure and written regulation, the UK system is much more transparent compared to the Chinese system which is characterised by multiple and overlapping responsibilities across multiple agencies and limited written guidance. The study recommends that, given China's enormous land mass, it's regulatory framework needs to be subdivided at the provincial level[258].

An extensive case study of the United States examines water pollution from the turn of the twentieth century until after the Second World War (1900-1948), a period during which water pollution was an interstate issue. During this period, though state water pollution control policy existed, states were unwilling to control pollution of interstate waters as this would have benefitted downstream states. The then existing legal institutions were not sufficiently efficient to resolve water pollution issues and, therefore, several new legal responses were experimented with before the onset of the Second World War. Initially, the states sought help from the Supreme Court of the United States to resolve their conflicts. Though some interstate water pollution conflicts were resolved by the Supreme Court, but instead of providing a framework for continual management of water quality in interstate waters it established entitlements for the involved states. In the 1920s, another legal solution known as the 'interstate compact' emerged. It recognized a special jurisdiction for managing pollution of interstate waters. This study deduced that the mere existence of institutional solutions does not translate to desirable environmental outcomes. Lack of political

http://pub.iges.or.jp/modules/envirolib/upload/2775/attach/policy%20review_water%20pollution%20control_china.pdf > accessed on 17 June 2016

[258] Organisation for Economic Co-operation and Development(OECD), '*OECD Reviews of Regulatory Reform in China'* (ISBN 978-92-64-05939-9, 2009)

will or lack of institutional capacity could be a contributing reason. In short, existence of institutional arrangements is a necessary but not a sufficient condition for curbing pollution[259].

One of the earlier papers [260] noted that water pollution has declined significantly in the industrialized countries along with an improvement in environmental regulatory quality, particularly in Japan, USA, UK, the Netherlands, France and Sweden. Few of the underlying reasons for this noteworthy improvement in the regulatory quality are the result of '*of more comprehensive and centralized water management programs, coupled with a thinning out of duplicative bureaucracies and a considerable amount of economic and legal muscle granted to various regional water authorities and national environmental protection agencies*[261]*'*. This comparative study also suggests that despite the efforts made in these developed countries to ensure consistent and coherent use of the various regulatory approaches and policy instruments, there is a need to develop better enforcement procedures (monitoring systems, compilation of detailed and standardized water statistics, and increased public participation in water quality and management).

In the Indian context, few studies have been conducted to investigate the influence of regulatory quality on river pollution. One paper conducts an econometric analysis to identify the effect of informal regulation of pollution on water quality in India. The analysis includes data on ten important Indian rivers over a period of five years (1995 to 1999). Poll percentage[262] was used as a proxy for informal regulation (informal pressure on industrial firms). The results reveal that informal regulation has a significant favorable effect on water pollution in India[263].

Another study assesses India's environmental regulations using a difference-in-differences approach[264]. A city level dataset for air pollution, water pollution, environmental regulations and infant mortality was constructed over a range of twenty years (1986- 2007) for a systematic

[259] J. Paavola, 'Interstate Water Pollution Problems and Elusive Federal Water Pollution Policy in the United States, 1900-1948' (2006) 12(4) Environment and History 435
[260] Jean-Phillippe Barde, G. M. Brown Jr. and P. F. T. Buchot, 'Water Pollution Control Policies Are Getting Results' (1979) 8(4) Ambio 152
[261] Ibid 152
[262] Poll percentage of three parliament constituencies have been taken where the water quality of the respective constituency's water quality was mapped
[263] B. Goldar and N. Banerjee, 'Impact of informal regulation of pollution on water quality in rivers in India' (2004) 73(2) Journal of Environmental Management 117
[264] Difference-in- differences is a statistical technique used in Econometrics and quantitative research in the social sciences that attempts to mimic an experimental research design using observational study data.

evaluation of the environmental regulations. The study demonstrates that air pollution regulations in India are more effective than water pollution regulations. Substantial declines in air pollution are a result of higher demand for air quality which ensures effective enforcement of air pollution regulations. This further establishes that strong public support permits environmental regulations to succeed in weak institutional settings[265].

Further, one paper analyses the impact of a particular piece of judicially mandated environmental legislation in the city of Kanpur, situated on the banks of Ganges. This study evaluated a 1987 order of India's Supreme Court[266] which instructed the tanneries of Kanpur to treat their sewage before discharging into the rivers. Using a reduced form model for the analysis, the study shows that the 1987 Supreme Court order has been successful in reducing water pollution in the Ganges substantially along with a decline in infant neo-natal mortality[267].

Another study attempts to theoretically analyse the prevailing legal and institutional measures that affect the state of Indian rivers. Some of the relevant Acts and related provisions evaluated include the Interstate River Water Disputes Act 1956, River Boards Act 1956 and State Irrigation and Drainage Acts. The study concludes that the regulatory and institutional framework for resolution of water conflicts, particularly for interstate rivers, is inadequate[268].

There exist some studies which evaluate the formal regulatory quality of the GAP theoretically and have criticized it on the following grounds:

1. **Failure of implementation, monitoring and lack of planning:** The framework of the GAP from the very beginning was flawed. Apart from the plan being formulated on the basis of incorrect sewage estimates, it relied on increased supply of electricity for operating the sewage treatment plants in areas where electricity was yet to reach[269]. Also, one of the reports published by the Comptroller and Auditor General of India (CAG) claims that,

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[265] M. Greenstone and R. Hanna, 'Environmental Regulations, Air and Water Pollution, and Infant Mortality in India' (2011) 17210 The National Bureau of Economic Research(NBER) <http://www.nber.org/papers/w17210.pdf > accessed on 13 June 2016

[266] M.C Mehta v Union of India [1999]

[267] Quy-Toan Do, S. Joshi and S. Stolper, 'Environmental Policy, River Pollution, and Infant Health: Evidence from Mehta vs. Union of India' (2016) International Growth Centre(IGC) < http://www.theigc.org/wp-content/uploads/2016/02/Joshi-et-al-2016-Working-paper.pdf > accessed on 13 June 2016

[268] H. Thakkar, 'Rivers: Legal and Institutional Issues in India' [2012] South Asia Network on Dams, Rivers and People < http://sandrp.in/rivers/Rivers_Legal_and_Institutional_Issues_in_India.pdf > accessed on 13 June 2016

[269] Singh (n 229)

under the GAP, towns and cities were selected inconsistently and funds were allocated based on imprecise estimates of sewage[270]. The local governments were not involved in the decision-making process which resulted in unavailability of necessary human resources and onsite knowledge or training at the local level to ensure efficient implementation and monitoring[271]. Apart from a faulty framework, the GAP faced criticism for its monitoring failure. Even though multiple agencies were engaged with the Plan, there was no single department or agency to give directions or coordinate the attempts at curbing pollution[272]. Furthermore, no provisions were made to monitor the implementation process or to penalize state/local governments for not meeting targets on time[273]. Administrative incompatibilities were another contributing factor for the failure of GAP. For instance, with regard to treatment of rivers around cities, the cleaning of sewers fell under the jurisdiction of the municipal authorities but the decision-making powers were held by the district magistrates and commissioners which led to conflict of interests. Moreover, state governments refused to cooperate with the Central (Federal) Government if the two had different political parties in power[274].

2. **Lack of support from the Government:** Being recognised on paper as part of the GAP scheme, the Non-Governmental Organisations (NGOs) were expected to maintain the ghats[275] but they received only a negligible amount of money for this purpose. They were not invited to the decision-making process which led to lack of coordination at the ground level[276].
3. **Religious significance**: Although GAP was declared to be a 'people's program', critics accuse the government for launching the plan mainly for political expediency. As the river Ganga always had a sentimental value for Hindus in a Hindu majority country, the government has very conveniently exploited it on more than one occasion to gain political power during elections. It was the very reason the GAP was introduced in the first place[277].

[270] Das and Tamminga (n 227) 1445
[271] A. Das and P. Das, 'Institutional Change for Environmental Challenges: Lessons from gaps in the GAP' in K.R.Gupta (Ed), *Encyclopedia of Environment* (Atlantic Publishers and Distributors, 2005)
[272] Singh (n 229) 592
[273] Das and Das (n 270) 10
[274] Upadhyay (n 226) 65
[275] Stepped landings on the bank of the river that form the land water interface.
[276] Upadhyay (n 226) 66
[277] Ibid 66

> Moreover, due to Ganga's religious significance, practices such as religious bathing are common in the river, but the GAP did not give adequate attention to maintaining ecological flows in the Ganges which, in turn, reduced the assimilative capacity of the river and hence religious activities could not be sustained[278].

Though several papers have tried to empirically analyse the impact of formal regulatory quality in India on general river pollution, none of them have attempted to do so specifically for the Ganga Action Plan (GAP). Moreover, it should be noted that the few existing studies on the GAP adopt a theoretical or qualitative approach and there exists virtually no study which attempts to analyse the formal regulatory quality of the GAP using an empirical or quantitative approach. In this context, this study will extend the literature in this direction by analysing the effect of the formal regulatory quality of the GAP using an econometric approach.

The methodology adopted in this study has been outlined in Chapter 2.

This study involves analysing the regulatory quality of GAP at the level of Indian states with the aid of two econometric models, as discussed in Chapter 2. Both the models have been estimated using panel model analysis over the time period 2006-2014 for the four Indian states namely, Uttarakhand (UK), Uttar Pradesh (UP), Bihar and West Bengal through which the Ganga flows.

3.5 Methodology and data description

3.5.1 **First Model**

Model Description

The first model is as described in Chapter 2. Besides RQ, GE and RL, per capita Net State Domestic Product (PCNSDP), industrialization (Indst) and population(Pop) have also been considered as independent variables in the model. At time 't' and in state 'i', Ganga water pollution (waterpoll) is expressed as a function of the above stated variables:

[278] Das and Tamminga (n 227) 1648

$$waterpoll_{it} = \beta_0 + \beta_1 RQ_{it} + \beta_2 GE_{it} + \beta_3 RL_{it} + \beta_4 PCNSDP_{it} + \beta_5 Indst_{it} + \beta_6 Pop_{it} + u_{it}$$

where, u is the error term

Variable and Data Description

RQ is included in the model as most of the theoretical studies on GAP have concluded that failure of implementation is a major cause of concern[279]. Similarly, studies on China, where water pollution is a rising concern, have also indicated that lack of implementation of the law is an underlying reason for inefficient regulatory quality[280]. To capture RQ for the GAP, stringency of environmental regulation was initially considered as a proxy. However, due to data limitations at the state level, the number of Civil or Criminal judgements for environmental cases resolved per year (CivC+CrimC) has been taken as a proxy[281]. The data on the same (CivC+CrimC) have been collected for 2006-2010 from the Supreme Court of India's website and for the later years (2010-2014) from the National Green Tribunal's (NGT) website. The reason for using two data sources is that, prior to 2010, the Supreme Court of India was responsible for disposal of environmental cases. However, under the National Green Tribunal Act 2010, the NGT was established specifically for handling environmental disputes, enforcement of environmental legal rights and general environmental protection in India.

GE is defined along the same lines as in Chapter 2. This chapter's analysis is one which bases its findings on assessing the effectiveness of GAP. The test of efficiency would not be appropriate for the purposes of this analysis for the following reasons:

(1) The GAP has already been declared inefficient by the Indian government, as it has failed to clean up the Ganges. Therefore, from the beginning of this study it is well established that the GAP is inefficient, however we did not have any knowledge about the GAP's effectiveness (from any past comments or public statements issues by the government of

[279] Singh (n 229); Das and Tamminga (n 227)
[280] Qi and Zhou (n 257)
[281] At times due to data unavailability, proxy variables are considered. A proxy variable is a variable that in itself is not important in the model but serves in place of the variable for which data is not available or is immeasurable. In order for a variable to be a good proxy, it must be closely related with the variable of interest by some theory or logic.

India or studies based on GAP), therefore the test of effectiveness has been considered instead of efficiency for the GAP.

(2) Secondly, due to restrictions on data availability, conducting an analysis of GAP's effective is more feasible than an analysis of GAP's efficiency.

Beyond these reasons, the test of effectiveness also comes in agreement with the widely established approaches in law and theory. For instance, the Kelsenian theory, which mentions that 'law is which is effected/sanctioned; that which is not sanctioned does not amount to law'[282]. This also applies to GAP, as it seems like an overall legal framework that lacks genuinely effective monitoring and coercive mechanisms behind it ever since its inception (as discussed in the previous section).

More often than not, the mere existence of institutional solutions does not translate into desirable environmental outcomes, especially where there exists a lack of institutional capacity[283]. To capture GE, institutional capacity in terms of the finances of the institutions functioning under the GAP is considered. To be precise, investment in effluent treatment plants per year (IETP) under the GAP is chosen as a proxy. The data for this measure have been collected from multiple data sources, as it was unavailable for the given time period from one single source. The data sources include the NGRBA, NMCG, CPCB, National Institute for Public Finance and Policy, Swachh Bharat Mission[284] and Ministry of Drinking Water and Sanitation.

Similarly, RL has been defined along the same lines as in Chapter 2. Along with the existence of a comprehensive environmental law framework, continuous supervision and deterrent punishment and prosecution are required for an effective water management framework[285]. Initially, the number of inspectors and the level of fine levied on industries were considered as a proxy for the RL variable. However, due to data unavailability, the number of trainings for inspectors relating to maintaining water quality conducted per year at the state level under GAP (No.T) is taken as a

[282] For more detailed discussion about the Kelsian theory, refer to: E. W. Patterson, 'Hans Kelsen and His Pure Theory of Law' (1952) 40(1) California Law Review 5
[283] Paavola (n 259)
[284] It is India's nationwide campaign which started in 2014 and aims to clean up the country's cities, towns and rural areas. The campaign's official name is in Hindi and it translates 'Clean India Mission'.
[285] Xi and Zhengxian (n 255)

proxy for RL. Data sources for this variable include the Ministry of Drinking Water and Sanitation's reports published on the corresponding Ministry's website.

Per capita Net State Domestic Product (PCNSDP) has been used to capture the volume of economic activity in the states. NSDP is defined '*as a measure, in monetary terms, of the volume of all goods and services produced within the boundaries of the State during a given period of time after deducting the wear and tear or depreciation, accounted without duplication*[286]'. Therefore, PCNSDP is the ratio of NSDP at constant prices for the base year 2004-05 to the corresponding population of the state. The PCNSDP data has been collected from the Handbook of Statistics published by the Reserve Bank of India (RBI) annually.

In this chapter, Industrialisation (Indst) has been quantified as the proportion of manufacturing industries to Net State Domestic Product (NSDP). The data on Industrialisation (Indst) have been obtained from the Handbook of Statistics published by the Reserve Bank of India.

Population (Pop) is measured by the number of people living in a state during a given period of time. The Census of India website provided the data for population, but the data was inconsistent as it is conducted decennially. Therefore, the data for the other years were extrapolated from the Census data.

The dependent variable (DV) in this model, water pollution (waterpoll) of the Ganges, is measured by the Biochemical Oxygen Demand (BOD). The BOD refers to the amount of oxygen that would be consumed if all the organics in one litre of river water were oxidized by bacteria and protozoa. Microorganisms, such as bacteria, are responsible for decomposing organic waste. When organic matter, such as, dead plants, leaves, grass clippings, manure, sewage, or food waste is present in a water body, the bacteria begins the process of breaking down this waste. When this happens, much of the available dissolved oxygen in the water is consumed by aerobic bacteria, robbing other aquatic organisms of the oxygen they need to survive. In short, BOD is a measure of the oxygen used by microorganisms to decompose this waste. Therefore, a higher BOD is indicative of higher pollution. Data on BOD levels in the Ganges have been obtained from CPCB, the Ministry of Environment and Forests (MoEF) and ENVIS[287] CPCB.

[286] as per the Reserve Bank of India's definition
[287] India's Environmental Information System

Therefore, the estimating equation for the first model after including the proxies can be expressed as follows. IETP, PCNSDP and Pop have been expressed in their natural logarithms.

$BOD_{it}= \beta_0+\beta_1(\text{CivC} + \text{CrimC})_{it}+\beta_2\text{IETP}_{it}+\beta_3\text{No. T}_{it}+\beta_4\text{PCNSDP}_{it}+\beta_5\text{Indst}_{it}+\beta_6\text{Pop}_{it}+u_{it}$

where, u is the error term.

3.5.2 **Second Model**

Model description

The second model is adapted from Chapter 2 as well. The independent variables (IVs) in this model include environmental expenditure by the local government (LGEE), Ganga water pollution (waterpoll), number of Non-Governmental Organisations (NNGO) and Population (Pop). The model is expressed as follows:

$RQ_{it}= \beta_0+\beta_1\text{LGEE}_{it}+\beta_2\text{waterpoll}_{it}+\beta_3\text{NNGO}_{it}+\beta_4\text{Pop}_{it} + u_{it}$

where, u is the error term.

Variable and data description

The dependent variable (DV), regulatory quality (RQ), has been defined in the same way as that in the first model (and thereby the same data source has been used as well) and its proxy has also has been taken as the number of Civil or Criminal judgements for environmental cases passed per year (CivC+CrimC). Among the independent variables (IVs), the proxies for Ganga water pollution (waterpoll) and population (Pop) are the same as in the previous model.

Local environmental expenditure is a key aspect of a state's environmental policy, regulatory, and institutional framework as development and implementation of most policies require public expenditure of some kind. Increased local environmental expenditure contributes to better environmental management at the state level and supplements other policy tools, such as, legislation and regulation [288] . Therefore, to capture the local government environmental

[288] The World Bank, *'Public Environmental Expenditure Reviews (PEERS) Experience and Emerging Practice'* (7, 2003)

expenditure (LGEE) for the GAP, investment made by the states under the NRCP has been considered as a proxy. The sources for expenditure data include the MoEF and Ministry of Drinking Water and Sanitation.

The number of Non-Governmental Organisations (NGOs) has also been considered as another independent variable (IV) in the model. Especially in the developing world, NGO's or civil society organisations are playing an important role in environmental management in the following ways: (1) through conducting public awareness programs as the public is more likely to believe the civil society organisations than the government; (2) most participants in these organisations tend to be highly committed to protecting the environment; (3) the activism of these organisations helps improve the regulatory quality; and (4) apart from generally lacking a larger political agenda towards protecting the environment, these organisations also take on responsibilities which would otherwise need to be undertaken by the over-strained and under-funded environmental protection agencies[289]. For this study, the number of NGO's working at the state level has been included. The data have been collected from the National Institution for Transforming India (NITI Aayog, Government of India) website.

The estimating equation for the second model can be expressed as follows:

$$(CivC + CrimC)_{it} = \beta_0 + \beta_1 \mathrm{NNGO}_{it} + \beta_2 \mathrm{BOD}_{it} + \beta_3 LGEE_{it} + \beta_4 \mathrm{Pop}_{it} + \mathrm{u}_{it}$$

where, u is the error term.

3.6 Results and Discussions

3.6.1 **Model 1**

The Hausman test was employed to determine whether a Random Effects Model (REM) or a Fixed Effects Model (FEM) should be used to estimate the above equations. The test ruled in favour of using REM model. But in the REM estimation results, first order autocorrelation was detected and therefore those results have not been used to draw inferences. Instead, the model is re-estimated using the Feasible Generalized Least Squares (FGLS) Method to correct for autocorrelation. The

[289] J. Schwartz, 'Environmental NGO's in China: Roles and Limits' (2004) 77(1) Pacific Affairs 28

FGLS method allows estimation in the presence of first order autocorrelation, heteroscedasticity or cross-sectional correlation across panels[290].

The REM and FGLS results for the first equation have been presented in the following table:

Table 3. 1 Panel Model Estimation Results for GAP (Model 1)

Independent Variables (IVs)	Random Effects Model (First Model)	FGLS Model (First Model)
$\mathrm{CivC} + \mathrm{CrimC}_{it}$	-0.103	-0.10
$\mathrm{No.T}_{it}$	0.00	0.00
IETP_{it}	0.157	0.15
PCNSDP_{it}	-0.018	-0.01
Pop_{it}	0.772***	0.77***
Indst_{it}	16.871***	16.871***
	Hausman Test H_0 : REM preferred P-value = 0.5775 **Multicollinearity Test** Mean VIF = 2.18 **Ramsey RESET Test** H_0 : Model has no omitted variables P-value = 0.6889 **Breusch Pagan Test** H_0 : Constant Variance P-value = 0.260 **Woolridge Test for autocorrelation** H_0 : No first order autocorrelation P-value = 0.0975	

Note: Dependent Variable is BOD_{it}. Heteroscedasticity robust standard errors are used for REM. According to VIF estimate our model does not suffer from multicollinearity problem as the value of the mean VIF is less than 10. ***, ** , * represent statistical significance at 1%, 5% and 10% level of significance respectively.

The results indicate that population affects BOD significantly and there exists a positive relationship between the two variables. This implies that growth in population leads to an increase in Ganges water pollution. According to the obtained estimates, a one per cent increase in population would lead to 0.008 per cent increase in Ganga water pollution levels. Other studies have also attempted to estimate the relationship between population growth and pollution levels

[290] S. Ghosh Dastidar, 'Essays on Public Education Expenditure, Trade Openness and Economic Growth of India' (Doctor of Philosophy, University of Dundee, 2015)

using both mathematical models[291] and qualitative methods[292] and reached similar conclusions. The growing population in India not only contributes to a rise in the demand of per capita availability of water (domestic water usage) but also increases the per capita wastewater generation. In such a scenario, current and future fresh water demand could be met if efficient wastewater management systems exist. However, although an estimated 38,254 milllion litres of sewage (MLD) is generated per year from domestic usages in major Indian cities, the sewage treatment capacity is only 11,786 MLD, thereby leaving a gap of 26,468 MLD in sewage treatment capacity. Moreover, even the existing sewage treatment facilities often do not function efficiently and remain closed for most of the year due to improper design, poor maintenance, frequent electricity break downs and lack of technical and human capacity[293]. Therefore, the water pollution levels in the Ganges keep rising with the growing population.

Besides population, the results verified that industrialisation also contributes significantly towards Ganges water pollution. According to the model estimates, every unit increase in industrialisation leads to 16.871 units increase in the Ganges water pollution levels. Many studies have acknowledged the existing relationship between the two[294] and have also tried to analyse the environmental costs imposed by industrialisation in India[295]. Despite the fast-paced growth of industrialization, only 60 per cent of industrial wastewater is treated in India. In addition, according to UNESCO, the industrial water use productivity of India is the lowest [in the world] and is only 1/30th of that of Japan and Republic of Korea[296]. Currently, with India being one of the most attractive destinations for investment in manufacturing and pollution intensive industries in the world owing to its large domestic consumer base of over one billion people and cheap labour, this trend represents a serious challenge. The country is already losing 10 per cent of its potential GDP

[291] B. Dubey and A.S. Narayanan, 'Modelling effects of industrialization, population and pollution on a renewable resource' (2010) 11 Nonlinear Analysis: Real World Applications 2833

[292] D. A. Nagdeve, 'Population Growth and Environmental Degradation in India' (Population Association of America 2007 Annual Meeting, New York, March 2007)

[293] R. Kaur, S.P. Wani, A.K. Singh and K.Lal, 'Wastewater Production and Treatment Use in India' [2012] Country Report India < http://www.ais.unwater.org/ais/pluginfile.php/356/mod_page/content/111/CountryReport_India.pdf > accessed 3 September 2016

[294] S. Singh, P. Jain and A. Kumar, 'Impact of Industrialisation on Environmental Pollution' (2009) 135(9) The Indian Forester 10

[295] R. Majumdar (2009), 'Environmental Costs of Industrialisation: A Study of Durgapur Region in West Bengal' [2010] Rabindra Bharati University Journal of Economics

[296] R. Kaur et.al (n 293) 2

due to environmental degradation and, without an effective pollution abatement program in place, the country's ecosystems seem to be under threat[297].

Existing level of RQ does not seem to affect Ganges water quality significantly. Firstly, the legal basis of the GAP is characterised by overlapping responsibilities across multiple agencies with limited written guidance. This results from unclear statutory law, the implementation of which is, therefore, very weak. Secondly, as the legislation does not clearly provide a dedicated funding authority, it results in disputes across all levels of government regarding financing of projects of the Plan which further diminishes the effectiveness of the RQ. Finally, there is an absence of widespread public support for implementation of the regulatory framework for water pollution in India[298].

It might be expected that RQ could have an effect on Ganges river pollution through the judiciary's role in delivering effective judgements regarding the GAP[299]. However, particularly with reference to the GAP, most cases are still ongoing or pending. For instance, the *Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others* case, which was filed in 1998 against the state government for failing to clean up the Yamuna river (a river included under the GAP), is still ongoing[300]. Secondly, there is no provision made for following up the judicial directions issued in such cases, especially under the GAP. This is evidenced by the fact that, in *Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others* , one of the claims filed against the state government argues that the directions passed earlier by the Supreme Court in the *Mehta* cases were not carried out by the state and central governments, even after a span of more than ten years. Furthermore, no action was taken against them regarding this failure[301]. This is probably the main reason that RQ fails to exert any significant effect on Ganges river pollution, unlike for the rest of India,[302] either through the Executive or the Judiciary.

It is also worth noting that government effectiveness (IETP) and rule of law (No.T) of the GAP do not seem to affect the water quality significantly. This might possibly be due to the fact that

[297] T. Rajaram and A. Das, 'Water pollution by industrial effluents in India: Discharge scenarios and case for participatory ecosystem specific local regulation' (2008) 40 Futures 56
[298] Greenstone and Henna (n 265)
[299] For reference, n 208
[300] Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh (n 216)
[301] Ibid 3
[302] As evidenced in the next chapter

institutional solutions and investment do not always translate into effective river action plans. Lack of political will[303], absence of cooperation amongst the state and central governments[304] and inefficient institutional capacity in terms of availability of trained personnel could also be the contributing factors. In short, the existence of institutional arrangements is a necessary but not a sufficient condition[305].

3.6.2 **Model 2**

Initially in the context of the second model, the Hausmann test was conducted to determine whether a Random Effect Model (REM) or a Fixed Effect Model (FEM) should be used. The test ruled in favour of REM. But, since first-order autocorrelation was detected in the REM results, the model was re-estimated using FGLS method.

Table 3. 2 Panel Model Estimation Results for GAP (Model 2)

Independent Variables (IVs)	Random Effects Model (Second Model)	FGLS Model (Second Model)
Pop_{it}	-0.698***	-0.600***
LGEE_{it}	0.1865	0.134
NNGO_{it}	0.704***	0.413**
BOD_{it}	-0.121	-0.123
	Hausman Test H_0 : REM preferred P-value = 0.333 **Multicollinearity Test** Mean VIF = 2.45 **Ramsey RESET Test** H_0 : Model has no omitted variables P-value = 0.252 **Breusch Pagan Test** H_0 : Constant Variance P-value = 0.0044 **Woolridge Test for autocorrelation** H_0 : No first order autocorrelation P-value = 0.015	

[303] Paavola (n 259) 20
[304] Qi and Zhou (n 257) 6
[305] Paavola (n 259) 436

Note: Dependent Variable is $\mathrm{CivC} + \mathrm{CrimC}_{it}$. Heteroscedasticity robust standard errors are used for REM. According to VIF estimate our model does not suffer from multicollinearity problem as the value of the mean VIF is less than 10. ***, ** , * represent statistical significance at 1%, 5% and 10% level of significance respectively.

The FGLS results demonstrate that a rising population affects the GAP's RQ significantly and negatively. This implies that, with everything else constant, a one per cent increase in population leads to 0.006 per cent weakening of the GAP's RQ. Population growth, besides lowering per capita resource availability, puts pressure on the existing natural resources thereby resulting in over-exploitation. This is evident from the results of our first model which demonstrate that a rising population results in deterioration of Ganges water quality. The GAP's implementing agencies face a shortage of resources[306], which is worsening with the increasing pressure of a rising population on natural resources. Judicial infrastructure has also clearly not kept pace with the rate of litigation in India. For instance, the NGT suffers from a severe staff shortage, especially in the states through which Ganges flows[307]. In other words, none of the benches of the NGT have enough staff but the eastern bench[308] of the NGT faces a severe staff shortage[309]. Some case hearings before the Eastern NGT bench are getting delayed because of the lack of an adequate number of judges and expert members[310]. Along with this, the current rate of population and the consequent increasing levels of Ganges pollution levels are further weakening the existing GAP regulatory quality.

Local government environmental expenditure (LGEE), on the other hand, does not lead to an improvement in the GAP's RQ. This further implies that the mere existence of institutions, and investment through them, does not necessarily lead to better environmental quality, supporting the earlier results in Model 1. Lack of implementation might be a reason for this. However, the underlying reasons for failure of implementation extend far beyond the existence of inefficient institutions, as explained in detail in the concluding section.

The second model results also indicate that the existence of environmental NGO's has led to an improvement in the GAP's RQ. In India, non-governmental organisations (NGO) have played a critical role in social, health and environmental issues. Public participation in environmental

[306] As explained in detail in the literature review section
[307] *The Hindu*, '' Not enough space at Green Tribunal office'' (9 November 2014)
[308] It includes all the states through Ganges flows
[309] J.Nandi, 'Plenty of cases, but not enough staff for NGT' (The Times of India, 2 May 2017)
[310] G. Verma, ''National Green Tribunal's Pune bench faces staff crunch'' *The Golden Sparrow* (13 May 2016)

management has recently been provided for by the legislation, which has given NGO's and other civil society organisations a greater power to contribute significantly towards environmental protection, especially in the case of Ganges river pollution abatement. A few global studies on river action plans indicate that public awareness campaigns go a long way in the long term towards promoting pollution abatement[311]. One of the campaigns run specifically for the Ganges, 'Swatcha Ganga' (Clean Ganges) run by the Sankat Mochan Foundation (SMF), contributed significantly in improving the regulatory quality of the GAP. Under GAP-I, only three sewage plants were constructed in Varanasi (Uttar Pradesh) which were inadequate for treating the city's waste. In addition, due to erratic electricity supply, these sewage plants were unable to function continuously. Furthermore, when water levels rose in the Ganges during the rainy season (June to September), the sewage plants got submerged and could not operate. To resolve this, the SMF approached the University of California, Berkeley in the mid-1990s for a partnership in search of an alternative solution for Varanasi's sewage problems. To this end, Dr. William Oswald at Berkeley developed an 'advanced integrated wastewater pond system' (AIWPS) which, apart from being affordable, treated sewage naturally and did not require any electricity. In 1997, the SMF proposed to set up the AIWPS to the Varanasi city government, who in turn decided to exercise the 74th Amendment[312] and claimed funds from the GAP for this purpose. However, the state and the federal government refused to accede to the urban local body's request. Upon the state's refusal to meet their request, several of Varanasi's leaders filed a PIL action[313] against the government alleging that it breached the 74th Amendment[314]. This case was pending from 1997 to 2008. During this time, the SMF promoted and attempted to gain international support for this issue along with domestically promoting awareness programs relating to Ganga pollution. Organisations like USAID, the Asia Foundation and US-AEP came to its aid. As a result of the SMF's efforts, the federal government formally agreed to support the AIWPS sewage treatment system in Varanasi

[311] Qi and Zhuo (n 257) 7

[312] The 74th Amendment was enacted in 1992 when it was realised that the state local bodies have become weak and ineffective due to failure for holding regular elections, prolonged suppression and inadequate delegation of powers and functions. Therefore, provisions relating to urban local bodies were incorporated into the Constitution. One of the provisions included 'grants-in-aid to the Municipalities from the consolidated funds of the State' and 'devolution by the State Legislature of powers and responsibilities upon the Municipalities with respect to preparation of plans for economic development and social justice, and for the implementation of development schemes as may be required to enable them to function as institutions of self-government'

[313] Explained in detail in Chapter 4

[314] As the 74th Amendment included grants-in-aid from the state to Municipalities for development schemes.

in 2008[315]. This substantiates the claim made above that NGO's have contributed significantly to bettering the GAP's RQ.

3.7 Conclusion

India's ill-fated GAP was launched thirty years ago but over this time Ganges water quality has deteriorated further. This study was conducted in order to analyse the existing formal environmental regulatory quality of the Ganga Action Plan (GAP). For this purpose, two econometric models were formulated. The first model attempted to identify and measure the potential effects of the GAP's regulatory quality, rule of law and government effectiveness on Ganges river pollution. The results revealed that neither of these seem to have made any significant contribution towards improving river water quality. RQ fails to make an impact on Ganges river pollution. The underlying reason for this is not only the weak legal basis of the GAP but also the inefficiency of the executive, a lack of follow up of the Ganges court cases and long hearings which reduce the judicial effectiveness. Further, the mere existence of institutions and related investments do not necessarily translate into successful river action plans. This is substantiated by the fact that the GE and RL of the GAP do not seem to have any impact on Ganges river water quality.

The second model was formulated to understand the role of the GAP's RQ in the decision-making of institutions or of the public at large. NGOs or civil society organisations seem to affect the regulatory quality of GAP significantly and positively. Lately, NGOs have contributed considerably towards river Ganga management by conducting public awareness programs, promoting issues internationally to gain more funding for the environmental initiatives and by working at the ground level to get a better understanding of the obstacles faced by the GAP in order to find viable solutions. In this model, LGEE does not seem to affect the GAP's RQ. One of the reasons for such a lack of relationship could be implementation failure.

Examining both the sets of results, it can be concluded that the existing institutions under the GAP do not seem to be working efficiently due to implementation failure. However, the underlying causes for implementation failure are not limited to inefficient institutions. Along with an unclear

[315] J. S. Schiff, 'Silencing the Opposition: The State v. Civil Society in India's Ganges River Basin' [2014] International Studies Perspectives 229

legislative basis for the GAP, factors such as absence of heavy penalties/fines for not meeting targets on time, a non-existent system for follow-up of the directions issued by environmental courts, lack of trained personnels at the ground level, inefficient monitoring systems, involvement of multiple agencies for the same work, and planning the GAP without a thorough field investigation all contribute towards it. Moreover, the pollution criteria levels determined by the pollution control boards are faulty as they are the same for the entire river at all places. Ideally, the pollution levels should be determined after conducting a thorough analysis of the geographical area and the existing river flow.

3.8 Policy implications

The legal basis of the GAP is weak and provides limited guidance characterised by overlapping responsibilities across multiple agencies. Therefore, there is an urgent need to formulate a well-defined legal basis for the GAP which clearly outlines the responsibilities of each agency involved, while indicating the Ministries responsible for the implementation of the GAP. In cases of failure of implementation of the GAP, the legislative basis should also include strict penalties/fines to be imposed on Ministries or the government bodies responsible for the same. Further, to ensure effective RQ results in lowering Ganga water pollution, there is an urgent need to make provision for following up on the directions issued by the judiciary. As discussed earlier, the state governments, Central government and pollution control boards have failed to comply with the directions till now.

This study has also found that NGO's seem to have a greater impact in reducing Ganga water pollution. Within the existing GAP, though NGO's have been included on paper, they have not been allocated funds, nor were they included during formulation of the GAP. Given that Ganga water quality is deteriorating at an unprecedented rate, it is extremely important in a country like India, with wide geographic, demographic and income differences, to understand that the hurdles faced by different regions cannot [always] be addressed using the same solutions. For instance, the SMF identified that cities like Kanpur were facing shortages of electricity and were unable to operate the sewage treatment plants. The SMF along with the local municipality helped the city come up with a viable solution for this issue. To understand problems at the ground level, NGOs

are the best option available as they usually do not have any ulterior political motives. This suggests that there is a need to grant a considerable amount of economic and legal power to NGOs and regional water authorities. However, public perception of NGOs has turned negative of late and it remains to be seen, therefore, whether they might have a similar effect on river pollution abatement for the whole of India[316].

Also, as the Ganges is a religious river for Hindus, the GAP needs to be implemented without offending people's religious sentiments. There is thus a greater need for conducting public awareness programs, especially in rural areas, in order to educate people regarding the dire consequences faced by their 'beloved river'.

[316] Discussed in detail in Chapter 4.

Rationale for Chapter 4

The findings obtained in the previous chapter identified the underlying issues behind the GAP's failure. The econometric results revealed that RQ of the GAP does not seem to have any effect on Ganges river pollution. Even GE and RL fail to contribute towards Ganges river pollution abatement. This indicates that, despite an enormous amount of investment on the GAP in terms of money and time by the Government of India, it did not translate into successful clean-up of the river. These results are very troublesome, especially in India's case. Firstly, as the GAP is India's first river action plan, it is believed that other river action plans would be based completely on the GAP's framework. Secondly, given the fact that more than 60 per cent of untreated sewage[317] in the country is dumped into rivers, it is only a matter of time before the other Indian rivers are also declared ecologically dead.

Furthermore, the results presented in Chapter 3 reveal that the GAP has a very weak legal basis and, therefore, provides limited practical guidance as characterized by overlapping responsibilities across multiple agencies. This makes an environmental lawyer curious regarding what is going on behind the scenes. The GAP is India's biggest river action plan and, given it lacks a formal legal basis, it makes one wonder about India's environmental law in general, and river pollution law in particular. Therefore, a country level analysis for India is necessary (in Chapter 4) in order to develop a better understanding of the effectiveness of RQ, GE and RL in river pollution abatement.

[317] S. Sengupta, 'Cleaning India's polluted rivers' (Down to Earth, 13 March 2018)

Chapter 4: Effective environmental protection and regulatory quality: A case study on the Indian rivers

4.1 Introduction and Background

India's liberalization reforms were introduced in the early 1990s[318] which contributed immensely towards getting the country out of the low growth trap. The liberalization not only encouraged the Indian states to enhance their production capacities but also assisted in restructuring economic activities[319]. Consequently, India's GDP growth rate increased from 5.7 per cent in the 1990's to 7.3 per cent during the 2000s[320]. Surprisingly, this growth has not been driven by the manufacturing sector but instead by the service sector[321]. These reforms helped in not only reducing the country's poverty levels[322] but also contributed towards an increase in foreign investment, foreign exchange reserves, per capita income and standard of living. India also experienced a decline in the unemployment rate during the post-liberalization period. External debt as a percentage of GDP also declined[323]. Currently, as per the forecasts of the International Monetary Fund (IMF), India is on track to become world's fifth largest economy in 2018[324].

However, this economic growth came at the cost of environmental pollution. According to the World Bank, pollution and other environmental degradation cost India 80 billion dollars a year, nearly six per cent of the country's GDP[325]. This is evidenced by the fact that the Environmental

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[318] To know more about India's liberalization reforms: A. Pangariya, 'India's Economic Reforms' [2001] EDRC Policy Brief No. 2 Asian Development Bank (ADB)

[319] S. Mukherjee and V. Kathuria, 'Is Economic Growth Sustainable? Environmental Quality of Indian States' [2006] MPRA Paper No. 6473 < https://mpra.ub.uni-muenchen.de/6473/1/MPRA_paper_6473.pdf >
Post 1991

[320] N. Anand, 'An Overview of Indian Economy (1991-2013)' (2014) 3(3) IOSR Journal of Economics and Finance (IOSR-JEF) 19

[321] A detailed analysis of this is provided later in the results section

[322] A. Kotwal et.al, 'Economic Liberalization and Indian Economic Growth: What's the evidence?' [2011] Discussion Paper 11-13, Indian Statistical Institute, Planning Uni, New Delhi

[323] A. Rao and K. Kadam, '25 years of liberalisation: A glimpse of India's growth in 14 charts' First Post (India, 7 July 2016) < http://www.firstpost.com/business/25-years-of-liberalisation-a-glimpse-of-indias-growth-in-14-charts-2877654.html >

[324] S. Babones, 'India Is Poised To Become The World's Fifth Largest Economy, But It Can't Stop There' Forbes (US, 27 December 2017) < https://www.forbes.com/sites/salvatorebabones/2017/12/27/india-is-poised-to-become-the-worlds-fifth-largest-economy-but-it-cant-stop-there/#72653e063ff1 >

[325] World Bank, *India - Diagnostic assessment of select environmental challenges: An analysis of physical and monetary losses of environmental health and natural resources* (2013) 45

Performance Index (EPI) 2018, an environmental metric developed by Yale and Colombia universities, ranked India amongst the bottom five countries in terms of environmental health[326].

To understand India's development of environmental and water law, it is crucial to look at the country's development of environmental management over different stages of it's economic development.

4.1.1 **Progress of environmental management with different stages of economic development**

Like many other countries, India's environmental management priorities have changed with its different stages of economic development.

The Moderate Growth Phase (1975-90)

During the 1975-90 period, India's economic growth rate accelerated at a rate greater than 5 per cent. This growth rate could be partly attributed to industrial deregulation favoring the private sector. The deregulation made it easier for large manufacturing industries to expand without permission from the government[327]. This resulted in high levels of environmental degradation.

There are several milestones which ensured setting up of an institutional, legislative and management framework for pollution abatement in India during this period:

(1) Prior to the 1970s, the Federal government considered 'poverty' as the biggest polluter. They believed that environmental issues of developing countries were not side effects of industrialization but instead were a by-product of inadequate development. Subsequently, the top priority of the Indian government during this period was limited to eradication of poverty and hunger, along with improving the standard of living. Therefore, the government launched the Minimum Needs program which was expected to contribute towards reducing poverty, improving rural health, sanitation and nutrition and improving provision of housing and, thereby, reducing environmental issues[328].

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[326] Yale Center for Environmental Law & Policy, Yale University and Center for International Earth Science Information Network, Columbia University, *Global metrics for the environment: Ranking country performance on high-priority environmental issues* (2018)
[327] R. Mukherji, 'The State, Economic Growth, and Development in India' (2009) 8(1) India Review 81
[328] Planning Commission, Fifth Five Year Plan, 1974-79, Part II (1974) 138

(2) In 1972, the Committee on Human Environment was set up following the UN Conference on the Human Environment in Stockholm, which required India to submit a state of the environment report. These reports justified setting up of a national body (as suggested in the Fourth Five Year Plan) to bring about greater coordination in environmental policies and programs and also to integrate environmental concerns in the process of economic development[329].

(3) Following the conference, the National Committee on Environmental Planning and Coordination (NCEPC) was set up in 1972 under the country's Department of Science and Technology (DST). This marked a turning point in the history of environmental management. Prior to 1972, environmental concerns such as sewage disposal, public health and sanitation were dealt with by different ministries and, therefore, there was a lack of proper coordination at the federal and intergovernmental level[330]. During the establishment of the NCEPC, Indira Gandhi (the then Prime Minister) stated:

> 'Our emphasis should be on the qualitative improvement of life as a whole rather than on the quantitative growth of various sectors of economy. Our attention cannot be diverted from the main question before us which is to bring basic amenities within the reach of our people and to give them better living conditions without alienating them from nature and their environment, without despoiling nature of its beauty and of the freshness and purity so essential to our lives[331]'.

Therefore, after 1972, although the Government's philosophy was to secure the basic necessities of life for the public, it also included reducing the environmental impacts of agro-industrial activities. During the first environmental decade, the term 'co-existence' was used quite often by Indian policy and planners[332].

The NCEPC's success was dependent on cooperation from other ministries and departments. The Committee's duties were limited to planning and coordinating whereas the responsibility for

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[329] Department of Science and Technology (DST), Address by Indira Gandhi at the UN Conference on Human Environment, Stockholm, Sweden, 14 June 1972 (agenda notes for an NCEPC Meeting, 28-29 July 1972, p. 2)

[330] O.P Dwivedi, 'India: Pollution Control Policy and Programs' (1977) 43(2) International Review of Administrative Sciences 123

[331] O.P Dwivedi, 'Environmental Regulations in India' (1985) 7 The Environmental Professional 121

[332] O.P Dwivedi, *India's Environmental Policies, Programmes and Stewardship* (1st Edition, Macmillan Press Limited 1997) 51

execution remained with various other ministries and governmental organisations [333]. The Committee was assisted by the DST and Office of Environmental Planning and Coordination (OEPC). Over time, greater bureaucratization made decision-making more complex and led to a lack of coordination amongst the departments. As a result, the Committee's functions remained solely on paper[334].

(4) Following the Stockholm Convention in 1924, the Parliament also enacted the Water (Prevention and Control of Pollution) Act. In the same year, CPCB was also set up under Section 3(1) of the Water Act. Subsequently different states also set up their respective SPCB's under Section 4(1) of the Water Act.

(5) Later in 1977, following a few environmental controversies such as the Silent Valley[335] and Mathura refinery incident[336] which caused huge public outcry, the Tiwari Committee was established in 1980 under the Chairmanship of N.D. Tiwari (former Deputy Chairman of the Planning Commission). The Committee was responsible for setting up and reviewing the existing legislative and administrative measures for environmental protection. The Committee concluded:

(a) Development projects, which involved hydroelectric or thermal power generation, industry, agriculture and mining, should be closely associated with environmental issues;

(b) Environmental conservation should be the basis of all development; and

(c) Poorly planned developmental activities are causing many serious consequences for human health[337].

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[333] Department of Science and Technology (DST), National Committee on Environmental Planning and Coordination, Inaugural Function proceedings (12th April, 1972)

[334] Dwivedi (n 332) 56

[335] Silent Valley is an evergreen tropical forest in the Indian state, Kerala Through this valley, the Kuntipuzha river flows. The Silent Valley controversy arose when the government decided to build a dam on this river. The ecologists protested against this as the valley is one of the world's richest biological heritages and home to over 900 species of flora and fauna. It was one of India's first environmental campaigns to garner international support. The campaign lasted for 10 years and in 1983 it was declared as a protected area. [Jayashree Nandi, 'World Environment Day 2013: Remembering silent valley movement' *The Times of India* (June 5, 2013) < https://timesofindia.indiatimes.com/india/World-Environment-Day-2013-Remembering-silent-valley-movement/articleshow/20437771.cms >; Mathura refinery incident is an ongoing controversy which suggests that the refinery release toxic gases which is responsible for causing acid rain and corroding the Taj Mahal [SAH Naqvi, 'Mathura Refinery: Eating away history' Zee News (December 21, 2000)] < http://zeenews.india.com/home/mathura-refinery-eating-away-history_6128.html >

[336] which caused acid rain on Taj Mahal

[337] Department of Science and Technology (DST), *Report of the Committee for Recommending Legislative Measures and Administrative Machinery for Ensuring Environmental Protection (N. D. Tiwari Committee)* (15th September 1980) 24

(6) In response to the recommendations or conclusions of the Committee, the Department of Environment (DOE) was established in November 1980. It acted as a watchdog at the Federal level for environmental degradation in all sectors and as an agency for coordinating environmental matters. It is worth noting that, before India's first environmental decade was over, governmental policies and programs were modified to prioritize pollution abatement[338].

(7) The Tiwari Committee also recommended replacing the NCEPC with a National Committee on Environmental Planning (NCEP) whose functions would be similar to its predecessor[339]. This renaming and replacing of institutions carrying out the same functions is evidenced throughout the history of India's environmental institutional framework[340]. This only points out that whenever the government is faced with public outrage regarding environmental issues it renames the existing committees to signal it's commitment towards pollution abatement. Meanwhile, the renamed committees keep on carrying out similar functions as before. Furthermore, NCEP's duties overlapped with the duties of DOE and it appeared that one agency was allocated a subservient role. As a result, the NCEP could not acquire the same status as the US Council on Environmental Quality.

(8) Following a leakage of toxic gas from the fertilizer factory of Union Carbide's Indian subsidiary in Bhopal which killed several thousand people, the Supreme Court laid down[341] important principles and new jurisprudence in terms of liability for mass torts. It also led to the establishment of the EPA in 1986[342]. It was an umbrella legislation which included a comprehensive definition of 'environment[343]' and provided the Federal government with exclusive powers[344].

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[338] Prime Minister's Office (PMO), Letter from the prime minister to the state governments, no. 660-PMO/80 (20th April 1980); Department of Science and Technology (DST), Report of the Committee for Recommending Legislative Measures and Administrative Machinery for Ensuring Environmental Protection (15th September 1980) iii

[339] Dwivedi (n 332) 57

[340] Refer to Chapter 3, where GAP's institutions are renamed and new ones are constituted for every phase of GAP

[341] M.C Mehta Vs. Union of India, A.I.R 1987 S.C 1086

[342] S. Gupta, 'Environmental Policy and Governance in a Federal Framework: Perspectives from India' in J. Huang and S. Gupta (eds.), *Environmental Policies in Asia* (World Scientific 2014) 19

[343] According to the EPA 1986, section 2(a) ''Environment' includes water, air, and land and the inter relationship which exists among and between water''.
air, and land, and human beings, other living creatures, plants, micro-organisms and property"

[344] The EPA 1986, is discussed previously in Chapter 3. It is discussed in further detail later on in this chapter.

The high growth trajectory (1991 to present)

India introduced wide ranging economic reforms in 1991. These reforms included macroeconomic stabilization programs along with reforms in industrial policy. Though industrial de-licensing was initiated in 1984-85 it was limited to a few sectors. In the 1991 reforms, the coverage of industrial sectors that were de-licensed was expanded to almost all sectors. In addition, trade liberalization policies were initiated as well. This resulted in the removal of the complex import licensing system, reduction in custom duties and removal of quantitative restrictions on imports[345].

Although these economic reforms led to a high growth trajectory, they came at a price. An increase in water and air pollution-intensive exports in the post-liberalization period led to a rapid pollution growth[346]. A World Bank study concluded that as India's GDP doubled between 1975 and 1995, vehicular and industrial pollution also increased by up to four and eight times respectively[347]. The budgetary allocation to environmental issues in the eighth five-year plan (1990-95) increased by more than sixteen times as compared to that in the sixth five-year plan (1980-85). This indicates that the federal government started taking environmental issues seriously since the 1990s. The following are the developments in environmental management since the 1990s:

(1) In 1991, the Parliament passed the Public Liability Insurance (PLI) Act 1991 as a legislative sequel to the Supreme Court's ruling in the Oleum Gas Leak[348] case[349].
(2) In 1994, the first full legislative requirement for environmental impact assessment (EIA) encompassed in the Environmental Impact Assessment Notification (1994)[350] was enacted under the EPA 1986. Earlier in 1986, when the EPA was enacted, EIA was not directly required for development projects. However, under the EIA notification, it was made compulsory for all projects to get environmental clearance[351].

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[345] R. Banga and A. Das (eds), *Twenty Years of India's Liberalization: Experiences and Lessons* ([United Nations Conference on Trade and Development (UNCTAD), 2012]
[346] S. Gamper-Rabindran and S. Jha, 'Environmental Impact of India's Trade Liberalization' [2004] < https://www.gtap.agecon.purdue.edu/resources/download/1690.pdf >
[347] World Bank, *Down to Earth* (1999) 17(7) 32
[348] The M.C Mehta Vs. Union of India, A.I.R 1987 S.C 1086 was referred to as the 'Oleum Gas Leak' case.
[349] V. Raghavan, 'Public Liability Insurance Act: Breaking New Ground for Indian Environmental Law' (1997) 39(1) Journal of the Indian Law Institute 96
[350] The Environmental Impact Assessment Notification, 1994 (as Amended on 4 May 1994)
[351] W. Banham & D. Brew, 'A review of the development of environmental impact assessment in India' (2012) 11(3) Project Appraisal 195

(3) In 1997, the National Environment Appellate Act (NEAA) was enacted. After the enactment of the Public Interest Litigation (1991), there was an explosion of public interest litigation cases in environmental issues alone. With the judges facing difficulty in matters concerning science[352], it led to establishment of the National Environment Appellate (NEA). The NEA was constituted by the Central Government as a grievance redressal mechanism to examine issues from a perspective which involves law, science and various other administrative procedures[353].

(4) The NEA had failed to contribute successfully towards pollution abatement, even after several years since its establishment. In its 186th report (2003), the Law Commission of India stated that the NEA's work was limited to providing a forum for reviewing the administrative decision of the EIA[354]. Furthermore, since the year 2000, no judicial appointments had been made for NEA. The Commission further proposed setting up of an environmental court consisting of judicial members and technical experts[355]. Although before the NEAA, the National Green Tribunal Act was passed in 1995 by the Parliament but it was never implemented. In 2010, the NEAA was replaced by the National Green Tribunal[356].

There exist various environmental issues in India. Of these, water pollution poses a serious threat to the country.

4.2.1 **River Pollution**

India's water pollution is a growing problem as more than 70 per cent of its surface and groundwater resources are contaminated by inorganic, organic, biological and toxic pollutants. The country has twelve major river systems along with 45 medium and over 120 minor rivers,

[352] As evidenced in the Supreme Court case, A.P. Pollution Control Board vs Prof.M.V.Nayudu (Retd.) & Others on 27 January AIR 1999 SC 812

[353] National Environment Appellate Authority (NEAA) < http://assets.wwfindia.org/downloads/block_2__unit_5.pdf >

[354] Law Commission of India, *Proposal to Constitute Environmental Courts* [2003] (168th Report)

[355] N. K. Yadav, 'National Green Tribunal: A new beginning for environmental cases?' Centre for Science and Environment (CSE) (11 October 2011) < http://www.cseindia.org/national-green-tribunal--a-new-beginning-for-environmental-cases-2900 >

[356] Centre for Policy Research (CPR), 'Understanding the National Green Tribunal' [2016] < http://cprindia.org/news/5400>

forming a total catchment area of 252.8 Mha[357]. These river systems support more than 50 per cent of the population via agriculture, aquaculture, commercial and domestic uses. In 1995, India's CPCB found highly polluted stretches in eighteen major rivers of India. In fact, many of these water sources are considered unsafe for human consumption as well as for various other agricultural and industrial activities. Furthermore, as most of these polluted stretches are found near urban areas, it indicates that the industrial and domestic sector's contribution to water pollution is much higher than recognized by the Indian government. In rural areas, on the other hand, agricultural activities contribute significantly towards river pollution[358].

India's total annual surface water availability is estimated at 1,869 billion cubic metre (bcm) but, because of spatial temporal variations, only 690 bcm of surface water is utilizable. In addition to this, if 432 bcm of replenishable groundwater is added, the total water availability amounts to 1122 bcm which is just about sufficient to meet the present water needs of India. But as the total water available is almost nearly constant, the demand supply balance will soon be strained with a rising water demand and water pollution[359].

Currently, 80 per cent of untreated wastewater is released into the rivers. According to a 2009 CPCB report, though India's daily sewage generation amounts to 57,000 MLD (million litres per day), it only has capacity to treat approximately 20,000 MLD. Moreover, most wastewater treatment plants do not function at full capacity and, even if they do, they do not adhere to the standards prescribed by the pollution control boards for sewage discharge[360]. A Centre for Science and Environment (CSE) report, entitled 'Excreta Does Matter', found that the dumping of untreated sewage is 'killing' the Indian rivers[361]. As a result, around 40 per cent of the 14500 kilometers of India's inland waterways is severely polluted[362].

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[357] Ministry of Environment and Forests (MoEF), *State of the Environment report* (2009) 3

[358] S. Kumar and M. N. Murty, *Water Pollution in India: An Economic Appraisal* (India Infrastructure Report 2011: Water: Policy and Performance for Sustainable Development) (IDFC and Oxford University Press, 2011) 285

[359] A. Gaur and P. Amerasinghe, *A River Basin Perspective of Water Resources and Challenges* (India Infrastructure Report 2011: Water: Policy and Performance for Sustainable Development) (IDFC and Oxford University Press, 2011) 3

[360] 2030 Water Resources Group, *Circular Economy Pathways for Municipal Wastewater Management in India: A Practitioner's Guide* (2016) 45

[361] A. F. Presse, 'India River Pollution: 80 Percent of Indian Sewage Flows Untreated Into Country's Rivers' The World Post (US, 6 December 2017) < https://www.huffingtonpost.com/2013/03/05/india-river-pollution-sewage_n_2810213.html >

[362] Central Pollution Control Board (CPCB), *River stretches for restoration of water quality* (2015) < http://www.indiaenvironmentportal.org.in/files/file/RESTORATION-OF-POLLUTED-RIVER-STRETCHES.pdf >

Starting in 2014, after a change of the Federal ruling party, river pollution has emerged as a national priority. However, appropriate institutional structures, legal framework and good governance are required to successfully address the problem.

4.2 Water law in India

India's water law is very difficult to map. It consists of a variety of legal instruments (both at the Federal and state level). In addition, it also consists of numerous legal instruments which are generally recognized as belonging to different areas of law such as, environmental law but instead are labeled as water law. Further, there also exist various other relevant instruments, such as administrative directions and statutes, which govern several different areas of water regulation and are not covered by separate legislation[363].

India's water law is a moderately old and complex area of law. Its long-standing focus on regulation, control over water rights and access to water has ensured that it addresses these different dimensions individually. This has led to the formation of a composite structure which is difficult to grasp as a single complete framework[364].

4.2.1 **Legislative fragmentation of water law**

India lacks an umbrella framework for regulating freshwater and all its dimensions. The existing water law framework is an amalgamation of different rules and acts adopted over decades. The absence of an umbrella legislation at the national level leads to situations where the Federal legal interventions and different state interventions do not essentially coincide[365].

As mentioned earlier, water in India is a state subject. As a result, all the states of the Union are liable for dealing with their own water issues. On the other hand, the Federal government has the constitutional mandate for resolving issues with regards to interstate use of waters. In addition, it is also responsible for planning water allocation and delivering technical support with regards to large projects (for instance, power generation projects, drinking water projects, irrigation and

[363] P. Cullet and S. Koonan, *Water law in India: An Introduction to Legal Instruments* (Oxford University Press, Second Edition 2017) 1
[364] Ibid 1
[365] P. Cullet, 'Water law in India: Overview of existing framework and proposed reforms' [2007] International Environmental Law Research Centre 5

navigation projects, etc.). The federal government has also established various water related institutions such as the Central Ground water authority, Central Water Commission, numerous ministries (eleven, in total), boards, departments and commissions. All these institutions have some jurisdiction on water related issues. At the state level, the state governments also have similar sector-specific water departments (with separate ones for major irrigation and hydropower projects for environmental monitoring). Such fragmentation, between and within the state and federal governments, makes the task of implementing policies extremely difficult[366].

In addition, at the state level, India's water law is also characterized by substantive gaps. In certain cases, it has been very difficult to fill the identified gaps as linkages between access to land and access to water have caused resistance amongst the beneficiaries of the earlier system against proposals to overhaul it[367]. As a result, water law has remained more conservative than other areas of law in India. For instance, though water has remained a central concern of environmental law and has developed rapidly since the 1970's, water legislation, including recent acts, lack environmental perspective. As a signal of this dichotomy, the most important piece of legislation with regard to water pollution, the Water (Prevention and Control of Pollution) Act 1974, is considered as a part of environmental law rather than water law[368].

Regulation of water is a complicated affair in India. This is partly a result of the water law being developed over many years[369] '*with the legislature's codification effort focusing each time on specific water bodies or water uses*[370]'. It is also because of the fact that, a long time ago, it was understood that the country required some sort of decentralization, given its size. As a result, this led to the development of dissimilar regulatory frameworks in different parts of the country, which in turn resulted in a *'multifaceted area of law that largely eluded lawyer's attention for a long*

[366] S.P. Prabhu, 'India's Water Challenges' [2012] accessed on 11 November 2018 < https://www.files.ethz.ch/isn/154067/PrabhuBrief.pdf >
[367] Cullet and Koonan (n 363) 1
[368] Ibid (n 364) 2
[369] For a long time, development of the country's water law revolved around the usage of water for productive activities (agriculture, industry, domestic purposes etc.). As a result, water law was initially concerned primarily with irrigation and land rights. Gradually, there has been a shift towards water conservation and protection, as well as the provision of safe drinking water.

[370] Cullet and Koonan (n 363) 4

time[371]*'*. Apart from the fact that access to safe drinking water is a basic human right[372], it also plays a significant role in livelihoods (primarily, in agriculture). Consequently, it is required to be regulated in a manner which includes both its preservation and protection in the short, medium and long terms. This characterizes a huge challenge in India's context as states play a pre-dominant role in water regulation[373].

4.2.2 **Legal framework of water law**

India does not have legislation specifically for river pollution abatement. Instead, it has an amalgamation of law, statutes and water policies which are aimed at water pollution abatement.

The preferred method for river basin management in India was believed to be through employment of river basin organisations. Subsequently, in 1956, there was an attempt to formulate a River Board Act. However, that was purely aimed towards developmental projects (such as, construction of dams). Since independence, several river boards were set up as river basin organisations in India with the expectation that these boards would take up river basin management. However, none of the river basin organisations done so. Given the lack of river basin law in India, the next section describes the structure of India's general water or environmental law and the specific laws in terms of river water resources management. Given the country's size, the laws could be categorized into three different categories (national level, state level and local level laws) and have been discussed below:

At the National Level

Unlike several other countries, India does not have a national water law. There are numerous laws at the state level and a few at the central level but there exists no overarching umbrella legislation to regulate freshwater in all its dimensions. A generic response to the fragmented and sectoral nature of Indian water law has been the development of water policies at the national and state level, such as the National Water Policy (NWP) 1987[374]. This policy only provides a broad

[371] Ibid (n 363) 5
[372] For instance, see Article 21 of the Indian Constitution at country level and UN Resolution A/RES/64/292 at the international level
[373] Cullet and Koonan (n 363) 2
[374] Cullet (n 365) 6

framework for the water sector but fails to fill in the gaps of the sectoral legal framework[375]. In addition, the NWP lacks statutory backing or force[376]. The existing water law framework in India comprises of a number of different principles, acts and rules adopted over many years, which include not only common law principles and irrigation acts from the colonial period but also recent judicial recognition of water as a human right and regulation of water quality[377].

The need to adopt a water framework act was recognized in 2010. Jammu and Kashmir was the first Indian state to take steps in this regard by adopting the Water Resources (Regulation and Management) Act, 2010 which merged various sectors of water law and management in one act. In the case of Rajasthan, though two draft bills have been prepared, the legislation has not yet been adopted[378].

At the state and local levels

India's water law is significantly influenced by the pre-independence era, where irrigation matters were delegated to states. This is evidenced by the Government of India Act 1935[379] (enacted before India's independence in 1947) which specifically provided powers to the provinces concerning water supply, drainage and embankments, canals, irrigation, water storage and hydropower. After independence, the Indian Constitution maintained the fundamental scheme chosen in 1935 and provided states with the leading role in water and river regulation. Water was therefore included in the state list acknowledging the fact that different water issues might arise in different parts of the country[380]. In general, India's water law is largely state based[381]. According to the Constitution, water is in the 'state' list and, consequently, states have the power to enact legislation regarding water issues like irrigation and canals, water supplies, drainage, water storage, water power, and embankment, except for development and regulation of river valleys and inter-state rivers, where

[375] Cullet and Koonan (n 363) 6
[376] John Briscoe and R.P.S Malik, *Handbook of Water Resources in India: Development, Management and Strategies* (The World Bank and Oxford University Press, 2007)
[377] Cullet (n 365) 7
[378] Cullet and Koonan (n 363) 7
[379] The Government of India Act 1935, Section 130 to 134
[380] The Constitution of India, Schedule 7, List II
[381] Cullet (n 365) 4

the Federal government's intervention is required. Further, there are other instances in water management where the Federal government can intervene[382]:

(1) Firstly, with regards to settlement of inter-state water disputes Article 262 of the Indian Constitution permitted the Parliament to legislate on this issue. As a result, the Inter-State River Water Dispute Act was adopted in 1956.

(2) Secondly, certain powers were reserved for the Central government in the 7th Schedule of the Indian Constitution. Regulation of inter-state rivers was one such issue which resulted in the enactment of the River Boards Act in 1956. This Act however is only partially successful because, till date, there are only a few broad-based river authorities, such as the Narmada Control Authority, which function at the operational level[383].

(3) Thirdly, the Federal government can take action under Article 252 of the Constitution which permits the Parliament to adopt an act under circumstances where the states have been incompetent in dealing with an issue. However, even under such circumstances, the Federal government requires the assent of the states before intervention. This was the basis for the adoption of the Water (Prevention and Control of Pollution) Act 1974[384].

It is also worth noting that the Federal Government uses financial resources as the stick to ensure that states follow the environmental measures[385].

The constitutional division of powers between the Federal and the state government forms a significant part of the basic water law framework. However, adoption of the 73rd and 74th amendments in the Constitution has considerably strengthened governance at the local level. In the rural areas, panchayat institutions[386] are now provided specific powers and responsibilities in the context of water management, minor irrigation, drinking water supply, fisheries and water shed development[387]. Correspondingly, the municipalities (in the urban areas) have also been provided

[382] S.R. Wate, 'An Overview of Policies Impacting Water Quality and Governance in India' (2012) 28(2) Water Resources Development 265

[383] A.D Mohile, 'Government Policies and Programmes' in Briscoe and Malik (eds.) (n 376) 10

[384] P. Cullet, *Water Law, Poverty, and Development : Water Sector Reforms in India* (Oxford University Press, 2009)

[385] Ibid 37

[386] In India, panchayati Raj was introduced by the constitutional amendment in 1992. It is a system of governance with three levels: Gram panchayat (village level), Block Samiti or Panchayat Samiti or Mandal Parishad (block level) and Zila Parishad (District level). In this system, gram panchayats are the basic units of local administration.

[387] Constitution of India, Article 243G and Eleventh Schedule

powers over water supply for commercial, industrial and domestic purposes[388]. These changes proposed in the constitutional amendments are momentous as they have effectively distributed power amongst the democratically elected local bodies[389]. The significance of democratic bodies and constitutional sanction cannot be highlighted enough in the context of water, especially in developing economies[390].

4.2.3 **Multi-sectoral Framework**

Over time, water law in India has grown in a sectoral manner with different rules and statutes being acquired for different water uses and different water bodies. This sectoral division could be considered as positive as the importance of water has been recognized in different sectors such as drinking water, irrigation and industrial use. However, this sectoral division has been very difficult to maintain as it hinders sustainable water protection[391].

Though the complex nature of water law is usually identified in areas like irrigation and groundwater law, significant development has occurred in environmental law which includes water as one of the key elements covered[392]. It is surprising that though the country's water law fails to identify water conservation or protection as one of its significant components, the Water (Prevention and Control of Pollution) Act (1974) is one of the earliest and significant pieces of environmental law enacted. This further contributes towards fragmentation of water law and to its complexity[393].

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[388] Constitution of India, Article 243W and Twelfth Schedule

[389] In India, local government should ideally deal with river pollution issues. As India is a very diverse country every village/municipality's public have their own religious beliefs and traditions about various rivers (as mentioned earlier, that in India, rivers are considered sacred). As a result, to involve the public in river clean-up efforts, the authorities should understand and reflect the sentiment of the public with regards to the rivers. This obviously would not be possible if the federal or the state government implement laws at the macro level. For instance, Lord Denning's English-Oak-Tree-in-Africa metaphor statement could be referred to in this scenario, when the English attempted to transplant their law off to far-off lands and failed, '[i]n those far-off lands the people must have a law which they understood and which they would respect'. Similarly, in India's case the local authorities ought to deal with the water resources protection as they have a better understanding of the micro-level circumstances and about the local public's religious sentiments as well.

[390] Cullet (n 384) 38

[391] Cullet and Koonan (n 363) 6

[392] Environment (Protection) Act 1986, [explained in detail later] Ibid 6

[393] Cullet and Koonan (n 363) 6

The next section discusses the laws which have provisions for river pollution abatement and could be used effectively for that purpose.

4.2.4 **Laws which could be used for regulating river pollution**

As mentioned earlier, India does not have any statutes specifically designed for regulating river pollution. However, some specific laws that could be used for rivers are briefly reviewed here[394]:

Water (Prevention and Control of Pollution) Act, 1974

Although the Central Government's role in water regulation is limited by the constitutional scheme[395] the significance of national regulation in water has been established in certain areas. The Water Act was adopted by the Parliament in 1974[396]. It was the country's first attempt to deal with environmental issues. The Water Act was amended twice, once in 1978 and again in 1988, to correspond with the provisions of the Environment Protection Act (EPA) 1986. This Act is the most significant legislation to control water pollution in India. It was enacted after fourteen years of procedural and bureaucratic issues and jurisdictional battles between the Federal and the state governments. This delay was a result of a lack of cooperation between the Federal and the state governments. As water is within state jurisdiction, the enactment of this legislation required the Federal government to seek approval from at least two state legislatures in the form of resolutions[397]. This Act defines water pollution as:

> '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[398]'

[394] P. Cullet et.al., 'Water Conflicts in India: Towards a new legal and institutional framework' (2012) Forum for Policy Dialogue on Water Conflicts in India 6
[395] The conditions under which the Federal government can intervene in State's water issues are explained in detail in 'At the state level' section
[396] Cullet (n 377) 4
[397] O.P. Dwivedi and B. Kishore, 'Protecting the Environment from Pollution: A Review of India's Legal and Institutional Mechanisms' (1982) 9(22) Asian Survey 894
[398] Water (Prevention and Control of Pollution) Act 1974, Section 1(e)

This Act establishes the CPCB to act as a national level agency for coordinating the State Boards' activities and for resolving disputes amongst them, along with providing technical assistance and guidance to them[399]. This Act also provides guidance regarding penalties and procedures. However, if a party fails to comply with the directions under this Act, only the State Government is authorized to press charges against the offending party[400].

A review of the 1974 Act indicates that though the Act has provisions for prevention and control of water pollution, its scope is restricted to streams and wells. Furthermore, State Boards have no powers to shut down a non-compliant industry. The State Board may seek a court order to restrain the polluters. However, as judicial procedures in India are time consuming, the offending parties might thwart the objective of the Boards through drawn-out litigation. Lastly, the control of point-source pollution, as outlined in the Act, might not be an appropriate way for pollution abatement. Instead, a combination of standards for maintaining the water quality of the rivers along with their corresponding assimilative capacities should be considered for every stream and river separately before industrial discharge[401] . In addition, the Water Act (1974) is limited in its application to the states as water is a state subject[402].

The text of the Water Act gives the illusion / misconception that India has a viable regulatory strategy for tackling water pollution but, in reality, it is not readily enforceable nor effective. Further, the complicated administrative organization set up by the Act is poorly staffed and its work is limited to routine work. The Water Act is deficient in five areas, as detailed by Abraham and Rosencranz[403]:

Consent administration:

(1) Pollution control is carried out using a permit or 'consent' procedure. Under the Water Act, a consent must be obtained from the respective SPCB for constructing or altering a drain outlet for discharge of sewage into a stream[404]. The Board also has the authority to revoke

[399] Ibid Section 16
[400] Water (Prevention and Control of Pollution) Act 1974, Section 49(1)
[401] Dwivedi and Kishore (n 397) 904
[402] S. G. Hadden, 'Statutes and Standards for Pollution Control in India' (1987) 22(16) Economic and Political Weekly 90
[403] C. M. Abraham and A. Rosencranz, 'An Evaluation of Pollution Control Legislation in India' 1986 101(11) Columbia Journal of Environmental Law 107
[404] Water (Prevention and Control of Pollution) Act 1974, Section 24 and 25

its consent or change the conditions at any time[405]. However, these broad powers have never been evoked and bear little or no relation to the actual functioning of the Boards. For instance, hypothetically speaking, if any industrial operator violates the conditions of the permit, the Board can withdraw its consent. However, this would only result in a new application for consent, at times accompanied by political interventions on the applicant's behalf. In the meantime, in the absence of a permit, the polluter will continue discharging sewage, violating the Board's order and authority. In such circumstances, the Board can initiate a prosecution and the likely outcome would be a modest fine on the polluter. Such prosecutions rarely act as pollution deterrents for large industries. In addition, prosecution is a time-consuming process in India, making it ineffective to use as an instrument for pollution control. There is also a loophole in this Act with regard to the consent procedure. Section 25(7) mentions that if the State Boards are unable to consider an application within four weeks of its submission it shall be deemed that the industrial operator be provided unconditional consent. Given the fact that the Boards are already facing a shortage of staff, this provision might lead to the unintended validation of illegal polluting activities[406].

Structure of Pollution Control boards:

(2) The Water Act has provisions elaborating the structure of the Central and State Pollution Control Boards[407]. An analysis of these statutory agencies' structure, functions and powers reveal that they are inefficient in managing and adopting pollution control measures. The Constitution of the CPCB, which should comprise seven to seventeen members, requires only two of them (Chairman and Secretary) to have expertise in environmental matters[408]. Furthermore, there are no minimum required qualifications for the other nominees[409]. The Federal government is also required to nominate five government officials from amongst the members of the State Boards[410]. Often these officials are agency heads who are already overstretched by their existing duties which, in turn, affects the efficiency of the Boards. Moreover, most of India's major polluters are government enterprises as many actors

[405] Ibid Section 41
[406] Abraham and Rosencranz (n 403) 108
[407] Water (Prevention and Control of Pollution) Act 1974, Section 3 and 4
[408] Ibid Section 2 (a to e)
[409] Abraham and Rosencranz (n 403) 108
[410] Water (Prevention and Control of Pollution) Act 1974, Section 2 (c to e)

within the steel and coal, natural gas, agrichemicals and power industries are public sector undertakings. As a Board comprises all government nominees this might result in conflict of interests. In brief, with the given constitution of the pollution control boards, there is a possibility of excessive government control over the board[411].

Further, there has not been a single instance where the SPCBs have been able to successfully clean up a river or which has led to river pollution abatement under this Act. In addition, under the Act, polluters have never been penalized for damage caused, except in rare exceptions. The exceptions include the tanneries in Vellore (Tamil Nadu) who were held responsible for discharging untreated effluents into the River Palar which served as a drinking water source for nearby residents. The SC ordered the tanneries to pay compensation to 29,193 families in 186 villages[412]. In another instance, a dying industry in Tirupur of Tamil Nadu was ordered to shut down by the High Court for discharging untreated effluents into the River Noyyal which made the water unfit for irrigation or drinking[413].

Setting of standards:

(3) Water quality standards are required to be set out explicitly to ensure the Act's enforceability in the courts. Under the Act, the State board has been set up as the standard setting authority[414] whereby Sections 24 to 26 of the Act require different standards to be set up for different regions.[415]

Since setting the standards contains extensive administrative discretion, the Act should have laid down broad procedural requirements. Further, the Act also offers no guidance to the Boards in setting proper standards. As a result, the Boards have not developed their own standards. Instead, in practice, the standards prescribed by the Indian Standard Institute (ISI) are followed. However, the ISI standards only act as guidelines for the Boards as these standards are uniform for industrial sewage. In addition, the Act does not contain any provision for influencing big industrial siting decisions. Only after a site has

[411] Abraham and Rosencranz (n 403) 109
[412] Vellore Citizens Welfare Forum vs. Union of India AIR 1996 SC 2715: (1996) 5 SCC 647
[413] Tirupur Dyeing Factory Oweners Association vs Noyyal River Ayacutdars Protection Association and Others, Civil Appeal No.6776 of 2009 at Special Leave Petition (Civil) No. 6963 of 2007
[414] Water (Prevention and Control of Pollution) Act 1974, Section 24 (1)(a)
[415] Abraham and Rosencranz (n 403) 114

been chosen and approved by the Ministry of industry at the Federal or State level can the Boards intervene in the site selection process[416].

Public participation:

(4) The decision-making in India with regards to pollution control can be divided into three categories namely, (a) inquiry stage; (b) permit granting stage; and (c) appeal to the State Board's administrative rulings and permit conditions. Public participation can play a crucial role in each of these stages. As water pollution affects the public adversely, the public should be provided with an opportunity to participate in all the stages of pollution control decisions. Section 25(3) of the Water Act authorizes the State Board to '*make such inquiry as it may deem fit in respect of the application for consent and in making any such inquiry shall follow such procedure as may be prescribed.*[417]' However, to verify the information given by an applicant, an officer from the State Board visits the site. This officer is not required to interact with members of the public living besides the plant/industry whilst making a decision. In fact, the Water Act does not have any provision for allowing the public to participate in the Board's decision at any of the three above-mentioned stages[418].

Lastly, this Act is based on criminal justice[419]. The principle, that it is based on, says that if firms do not comply with pollution control regulations they will be fined. As a result, polluters found it economical to pay penalties instead of complying with the Act. If this Act was based on law of torts instead, the polluters would have had to pay the equivalent amount as the damage caused, which in turn would have ensured compliance. Other underlying factors for the ineffectiveness of this Act include issues, such as, the procedural complexity of proving criminal liability and unpredictable outcomes for litigation[420].

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[416] Ibid 115

[417] Water (Prevention and Control of Pollution) Act 1974, Section 25(3)

[418] Abraham and Rosencranz (n 403) 110

[419] C. Singh, 'Legal policy for the control of environmental pollution' in P. Leelakrishnan (ed.), Law and Environment (Department of Law, University of Cochin, 1984) 1-27

[420] B. Bowonder and S. S Arvind, 'Environmental regulations and litigation in India' (1989) 4(4) Project Appraisal 183

Wild Life (Protection) Act, 1972

Section 35(6) of the Wildlife (Protection) Act 1972 forbids anybody from stopping or increasing the flow of water inside or outside a National Park with the exception in cases where permission has been sought from the Chief Wild Life Warden. It further states that the permission will be granted only if the state government in consultation with the National Board agrees that this change in flow would be necessary for the improvement and well-being of wildlife therein[421]. This important provision of the 1972 Act could have been useful for improving river water quality of various rivers but it has been rarely used[422].

However, there are certain instances where proposals for construction on rivers have been discontinued using section 35(6) of this Act. In 2008, the proposal for the Chambal Development Scheme, which involved development of four hydropower projects on the Chambal River in Rajasthan, was not sanctioned by the National Board for Wildlife Committee[423] as it would have destroyed the river and wildlife dependent on it. Similarly, in 2014, after the Supreme Court declared the Bhagirathi River and the area around it in Uttarakhand an ecological zone, the Union Government was forced to abandon its plan of constructing hydropower projects on that river[424].

Forest Conservation Act, 1980

Section 4(6) of the Act helps protect rivers which pass through the forests by putting a restriction on mining activities on river beds. However, the Act has not yet been utilised to date for protecting rivers, not even in the most deserving cases[425].

Electricity Act, 2003

Section 8(2) of this Act states that the Central Electricity Authority (CEA) can only approve hydro-projects if the proposal is the best possible development of the river for power generation and

[421] Report of the Central Empowered Committee of the Supreme Court (2005), in the Keoladeo National Park (Bharatpur Bird Sanctuary) case
[422] Cullet et. al (n 394) 6
[423] Gharial Conservational Alliance, 2009 < http://www.gharialconservationalliance.org/?p=49>
[424] S. Sharmal, 'SC committee rejects 23 of 24 proposed Uttarakhand hydro projects' (The Times of India, 9 April 2014) < https://timesofindia.indiatimes.com/india/SC-committee-rejects-23-of-24-proposed-Uttarakhand-hydro-projects/articleshow/33478846.cms >
[425] Cullet et. al. (n 394) 7

consistent with requirements for drinking water, irrigation, flood control, navigation and other public purposes. However, the South Asia Network on Dams, Rivers and People (SANDRP) found out through the Right to Information Act that the CEA consults only two organisations while approving hydro-power schemes under the Electricity Act-the Geological Society of India (GSI) and the Central Water Commission (CWC). Although GSI and CWC assess the scheme through the specific parameters of geology and hydrology, they do not consider the other basin related issues as required by the Act, nor does the CEA consult the stakeholders likely to be affected. As a result, this Act has not been able to contribute towards the protection of rivers[426].

Environment (Protection) Act (EPA) 1986

The EPA was expected to fill the void of an umbrella statute for the environment and to act as a blue print for a progressive policy to protect ecosystems. This Act strengthened the Central Government's role in environmental decision-making. Although it seems to be an operating act, in reality, it is enabling legislation. One of the advantages of this Act lies in the fact that it does not contain any of the intricacies of the Water Act 1974[427].

One of the critiques of the EPA is that it demonstrates a total lack of understanding of the '*modern*[428]' concept of environmental pollution. The definition of 'environmental pollutant' in Section 2(b) is arbitrary and inadequate. It defines the above concept as '*any solid, liquid or gaseous substance present in such concentration as may be, or tend to be, injurious to environment*[429]*'*. Further, when it specifies the three states of environmental pollutant in Section 2(b), it has left out 'plasma[430]', the fourth state, which is used in enhanced scientific and technological experiments. Therefore, it can be argued that the present definition of environmental pollutants might lead to issues in regulation[431]. In addition, the definition of 'hazardous substance' in Section 2(e) has many loopholes and thus limits control over harmful substances[432]. In other words, the definitions provided in Section 2 are ambiguous on many instances.

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[426] Ibid 7
[427] K. Jayakumar, 'Environment Protection Act: A Critical Overview' [1987] Cochin University Law Review 33
[428] Ibid 35
[429] The Environment (Protection) Act 1986, Section 2(b)
[430] Plasma can be considered the fourth state of matter that causes pollution. It is used in many advanced technological and scientific experiments and is at the threshold of industrial use.
[431] Jayakumar (n 427) 35
[432] Ibid 35

Chapter II describes the general powers of the Central Government. Section 3 of this Act is a copy of Article 48(A) of the Constitution expressed in different words[433]. Taking into consideration, the enabling nature of this Act, the sections and their corresponding details are superfluous, except the ones relating to appointment of officials and constitution of authorities[434].

Chapter III lays down the provisions relating to the prevention and abatement of environmental pollution. Advances made in testing and laboratory technology were not considered while drafting the provisions relating to sampling and testing.

Despite its flaws, the EPA has played a crucial role in attempting to conserve and protect water. For instance, it has provided powers to the Federal Government to establish authorities under Section 3(3). This has been the basis of setting up various notifications and numerous water-related institutions. For instance under this Act, the National Ganga River Basin Authority Notification, 2009 established the Water Quality Assessment Authority[435].

Although this is a powerful Act which provides the MoEF with considerable powers to protect India's rivers both directly and indirectly, unfortunately, the Act has not been used for this purpose even in the most deserving cases[436].

4.2.5 **River basin management and organization**

In India, the River Basin Organisation (RBO) was always thought to be the preferred method for river basin management,[437] but the philosophy behind employing RBOs was to utilise the river through large dam projects instead of pollution abatement[438]. After India's independence in 1947, dams were considered to be important means of 'development' which could be promoted through centralized management, as evidenced by the success of the 'Tennessee Valley Authority

[433] Artcle 48A was inserted via the 42nd constitutional amendment. It directs the state to protect and improve the environment and safeguarding wildlife and forests. It is the fundamental duty of the state to apply this Article while legislating laws.
[434] Jayakumar (n 427) 35
[435] Cullet (n 377)
[436] Cullet et. al (n 394) 7
[437] M.A Chitale, 'Development of India's river basins' (1992) 8(1) International Journal of Water Resources Development 30
[438] South Asia Network on Dams, Rivers and People, *River Basins Organisations in India – Institutional Frameworks and Management Options* [1999] < https://www.zef.de/uploads/tx_zefportal/Publications/75c0_0f22_Saravanan-RiverBasin_wcd.pdf >

(TVA)[439]' in the United States of America. Subsequently, the Damodar River Valley project was developed to control floods, generate power, irrigate land and make the river navigable[440]. This resulted in the enactment of the Damodar Valley Corporation Act (DVC) in 1948. To enable the development of other rivers in the country along the lines of DVC, the River Boards Act was enacted in 1956. The Act was set up to regulate and develop the river valley projects by establishing the River Valley Boards (with either the consent of corresponding State governments or by notification via the official gazette)[441]. The Board's role was to advice the participating states with respect to preparing, monitoring and coordinating the development of river valley projects.

Since independence, several river boards were set up as river basin organisations in India[442]. It was expected that the RBOs would advocate river basin management and development. However, so far not a single river basin board has taken up the issue of integrated development and management of the river basins[443]. The underlying reasons for this are: firstly, most of the projects were limited to constructing or operating a specific engineering project. Secondly, from the perspective of river basin development, the river boards were guided by an engineering perspective for development of projects and completely ignored community involvement for managing environmental issues. Furthermore, none of the organizations carried out EIAs before developing the projects[444].

4.2.6 **Redefining / reforming the role of government**

Redefining the role of government in India's water sector included setting up water regulatory authorities in order to take over part of the responsibilities of the existing government departments

[439] It was a federally owned corporation in the USA created by the Congressional charter in 1933. It was established to provide flood control, electricity generation, navigation, fertilizer manufacturing and economic development to the Tennessee Valley, an area which was affected severely by the Great Depression.
[440] W. Kirk, 'The Damodar Valley - Values optima' (1950) 40 Geographic Review 415
[441] The River Boards Act, 1956 [Article 4(1)]
[442] For instance, the Bhakra-Beas Management Board was set up in 1966, followed by the Bhakra-Beas Management Board in 1972. Later, in 1976 the Betwa River Board was constructed, followed by the Upper Yamuna River Board and Brahmaputra Board. [South Asia Network on Dams, Rivers and People (n 438) 28
[443] A. Vaidyanath, *Water Resource Management: Institutions and Irrigation Development in India* (Oxford University Press, 1999); South Asia Network on Dams, Rivers and People (n 438) 5
[444] Ibid 5

concerned. The first experiment undertaken in this regard was the adoption of the Water Resources Development Corporation Act[445] in 1997 in the state of Andhra Pradesh (AP)[446].

Later, an independent water institution was set up under the Maharashtra Water Resources Regulatory Authority Act 2005 for the purpose of river pollution abatement.

Maharashtra Water Resources Regulatory Authority Act (2005)

The Act provides river basin agencies and state water board with a legislative basis for formulating river basin and state water plans. It is worth noting that one of the important criteria for formulating state river water plans is the protection of environmental flows[447].

In addition, this Act has also attempted to entirely exclude political leaders from the '*power structure*[448]'.On paper, the Act does take a clear stance against political interference but, in reality, bureaucracy still plays an indirect role[449].

Various other states such as Uttar Pradesh (UP) (2008) and Andhra Pradesh (AP) (2009) have enacted such Acts. However, neither Act explicitly mentions protection of rivers or environmental flows.[450]

Theoretically, the fragmentation of India's water law and its complexity is not necessarily a negative thing as water regulation in India can never be simple. However, the reality is that this sectoral development of water law has resulted in institutional competence being shared amongst different ministries and departments, none of which have an operational mandate to look after water or to coordinate the implementation of the corresponding laws and policy. In fact, even at the Federal level, the Ministry of Water Resources, also known as the '*umbrella ministry for water*[451] does not deal with every aspect of water regulation. It mostly focuses on promoting development of water related infrastructure, such as dams[452]. However, it should be noted that the Ministry has been renamed as the Ministry of Water Resources, River Development & Ganga

[445] For further details, refer to : http://www.ielrc.org/content/e9702.pdf
[446] Cullet (n 377) 10
[447] Ibid 8
[448] Cullet (n 377) 10
[449] Ibid 11
[450] Cullet (n 377) 8
[451] Cullet and Koonan (n 363) 6
[452] Ibid 6

Rejuvenation since July 2014. Furthermore, the ministry has also started to act as the National Ganga River Basin Authority for conservation and management of the river Ganga and its tributaries. Whether this measure will be effective in relation to river pollution remains to be seen.

According to the Indian Constitution, water is a state subject. Therefore, in the absence of a national law or uniform law or policy, water management remains generally uncoordinated. As a result, different states have different legal positions on water management. It is worth noting that the Supreme Court, in various judgements and on various water related issues, has emphasized the importance of the *jus gentium*[453] principle or the doctrine of public trust at the national level[454]. This doctrine of public trust could be utilised efficiently for ensuring good ecological status of water resources[455].

4.2.7 **Legal Activism in river pollution**

Recently, environmental activists, legal scholars and public officials have observed that the initiative to bring about environmental reforms, especially in river pollution, has been brought about more by the courts and less through executive and legislative actions. The time period, mid 1980s-90s, was a very active period for the involvement of Indian courts in environmental issues[456].

India's environmental legal activism has contributed towards the use of public interest litigation (PIL), which has evolved over the years from its '*dependence on constitutional provisions and the decisions of post-independence justices to the current level of legal activism*[457]*'*.

Public Interest Litigation (PIL) in environmental issues

[453] It is a body of law, which is recognized by nations as binding and governs their relation with each other. Application of jus gentium led to the birth of the public trust doctrine. Public trust became a part of English Common law through Magna Carta [Mohd Shawahiq Siddiqui, 'Water Policies and Legal Framework in India' (2008) Conference Papers h042921, International Water Management Institute < http://publications.iwmi.org/pdf/H042921.pdf]

[454] Constitution of India, Article 21; India's Supreme Court is influenced by the Water Framework Directive (WFD) of the European Union. It is a directive which commits the European Union member states (27 member nations) with diverse traditions and cultures to change their water laws to attain a common vision based on a uniform set of principles inherent in *jus gentium* [Siddiqui (n 453) 582]

[455] Ibid 582

[456] K. D. Alley, 'Legal Activism and River Pollution in India' (2009) 21 Georgetown International Environmental Law Review 793

[457] Ibid 793

India's PIL comprises cases which addresses issues affecting the common goods. PIL offers an opportunity for citizens to challenge the political and institutional 'power structure' from within the constitutional framework. Cases concerning environmental issues and problems are referred to as 'environmental PILs'[458].

The origin of PIL's could be traced back to the 1975-76 emergency[459]. PIL emerged along with environmental and human rights activism and investigative journalism. It brought about a period of judicial populism by '*charismatic*[460]' justices.

With the introduction of PIL, Justices were concerned about opening up usage of law to all socio-economic classes in the post-independence period[461]. In this process, Justices debated amongst themselves over various procedural and standing matters. Citizens were also included in the discussions which questioned matters involving public interest and how can constitutional rights of citizens be represented or argued for[462].

Eventually, a unanimous interest was developed in relaxing the rules on standing[463]. Further, while relaxing the rules on standing, the Courts were concerned about whether this would result in the misuse of PIL for personal profit, gain or political influence. In fact, there have been quite a few cases where Justices have had issues determining the 'person aggrieved[464]'.

In public interest cases, the issue of standing has been associated with other procedural matters. In India's river ecology cases, it is evident that some of the citizens and lawyers have used constitutional provisions to broaden their standing during proceedings[465]. For instance, in early

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[458] Alley (n 456) 796

[459] For more details, refer to U. Baxi, 'Foreward to J.Kapur, Supreme Court on public Interest Litigation' [1998] viii

[460] Alley (n 456) 797

[461] A.H Desai and S. Muralidhar, 'Public Interest Litigation: Potential and Problems' in B.N Kirpal et.al (eds.), *Supreme but not Infallible- Essays in Honour of the Supreme Court of India* (Oxford University Press, 2000) 45

[462] C.M Jariwala, 'The Directions of Environmental Justice: An Overview' in S.K Verma and K. Kusum (eds.), *Fifty Years of the Supreme Court of India: Its Grasp and Reach* (Oxford University Press 2000) 469

[463] For instance, in *Akhil Bhartiya Soshit Karamchari Sangh v. Union of India (1981)* 2 S.C.R 185, 224-25, Justice Iyer observed on the issue of standing: 'Our current processual jurisprudence is not of individualistic Anglo Indian mould. It is broad based and people oriented, and envisions access to justice through 'class actions' 'public interest litigation' and representative proceedings. Indeed, little Indians in large numbers seeking remedies in courts through collective proceedings, instead of being driven to an expensive plurality of litigations, is an affirmation of participative justice in our democracy. We have no hesitation in holding that the narrow concept of 'cause of action' and 'person aggrieved' and individual litigation is becoming obsolescent in some jurisdictions'.

[464] Alley (n 456) 802

[465] Ibid 802

post-independence jurisprudence, Justices broadened the guidelines for writing an acceptable writ on the basis that the general format should be flexible to accept various forms of appeal. India's High Court and Supreme Court Justices have accepted newspaper editorials, letters and appeals as writ petitions[466] in public interest cases[467].

Kelly D. Alley has provided three river pollution cases which illustrate how, despite imprecise foundations of law, Justices have exercised *suo moto* powers to intervene directly in the functioning of private projects or state directed projects. These powers have contributed towards exercising judicial powers in legislative and executive fields[468]. These cases also demonstrate how the established notion of standing, the existence of fundamental rights, and the actions of petitioners and judges have shaped a legal pathway towards defining public policy and managing water resources[469] in India as follows:

1. *Rakesh Jaiswal Vs State of Uttar Pradesh*[470]

In this case Justice Malaviya took up the role of an activist. This case was initiated by a letter which was written directly to Justice Malviya. This letter was written by an environmental activist who claimed that in the city of Kanpur (in the state of Uttar Pradesh), police officers were throwing unclaimed dead bodies into the river Ganga, so as to dispose of them and pocket the public money allocated for cremation. The letter said:

> 'Hon'ble Sir,
>
> Almost after a fortnight since we cleaned river Ganges of Kanpur by removing 127 dead bodies (117 human and 10 animal carcasses), more than 100 dead bodies could be counted in the same stretch of Ganges. Hon'ble Supreme Court had defined the duties of Kanpur Municipality in 1988 (Ganga Case II). It is the duty of Kanpur Nagar Nigam to ensure that no dead-bodies are thrown into Ganga, but KNN seems to be in a slumber. Our efforts have failed to awaken the government machinery, be it police department (biggest culprit), KNN or Pollution Control Boards (State

[466] Alley (n 456) 803
[467] For instance, in R.K. Jaiswal v. State of Uttar Pradesh & Ors. (No. 21552 of 1997) letters from concerned citizens and scientists and media articles were used as sources of information for in hearings and petitions.
[468] Alley (n 456) 803
[469] Ibid 804
[470] R.K. Jaiswal v. State of Uttar Pradesh (n 467)

> and Central). Instead, a strange rivalry is going on between Eco-Friends and police department. We're removing the pollutants and police personnel are all out to thwart our efforts and other concerned departments are looking the other way.
> Sir, please you do something[471]'.

Appealing for the relaxed doctrine of standing and treating the letter as a writ petition submitted in public interest, Justice Malviya ordered issuance of notices to numerous respondents. In fact, it is widely believed that, for PIL actions in India to proceed, it is crucial for the petitioner to appeal to the Justice's activism[472]. Justice Malviya broadened the original writ so as to include various groups with special interests whose interests were not only limited to Kanpur but also other cities in the Ganges river basin[473].

In the first year of the case, the Court closed down more than 200 industrial operators in the area as the latter failed to set up primary effluent treatment plants. In addition, the Court also ordered setting up river police forces in 22 towns in the State to ensure no corpses are thrown into the river. However, these orders were not complied with or fully implemented in the manner desired by the Court or Justice Malviya[474]. This trend of institutions not following court orders, especially in the case of the Ganges, is also supported by the econometric results in Chapter 3; evidenced by RQ failing to affect Ganges river pollution.

The Allahabad High Court also appointed a team of senior officers from the Indian Audit and Account Services to investigate how the GAP funds have been spent[475]. The Audit team found several misdemeanors in the GAP's spending along with inefficiencies in administrative duties of various agencies involved in it[476]. This ineffectiveness of GAP's institutions is also in line

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[471] Alley (n 456) 808
[472] M. F. Saldanha, *Peoples' Initiatives and Judicial Activism as a Catalyst of Institutional Reform* (International Network for Environmental Compliance and Enforcement (INECE), 1998) 13-20
[473] Alley (n 456) 810
[474] Ibid 811
[475] Order of the High Court of Judicature at Allahabad at Civil Misc. Writ Petition No. 21552, R. K. Jaiswal v. State of U.P. Ors. (May 5, 1998)
[476] National Rivers Conservation Directorate (NRCD), Audit Report on Ganga Action Plan in Uttar Pradesh: Gomukh to Kannauj (1999)

with the results obtained in Chapter 3, regarding the effect of GE and RL on Ganga's pollution levels.

2. *News Item "Hindustan Times" A.Q.F.M. Yamuna v Central Pollution Control Board*[477]

This case is one of the least developed cases of river pollution. It failed to get the support of a concerned petitioner[478]. However, the orders issued in this case were significant in terms of river pollution abatement. For instance, the SC issued the following order in January 2000:

> 'Affidavit of the Chief Secretary has been filed which seems to indicate that orders which were passed by us earlier directing that the pollution of the river Yamuna should be stopped with effect from 1st November, 1999 have not been complied with. This is so especially in view of the Report which has been filed by the Central Pollution Control Board which shows that the situation is alarming. For example, the BOD which should be at 2 in respect of fresh water, was at 234.21 tons per day on 30th November, 1999. The position with regard to the other pollutants is no better. In a hope that the Attorney General will be able to take effective steps with a view to achieve the desired result, we adjourn this matter to 3rd March, 2000. We, however, in the meantime direct every industry in Delhi not to discharge their effluent into any drain leading to river Yamuna or to river Yamuna itself which has the effect of polluting the said river. This order prohibiting every industry from discharging the effluent which causes pollution, will be communicated to every industry by the Delhi Administration. The Central Pollution Control Board will file a fresh report giving the state of water as on Ili Marsh 2000. This order prohibiting contaminated discharge will also operate in respect of industries in Haryana who will be informed by the State of Haryana[479]'.

Although the Court made a wide order with very specific details on its execution, directing the Chief Secretary of the National Capital Territory (NCT) of Delhi and the CPCB, the orders

[477] News Item "Hindustan Times" And quiet flows the Maily (A.Q.F.M.) Yamuna v/s Central Pollution Control Board and Another Ias Nos. 5-10 In Writ Petition (C) No. 725 of 1994

[478] The Supreme Court was moved by a national newspaper's (Hindustan Times) report on the river pollution cases and thereby began a hearing for this case

[479] Supreme Court of India at Writ Petition (Civil) No. 725 of 1994, News Item published in Hindustan Times titled, A.Q.F.M Yamuna v. Central Pollution Control Board & Ors. (Jan. 24, 2000).

were not implemented. This is consistent with the results found earlier in Chapter 3 (as Yamuna river clean-up was also a part of GAP). However, the orders did contribute towards introducing Court directed clean up activity as a national and state priority. At least, this case increased the visibility of river pollution issues[480].

3. *Commander Sureshwar D. Sinha v. Union of India & Ors*[481]

In this case, the petitioner filed a PIL for enforcing the Fundamental Rights guaranteed under Articles 14, 21 and 25 of the Indian Constitution[482].The petitioner demanded satisfactory treatment of wastewater, availability of clean drinking water and improved management of water resources by maintaining optimum flow of water in the Ganges and Yamuna rivers[483]. In response to this, Justices ordered the River Conservation Authority to establish a High Powered Committee (HPC) which would be responsible for maintaining the optimum flow of river water in order to restore river water quality. The HPC was also asked for both long and short term remedial measures for doing the same, including monitoring the setup of sewage treatment plants[484].

On 10th April 2001, three related cases namely, *Commander Sureshwar D. Sinha v. Union of India & Ors, News Item "Hindustan Times" A.Q.F.M. Yamuna v Central Pollution Control Board* and *M. C. Mehta vs. Union of India & Ors*[485] were listed by the Bench (consisting of five Honorable Judges), so as to address the overlapping arguments and concerns. One problem-solving strategy was issued by the Court for all three cases. In this process, the 'right to life' was cited:

> 'There can be no denying of the fact that right to life guaranteed under Article 21 of the Constitution would surely include a right to clean water. That is a right which is being deprived to 13.8 million citizens of Delhi because of the large-scale pollution of the river Yamuna. The entire pollution takes place only in the stretch which the Yamuna passes

[480] Alley (n 456) 812
[481] Comdr. Sureshwar D. Sinha And Ors. vs Union Of India (Uoi) And Ors. , 8 SCC 368 10 May, 2000
[482] Constitution of India Article 14 (it refers to equality before law); Article 21 (it refers to protection of life and personal liberty); Article 25 ss1 (it refers to freedom of conscience, free profession, practice and propogation of religion)
[483] Civil Writ Petition (Civil) No. 537 of 1992, Comdr Sureshwar D. Sinha and Ors v. Union of India & Ors
[484] Order of the Supreme Court of India at Writ Petition (Civil) No. 537 of 1992, Comdr. Sureshwar D. Sinha & Ors. v. Union of India & Ors. (Jan. 10, 2000).
[485] Writ Petition (civil) No. 4677 of 1985, M.C. Mehta vs Union Of India & Ors. (29 August, 2000)

through Delhi, which is of about 22 Kms. The quality of water of the river Yamuna, when it enters Delhi, is far superior to that when it leaves Delhi and by the time Yamuna enters into Agra Canal. Delhi succeeds in reducing the dissolved oxygen level of the water to 0 per cent. This Court has been seized of the matter since a number of years but till today no effective steps have been taken to ensure the improvement of the quality of the water. The quality has deteriorated only. This shows the lack of proper governance. In an affidavit filed on behalf of the Ministry of Urban Development on 8th November, 2000, an Integrated Action Plan has been proposed for improving the water quality of river Yamuna. The response to this, in the affidavit filed on behalf of the Delhi Government, is that the Integrated Action Plan is broadly accepted, but as is usually the case, it has pleaded helplessness in implementing the same in its entirety. It appears to us that with the existence of numerous agencies in Delhi no single entity can be held responsible for cleaning up the river Yamuna. Now when an Integrated Action Plan has been furnished, it is imperative that steps be taken so as to ensure that at least by 31st March 2003 the minimum desired water quality, i.e. of Class-C, of the river Yamuna is achieved. We direct the Ministry of Urban Development to file a further affidavit indicating as to how its Integrated Action Plan can be implemented within the prescribed time frame. Affidavit to this effect be filed within two weeks from today. The Chief Secretary, Delhi will also file an affidavit informing the Court as to what steps will be taken in order to ensure the attaining of the required quality of water in the river Yamuna so that the said river can no longer be called *'mailee*[486] *Yamuna*[487]*'*.

Although this judgment sheds light on the fact that India's courts have appointed coordinating committees according to their own assessments and upon the request of the petitioners it also represents the fact that the Justices themselves have also grappled with the issue of coordination between the concerned parties and agencies. Also, the orders which emerged from these cases with regards to coordinated activities did not result in implementation of the issued orders[488].

[486] 'Mailee' refers to dirty in Hindi
[487] Order of the Supreme Court of India at Writ Petition (Civil) No. 537 of 1992, Comdr. Sureshwar D. Sinha & Ors. v. Union of India & Ors. (Ap. 10, 2001)
[488] Alley (n 456) 818

This case judgement also reaffirms the results obtained in Chapter 3, with regards to the ineffectiveness of GAP's RQ, GE and RL.

A few other cases of river pollution, which arose because of poor implementation or non-implementation of relevant provisions of existing law, have had the SC, High Courts and NGT address river pollution issues. In some instances, the Court has also relied on certain environmental law principles like the precautionary or the polluter pays principle to inflict liability on polluter/s who have been instructed to carry out preventive or remedial measures[489] such as the *Indian Council*[490] and *Vellore case*[491].

In the *Indian Council for Enviro-Legal Action v Union of India,* one of the claims was that industrial complexes in Bichhri have dumped untreated sewage into the streams which, in turn, have polluted the same to such an extent that their waters are unfit for consumption. The SC held that the respondents were therefore liable to pay compensation for the harm caused to the villagers and environment in the affected areas. Furthermore, the Court also pointed out that the EPA implicitly states that costs should be levied on the polluting parties for carrying out corrective measures[492].

Similarly, in the case of *Vellore Citizens Welfare Forum v Union of India,* the petitioner claimed that the untreated effluents released by tanneries into the River Palar in the state of Tamil Nadu were polluting not only the river but also the only source of drinking water for numerous people. Under the EPA, the SC ordered formation of a committee to deal with the situation created by the tanneries as well as other polluting industries in the state. The committee was also directed to formulate plans for reversing or limiting the effect of pollution caused. The committee, upon reviewing, levied fines on the tanneries. In cases where the tanneries were unable to pay the fine, they were closed down. However, they were exempted from being closed down if they agreed to set up effluent treatment plants or individual pollution control devices and obtain consent for the same from the SPCBs[493].

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[489] Government of India, Ministry of Human Resource Development(MHRD), 'Law relating to water pollution' < https://blog.ipleaders.in/laws-existing-india-prevent-control-water-pollution/ >
[490] Indian Council for Enviro-Legal Action v Union of India and Others, AIR 1996 SC 1446
[491] Vellore Citizens Welfare Forum v Union of India and Others (n 412)
[492] MHRD (n 489) 8
[493] Ibid 8

India's environmental protection legislation follows a command and control approach. Consequently, public nuisance related provisions in criminal and civil laws and the statutory framework governing water pollution which comprises of municipal laws have experienced implementation failure. In fact, provisions relating to public nuisance have not been invoked. Though the issue of water pollution has been raised in a number of PIL's with varying effects, it remains to be seen whether they can contribute towards effective river pollution abatement in the long run [494].

The country's existing legal system is not sufficiently equipped to handle cases of transgression of current laws of river pollution. These laws only cover river pollution from industrial sources whereas pollution control from agriculture or domestic sectors is regulated by Minimal National Standards (MINAS). Further, there are no specific standards set up for monitoring pollution from non-point source pollution (runoffs from agriculture, industry or mines)[495].

4.2.8 **Legal rights for rivers**

Recently two of the Indian rivers have been granted legal rights. For a long time, questions have been raised regarding how it may be possible to represent the environment in the best way in courts, in addition to understanding how to frame legal challenges for delivering '*judicial protection of nature for the sake of nature itself*[496]*'*. In 1972, it was proposed that nature could be personified in law for this purpose which would aid nature to seek legal redress on its own behalf[497]. This led to the foundations of quite a radical concept of law which implied that legal rights can be conferred to non-human entities[498].

In India's case, the Uttarakhand (the state from which River Ganges originates) High Court declared on 20th March 2017:

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[494] MHRD (n 489) 8

[495] R.M Saleth and A. Dinar, 'Institutional changes in global water sector: trends, patterns, and implications' (2000) 2 Water Policy 122

[496] E. Daly, 'The Ecuadorian exemplar: the first ever vindications of constitutional rights of nature' (2012) 21(1) Review of European, Comparative & International Environmental Law 63

[497] C.D Stone, 'Should trees have standing? Towards legal rights for natural objects' (1972) 45 Southern California Law Review 450

[498] E.L O'Donnell and J. Talbot-Jones, 'Creating legal rights for rivers: lessons from Australia, New Zealand, and India' (2018) 23(1) Ecology and Society 7

> 'the Rivers Ganga and Yamuna, all their tributaries, streams, every natural water flowing with flow continuously or intermittently of these rivers, are declared as juristic/legal persons/living entities having the status of a legal person with all corresponding rights, duties and liabilities of a living person[499]'.

This decision came a few days after New Zealand's Parliament ratified a statute which declared the Whanganui river catchment as a legal entity[500].

Given India's religious sentiments for the River Ganges (explained in detail in Chapter 3) and the Yamuna, the Indian courts drew upon this as an argument for supporting legal rights for Indian rivers. For creating a legal personality for the Yamuna and Ganges Rivers, a guardianship model was used which declared them as minors under law. This arrangement acknowledges that, as the river cannot speak for themselves, being minors under law ensures their legal status and rights[501].

The Chief Secretary of the State of Uttarakhand, Director of Namami Gange and the Advocate General of the State of Uttarakhand were identified as the as *loco parentis* for the rivers. Their responsibilities included being '*the human face [and] to protect, conserve and preserve Rivers Ganga and Yamuna and their tributaries[502]*'.

Though this was a much-appreciated progress in terms of pollution abatement by the High Court, the state government of Uttarakhand lodged an appeal on 27 June 2017 against this decision at the Supreme Court. They argued that as the rivers extend well beyond Uttarakhand to other states their responsibility as guardians of the river is unclear. This dispute amongst states for maintenance of the river and for river pollution is yet another example of the longstanding issue of rivalry amongst Indian states with regards to procuring funding from the Federal government for environmental issues. This problem is further exacerbated by the fragmented institutional structure, as evidenced in the next section and also in Chapter 3 with regards to GAP. Therefore, as of now, the current legal status of both the rivers is pending[503].

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[499] Mohd. Salim vs. State of Uttarakhand and Others, Writ Petition (PIL) No.126 of 2014
[500] O'Donnell and Talbot-Jones (n 498) 12
[501] Ibid 13
[502] Mohd. Salim vs. State of Uttarakhand and Others (n 499) 11
[503] O'Donnell and Talbot-Jones (n 498) 13

4.3 Institutional Framework of river management

At the National level

Despite the Indian states having most of the legislative powers with regards to water pollution and development responsibilities, the Federal government also has indirect yet powerful leverage in water pollution abatement, as mentioned previously in the 'legal framework' section. The core of national water administration comprises of the Ministry of Water Resources (MoWR), River Development and Ganga Rejuvenation and its technical and planning organizations. It is the central organization for planning, management and implementation of national water resources and other federal ministries.

The MoWR shares its water sector responsibilities with other ministries, such as, the Ministry of Agriculture, MoEF, Ministry of Shipping, Ministry of Drinking Water, Supply and Sanitation, Ministry of Urban Development, Ministry of Tourism and Ministry of Health and Family Development. Each of these agencies have their own corresponding interests, preferences and mandates in dealing with river pollution[504]. For instance, CPCB is under MoEF's jurisdiction and its chief responsibilities include controlling, monitoring and preventing air and water pollution, in addition to advising respective state governments and also coordinating activities amongst various state governments. Organizations under the MoWR, such as the NMCG, NRCD and Central Ground Water Board (CGWB) and various research institutes, are also responsible for looking after region specific management of river basins and groundwater resources[505].

Furthermore, irrigation or water resources departments and their corresponding specialized agencies lie at the core of the state level water administration. There also exist the National Water Resource Council and National Development Council which act as mechanisms to promote state-Federal coordination in water sectors[506].

[504] Y. Wang et al., 'Combating river pollution in China and India: policy measures and governance challenges' (2016) 18 Water Policy 128
[505] Ibid 128
[506] MHRD (n 489) 8

However, these efforts are not effective in furthering a nationwide consensus or coordinating institutional initiatives at the country level. As operational responsibilities, planning skills and technical capabilities remain dispersed across various government layers, India's water institutions remain fragmented, sectorally disjointed, biased and regionally uncoordinated[507].

In 2001, the Water Quality Assessment Authority (WQAA) was set up under the EPA at the Federal level. This authority is delegated to manage standardization of water quality monitoring methods and ensuring efficient treatment of waste water. In 2005, the WQAA issued the Uniform Monitoring Protocol (UMP) for ensuring uniform procedures regarding analysis, sampling, data storage and reporting amongst the various nation-wide agencies of water quality monitoring networks. A task force has also been set up under this Authority for developing a water quality data information system so as to ensure coordination in collection and dissemination of data. Water quality Review Committees were also established in a few states to promote coordination amongst Federal and state agencies. However, these Committees were rarely active and met only in two states (Maharashtra and Himachal Pradesh). Further, since the establishment of WQAA in 2001, they have had only seven meetings to date[508]. Though it is highly doubtful that even if the WQAA would have been efficient in mandating uniform nation-wide water quality monitoring, it would have been followed by the states. That is because WQAA is unable to issue effective directives directly to states given water is a 'state subject'.

Unlike a lot of countries, India does not have any separate river basin authority for individual river basin management with the exception of the River Ganges, as mentioned in the previous section. The NMCG and NRCD are the coordinating agencies for regional state agencies and the central organization for rejuvenation and management respectively for all river basins across the country[509]. Both these bodies play only an advisory role as they do not have any authoritative jurisdiction over pollution control[510].

[507] Saleth and Dinar (n 495) 122
[508] MHRD (n 489) 6
[509] Explained in detail in Chapter 2
[510] Saleth and Dinar (n 495) 128

At the state level

In the states, river pollution control programs and restoration of quality and abatement programs are executed through National River Conservation Programmes (NRCP) which are themselves based in various state government departments. In most of the states, however, the SPCBs are responsible for water pollution control[511].

The SPCB and CPCB are autonomous of each other. While CPCB is under the administrative control of MoEF, the latter are under state governments and are expected to operate under CPCB and MoEF's overall policy framework. SPCBs are also responsible for implementing numerous provisions of environmental acts concerning water pollution at the ground level. This dichotomy of control is specified in the Water Act which delegates SPCB with compliance and enforcement of pollution control related activities and, on the other hand, provides the CPCB with an advisory role. SPCB's are dependent on the Federal and state governments for their grants for even monitoring pollution levels as they are not empowered under the Act to generate their own financial resources. As a result, at times, political motivations might interfere with the functionings of SPCBs. Therefore, though the actions of CPCBs and SPCBs are correlated at the output stage, there is no functional correlation at the input stage. This dichotomy of control also results in a situation whereby no single agency could be made accountable for nationwide river pollution abatement[512].

Although the CPCB was envisaged as a technical and regulatory authority, its role is now limited to a fund-sanctioning authority with no control over the functioning of the SPCBs. On the other hand, SPCBs suffer from inadequate staff and, as a result, inspection of all large and medium-sized enterprises and sources of pollution is usually possible only once a year, which is inadequate for assessing compliance with prescribed standards[513].

The existing legal and institutional arrangements for river pollution abatement in India have demonstrated their ineffectiveness through rising surface water pollution. The protection of rivers in rare instances has been achieved through community or social initiatives which have often

[511] Ministry of Environment and Forests (MoEF), 'Water Pollution in India' (2014-15) Public Accounts Committee, Eighth Report 37
[512] Ibid 52
[513] MoEF (n 511) 56

involved bypassing these structures. In the decision-making process, the services provided by a river are not valued either qualitatively or quantitatively. Very few '*river friendly elements*[514]' exist in NWP and state river water policies and, even if they do, they lack legal and institutional mechanisms to ensure their implementation[515].

In addition, given that water is a 'state' subject in India, there are serious questions regarding the state's authority in terms of the manner in which this power is to be utilised. For instance, the states are provided with discretionary powers without setting any limits on it. This also offers too much room for uncertainty. Finally, functions regarding development, management, implementation of regulatory functions and conflict resolution are served by the executive arm of the government which make matters worse[516].

4.4 Literature Review

Chapter 3 reviews the existing papers on the effect of India's legal and institutional measures on river pollution. It includes papers which demonstrates the effect of RQ, GE and RL on river pollution. This section, therefore, reviews those studies which investigate the impact of other variables, such as, corruption and free media on pollution abatement efforts.

There exist numerous global studies which have looked at how corruption affects environmental protection. One empirical study has developed a theory of environmental policy formulation which looks at how political turbulence and corruption play a role. The study finds that if political instability has a negative effect on the stringency of environmental regulations. It also finds that corruption reduces the stringency of environmental regulations[517].

Another study looks at the empirical relationship between corruption and air pollution emissions. It tries to determine the direct and indirect effects of corruption on air pollution emissions. The results indicate that although corruption's direct effect on pollution is positive, its net effect in most countries is negative. Moreover, reducing corruption levels might result in an increase in income but this could result in a rise in environmental degradation. Therefore, corruption should

[514] Cullet et.al (n 245) iii
[515] Ibid iii
[516] Siddiqui (n 453) 582
[517] P.G Fredriksson and J. Svensson, 'Political instability, corruption and policy formation: the case of environmental policy' (2003) 87 Journal of Public Economics 1383

be tackled alongside ensuring successful implementation of suitable environmental legislation[518]. The negative relationship between corruption and environmental regulation is supported by the results of another study[519]. The study concludes that the underlying cause of this negative relationship is the fact that as corruption results in more forms of pollution entering the market it further worsens environmental outcomes. One of the studies finds a non-linear long-run relationship between corruption and pollution for 62 countries[520].

A study attempts to understand empirically how democracy and corruption influence environmental policies. The results indicate that corruption is a significant and substantial determinant of environmental policies, whereas democracy plays an insignificant role[521].

A theoretical study by the Stockholm International Water Institute (SIWI) attempts to understand the causes and consequences of corruption in the water sector. The study observes that corruption is one of the least attended issues in the water sector. One of the major causes of corruption in the water sector can be attributed to multiple breakdowns of governance in this sector and is usually accompanied by a tightly organized logic of reciprocity, supported by insubstantial political competition, a weak civil society and dysfunctional public administration. As a result, to deter corruption in the water sector, financial and legal reforms in the delivery systems of both public and private sectors should be introduced[522].

Some studies examine how voice and accountability (which includes freedom of expression, freedom of association, and a free media) can affect pollution abatement. One of the papers asserts that mass media can play a significant role in enabling citizens to monitor a government's actions[523]. This argument is based on the idea that citizens have imperfect information about the actions of the government and mass media can therefore act as a medium to scrutinize a government's actions.

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[518] M. A. Cole, 'Corruption, Income and the Environment: An empirical analysis' (2007) 62 Ecological Economics 637
[519] A.K Biswas and M. Thum, 'Corruption, environmental regulation and market entry' (2016) 22 Environment and Development Economics 66
[520] Shu-Chen Chang and Teng-yu Chang, 'The relationships between corruption and pollution on corruption regimes' (2010) 30(3) Economics Bulletin 5
[521] L. Pellegrini, 'Corruption, Democracy, and Environmental Policy: An Empirical Contribution to the Debate' (2006) 15(3) The Journal of Environment and Development 332
[522] P. Stålgren, 'Corruption in the Water Sector: Causes, Consequences and Potential Reform' [2006] Swedish Water House Policy Brief Number. 4, Stockholm International Water Institute (SIWI) 22
[523] T. Besley et. al, 'Mass media and political accountability' [2002] CARR Discussion Papers, DP 6. Centre for Analysis of Risk and Regulation, London School of Economics and Political Science, London, UK 24

Another paper explores how freedom of expression in terms of environmental activism can influence pollution abatement in India. The study indicates that environmental activism is gaining support in urban India and is promoting dissemination of environmental knowledge. Civil society also acts as a watchdog and thereby contributes to political transparency[524].

Although there exist various papers which have attempted to look at how corruption and voice and accountability affect pollution, none of the papers have done so specifically for river water pollution in India. Moreover, none of these studies examined the role of factors like RQ, RL and GE in their models nor analysed how these factors work in tandem to influence river pollution abatement.

4.5 Methodology and variable description[525]

To comprehend the effect of RQ on water pollution, it was crucial to first find a proxy for regulatory measures which could help quantify it. One proxy for RQ that could be used in this study is 'stringency of water pollution regulations'. As RQ has been defined as 'statutory law' in this study[526], taking stringency of water pollution regulations as a proxy would imply that the higher the stringency of water pollution regulations the better the RQ. However, creating an index for regulatory stringency of water pollution not only suffers from data availability issues but there also exist major fundamental conceptual obstacles[527]:

Multidimensionality

Governments regulate numerous environmental measures such as water, air and waste. In addition, there exists further regulations for controlling numerous pollutants in water, air and waste such as BOD, sulphur di-oxide, toxic gases etc. Further, there are different regulations that target industries and households. The standards set for emission concentrations, total emissions, environmental

[524] A. Follman, 'The Role of Environmental Activists in Governing Riverscapes: The Case of the Yamuna in Delhi, India' (2016) 14 South Asia Multidisciplinary Academic Journal 1

[525] The methodology mentioned for this Chapter also applies to the next chapter, Chapter 5

[526] Refer to Chapter 2

[527] C. Brunel and A. Levinson, 'Measuring Environmental Regulatory Stringency' [2013] OECD Trade and Environment Working Papers, 2013/05 < http://www.oecd-ilibrary.org/docserver/download/5k41t69f6f6d-en.pdf?expires=1508596860&id=id&accname=guest&checksum=0569B44A916FD50596594594B44F71E0 > accessed 29 June 2017

quality or even the technologies employed by industries are determined by regulations[528]. However, the regulations are only applicable if they are enforced at various levels of government. Therefore, it can be argued that the '*multidimensionality itself is multidimensional'*[529]. Multidimensionality poses numerous challenges for measuring 'stringency of regulations'[530]. Firstly, some regulations might be irrelevant in the context of certain research questions. For instance, if we seek answer to the question, 'how environmental regulations affect industrial flight from stringent countries', variables like incentives for recycling household wastes and lead content of automotive gasoline would not be directly significant for calculating industries' profitability in various locations. Secondly, a problem related to multidimensionality is that multi-faceted regulations cannot be compared. For instance, USA set up two standards for contaminated emissions from industrial boilers in 2012.[531] One was set at 580,000 short tons of sulphur di-oxide per year and the other at 2.0-3.0 short tons per year. In this situation, which of the two can be considered more stringent? In addition, if measuring stringency of regulation within a country for a specific issue is so difficult, it is almost impossible to conduct a comparative study across countries[532].

4.5.1 **Formulating an index for stringency of environmental regulation**

To date, the literature using stringency as a measure for environmental regulation can be classified into five different categories based on the methodologies used[533]: (1) directly assessing the regulations themselves[534] ;(2) pollution abatement expenditures of the private sector[535]; (3)

[528] N. Johnstone, I. Haščič and M. Kalamova, 'Environmental Policy Design Characteristics and Technological Innovation' (2010) 27(2) Economica Politica 277
[529] Brunel and Levinson (n 527) 7
[530] Ibid 7
[531] The burning of fossil fuels generates various air contaminants and also combustion. The combustion from industrial boilers generates Sulphur-di-oxide, oxides of nitrogen and particulate matter.
[532] Brunel and Levinson (n 527) 8
[533] Ibid 13
[534] V. D. McConnell and R. M. Schwab, 'The Impact of Environmental Regulation on Industry Location Decisions: The Motor Vehicle Industry' (1990) 66(1) Land Economics 67; J. V. Henderson, 'Effects of Air Quality Regulation' (1996) 86(4) The American Economic Review 789; M. Greenstone, 'The Impacts of Environmental Regulations on Industrial Activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census of Manufactures' (2002) 110(6) Journal of Political Economy 1175
[535] A. Levinson, 'Environmental regulations and manufacturers' location choices: Evidence from the Census of Manufactures' (1996) 62(1-2) Journal of Public Economics 5; W. Keller and A. Levinson, 'Pollution Abatement Costs and Foreign Direct Investment Inflows to U.S. States' (2002) 84(4) Review of Economics and Statistics 691; C. Pasurka, 'Perspectives on Pollution Abatement and Competitiveness: Theory, Data, and Analyses' (2008) 2(2) Review of Environmental Economics and Policy 194

indexes formulated for compressing the multidimensionality problem to one issue[536]; (4) direct measures based on energy usage, ambient pollution and emissions;[537] and (5) efforts made by government to control pollution[538].

An ideal measure for environmental stringency should be: a) easy to calculate; b) data should be published for it annually; c) it should be available for various pollutants and media; and d) it should be related to industry costs without being determined by the industry composition. But most measures do not satisfy the four aforementioned conditions[539]. In addition, measures of stringency for regulations cannot be generalized as countries are so dissimilar. Therefore Brunel and Levinson[540] suggest a new emission-based measure to be able to quantify the stringency of environmental regulations. The main assumption of this regulatory index is that the regulated firms will emit less[541].

Environmental regulations stringency index by Brunel and Levinson

This method, as suggested by Brunel and Levinson[542], would aid in computing every jurisdiction's predicted emissions based on the average emissions intensity of the industries located in those jurisdictions. This new index could be calculated for a particular media (such as water, air, waste etc.) or pollutant, provided two sets of data are available for the countries in question: (1) value added by industry and jurisdiction (which is easily available for every country); and (2) emissions by industry and jurisdictions. The idea of constructing this emission-based index is based on the same microeconomic principle as the shadow-price approach. Shadow-price of an input is defined as '*the potential reduction in expenditures on other variable inputs that can be achieved by using*

[536] Levinson (n 535); Wayne B. Gray, 'Manufacturing Plant Location: Does State Pollution Regulation Matter?' [1997] NBER Working Paper No. 5880 < http://www.nber.org/papers/w5880.pdf > accessed 21 October 2017; S. Dasgupta et.al., 'Environmental Regulation and Development: A Cross-country Empirical Analysis' (2001) 29(2) Oxford Development Studies 173

[537] Y. Xing and C. D. Kolstad, 'Do Lax Environmental Regulations Attract Foreign Investment?' (2002) 21(1) Environmental and Resource Economics 1; B. K. Smarzynska and Shang-Jin Wei, 'Pollution Havens and Foreign Direct Investment: Dirty Secret or Popular Myth?' (2001) NBER Working Paper No. 8465 < http://www.nber.org/papers/w8465.pdf > accessed 21 October 2017

[538] Gray (n 536) ; D. Pearce and C. Palmer, 'Public and private spending for environmental protection: a cross-country policy analysis' (2001) 22(4) Fiscal Studies 403

[539] For a detailed analyses refer to Brunel and Levinson (n 527) 28

[540] Ibid 28

[541] Brunel and Levinson (n 527) 29

[542] Ibid 29

an additional unit of the input under consideration (while maintaining the level of output)'[543]. This definition can be explained through Figure 4.1.

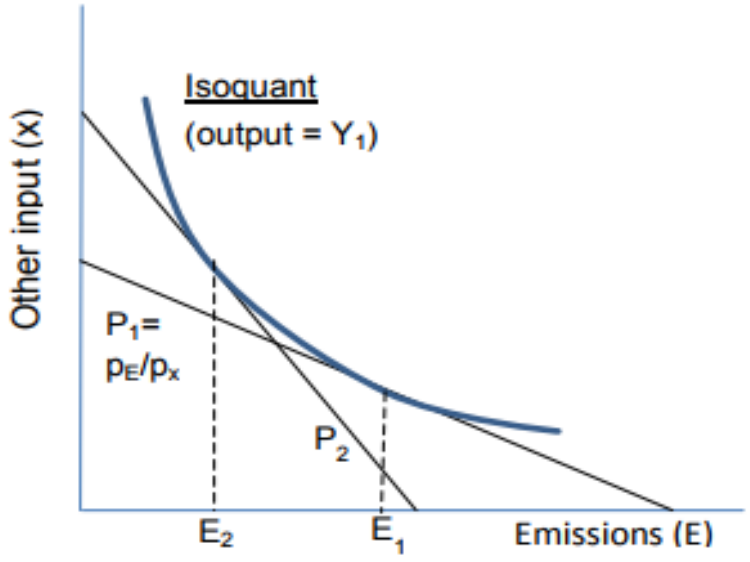


Figure 4. 1 The Shadow Price Approach[544]

The curved line, also known as isoquant, represents all the combinations of inputs which can be used to produce the given amount of output, Y_1. Trade offs can occur between any two inputs such as labour and capital, energy and materials, etc. To make it easier for demonstration, only two inputs of production are taken, emissions (E)[545] and other inputs (X) and trade-off between other factors has been ignored. In the absence of regulations, the price[546] of emissions (P_E) will be very low or even zero. So, when the price of emission is very low and the price of other inputs is high, as depicted by the price ratio, P_1, profit maximizing firms will choose to produce more output using more of emissions (E_1) and less of other inputs. On the other hand, when price of emissions is higher maybe because of strict regulations in place, the firm chooses less emissions (E_2) and more of the other input to produce the same output (Y_1). The shadow-price approach attempts to establish that, because there is no 'directly' observable price of emissions, its price is determined

[543] D. P. Van Soest, J. A. List and T. Jeppesen, 'Shadow prices, environmental stringency, and international competitiveness' (2006) 50(5) European Economic Review 1151
[544] Taken from Brunel and Levinson (n 527) 17
[545] People always get confused when economists consider 'pollution emitted' as an input to production because it is released from the wastewater pipes etc. But, because it is an activity undertaken to produce the main product of the firm it is considered an input.
[546] Price in the economic sense

by the levels of environmental stringency in various countries. With lack of regulations, price of emissions is low and, as a result, firms will use every factor of production until the marginal revenue product[547] equals the price [548]. On the other hand, with rising environmental stringency, the cost of emissions will increase. Therefore, emissions per dollar of value added that is, emissions intensity could be used as a measure for regulatory stringency. Where emissions intensity in a country is higher, it could be concluded that the cost of polluting is lower because regulations are less stringent and, as a result, the regulatory quality is poor[549].

Using emissions intensity as a measure of regulatory stringency is based on the production function approach as outlined by Van Soest et al[550].This approach ideally uses plant level data for all factors of production alongwith emissions. However, as plant level data is highly confidential and difficult to access, Brunel and Levinson[551] combined the intuition of the Van Soest[552] approach with the cost based approach by Levinson and Keller[553]. The approach of Brunel and Levinson[554] can be expressed as follows:

Let e_j be the emissions per dollar of value added in jurisdiction j averaged across all industries,

Therefore, $e_j = E_j / V_j$

Where, E_j and V_j denote total emissions and value added in industry i summed across all industries respectively. Besides calculating emissions per dollar of value added in jurisdiction j, Brunel and Levinson's approach also determines the emissions per dollar of value added in each industry and then finds the predicted emissions of per dollar of value added. A measure of the stringency of regulations is then calculated taking the ratio of predicted emissions intensity to actual emissions intensity. Besides data on value added by jurisdiction, construction of this index requires data on total amount of pollution emitted by each industry according to industrial classification code.

[547] Marginal Revenue Product is the additional revenue obtained from selling an extra unit
[548] Brunel and Levinson (n 527) 17
[549] Ibid 25
[550] Soest et.al (n 543) 1152
[551] Brunel and Levinson (n 527) 25
[552] Soest et. al (n 543) 1153
[553] W. Keller and A. Levinson, 'Pollution Abatement Costs and Foreign Direct Investment Inflows to U.S. States' (2002) 84(4) The Review of Economics and Statistics 691
[554] Brunel and Levinson (n 527) 26

Environmental regulation stringency index constructed for this study based on Brunel and Levinson[555]

As it was difficult to get data for the 'total amount of pollution emitted by each industry according to the industrial classification code', Brunel and Levinson modified their model accordingly. Therefore, the environmental regulation stringency index constructed for this study is as follows:

Let e_{jm} be emissions per dollar of value added in jurisdiction j averaged across all manufacturing industries and construction,

Therefore, $e_{jm} = E_{jm} / V_{jm}$

where, E_{jm} and V_{jm} denotes total emissions and value added in manufacturing industries and construction summed across all industries in jurisdiction j respectively.

This model has been modified not only on the basis of data availability but also to better address the research question. Firstly, in Brunel and Levinson's approach, the authors have not appropriately stated what is meant by 'industries'. If going by the widely accepted World Bank's definition of industry, it consists of mining and quarrying, manufacturing, construction and public utilities (electricity, gas and water). Of these four industrial sectors, both China and India have the biggest contribution (value added) from manufacturing at an average rate of 32 per cent and 18 per cent, respectively[556].

So, instead of including all industries, only the manufacturing sector has been included in this study as the latter is one of the most important industries in both India and China. Also, disaggregated data on emissions for 'public utilities' and 'mining and quarrying' is not available for India and China.

In addition, Brunel and Levinson's model[557] also requires disaggregated data for 'manufacturing by sector'. However, due to data unavailability the model been modified to only compute 'emissions per dollar of value added in each jurisdiction'.

[555] Ibid 26
[556] World Development Indicators developed by the World Bank (1990- 2016) (n 19)
[557] Brunel and Levsinon (n 527) 27

It should be noted in addition to the earlier points that Brunel and Levinson themselves mention about modifying the model:

> '*The actual emissions intensity of a jurisdiction is equivalent to a weighted average of the actual emissions per dollar of value added of each industry in that jurisdiction where the weights are the industries' shares of total output in that jurisdiction, though we won't need or want disaggregated jurisdiction-industry emissions data because we can just use the aggregate equivalent* E_j / V_j[558] *'*

Therefore, considering the above issues, the approach for constructing environmental regulatory stringency has been modified.

Lastly, it has been widely accepted that data for environmental regulatory stringency is scant if not non-existent, especially for developing countries. Though there exist some disaggregated surveys, there is a lack of consistent time series to capture environmental regulatory quality. In fact, Carraro et.al[559] point out the lack of quantitative measures for understanding regulations in developing economies:

> *'Detailed data collection is needed for applications in developing economies. The development of environmental legislative inventories and the construction of qualitative and quantitative indicators targeting the policy formulation phase would help advance research with application to developing countries*[560] *'.*

Given the data limitations for constructing an index for measuring the stringency of environmental regulations and in turn determining regulatory quality, this method is only an attempt towards formulating an index for the developing countries. Despite the limitations of this formulated index, it would aid in understanding not only the effects of regulatory quality on water pollution abatement in India and China but would also assist in formulating better policies and recommend policy implications accordingly.

[558] Ibid 26
[559] Carraro et.al (n 178) 163
[560] Ibid 26

4.5.2 **How do CO2 emissions correspond to water pollution?**

Despite the utmost importance attributed to water resources, there are lack of good measures to capture water quality globally. Apart from poor data quality and coverage, there also exist challenges regarding framing issues which undermine global water quality indexing efforts[561].

The only available global water quality data is the UN Global Environmental Monitoring systems (UN GEMS). This primary dataset for water quality parameters was set up in 1978 with the aim of improving water quality monitoring and assessment capacity[562]. This dataset is critiqued for various reasons. Firstly, because it is a self-reported database, more often than not, the more polluted river bodies within countries are disregarded before reporting water quality data. Secondly, data collected by the GEMS system has very limited coverage which makes its relevance for comparative international assessment activities questionable, especially in Asian and African countries[563]. The densities of the stations in GEMStat are very low. Of the available data for 110 river basins, 71 of them have a density of 0.5 stations per 10,000 km^2. Further, only 57 countries have reported data during the time period 1990-2010. In this time period, the average density for monitoring stations in Africa is 0.02 stations per 10,000 km^2 whereas that in Asia is 0.08 stations per 10,000 km^2. In such a scenario, it is very difficult to get consistent river quality data for the entire river basin which allows for valid assessment. Furthermore, the water quality parameters are selected erratically every year and the frequency of measuring these parameters varies every year. Because of this huge data gap and high variation amongst the data, a valid cross-country comparison between water quality data is impossible[564]. A lack of standardization in terms of definitions and measurements also contributes to the lack of clarity. In addition, the fact that quality of freshwater resources is completely dependent upon a landscape's capacity to collect and purify water, the amount of water abstraction, rainfall levels and ecology, this makes it even more difficult to aggregate water quality levels according to landscape dynamics globally given the vast geographical differences[565]. Due to the non-existence of a truly global water quality database, it

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[561] A. Hsu, 'The challenge of measuring global water quality' [2017] The Metric < http://www.globalwaterforum.org/2014/12/09/assessing-global-water-quality-the-data-challenge/ >
[562] UNEP (n 12) 7
[563] United Nations System-Wide Earthwatch, 'United Nations Environment Programme Environmental Observing and Assessment Strategy: Reference Paper Annexes' < http://www.un.org/earthwatch/about/docs/unepstrx.htm#GEMS/Water >
[564] UNEP (n 12) 8
[565] Hsu (n 561) 8

has also not been possible to formulate a global water pollution index at the country level especially in Asian and African countries.

Measuring water pollution

The issues of air and water pollution are very closely related. More often than not, both categories of pollution arise from the same causes and affect the same area. In many cases, the wastes emitted in the air are the same that contaminate the waters[566]. As a result, countries with high air pollution often also face high levels of water pollution. For instance, India's Union Minister of MoEF declared in 2016 that '*analysis of data shows that 41 cities exceed the ambient air quality standard. In addition, these cities are also facing problem of water pollution due to discharges of untreated sewage*[567]'. Similarly, China's city clusters are facing not only the problem of severe air pollution but also of water pollution[568].

Given the absence of global water pollution data, CO2 emissions from fuel combustion are taken instead as a substitute to calculate the regulatory stringency of river basin water pollution, on the assumption that a country with high air pollution will also have high water pollution. This is because a higher environmental regulatory stringency should ideally reduce both air and water pollution levels. Therefore, it is assumed that there exists a positive correlation between air and water pollution.

As global water pollution data is unavailable, therefore, a proxy for water pollution was taken as an average of the total greywater footprint of national consumption and national production.

Water footprint

The water footprint concept was introduced by Hoekstra[569] in 2002. Water footprint is defined by the water footprint network as a '*measure of humanity's appropriation of fresh water in volumes of water consumed and/or polluted*[570] '. The water footprint measure is an indicator which

[566] L. C. McCabe, M. A. Pond and E. N. Helmers, 'Interrelationship of Air Pollution and Water Pollution' (1952) 24(1) Sewage and Industrial Wastes 83
[567] M. Agarwal, 'High air and water pollution in India's 41 tier-II cities' The Mint (28th April 2016, India)
[568] M. Shao et.al, 'City clusters in China: air and surface water pollution' (2006) 4(7) Frontiers in Ecology and the Environment 353
[569] A.Y Hoekstra (ed), 'Virtual water trade: Proceedings of the International Expert Meeting on Virtual Water Trade' (2003) Research report Series No. 12, UNESCO-IHE 67
[570] Water footprint network website < http://waterfootprint.org/en/water-footprint/what-is-water-footprint/ >

represents water consumption by source and by type of pollution. All the constituents of the total water footprint are specified according to country. Three types of water footprint are calculated[571]:

(1) Blue water footprint: Measures the consumption[572] of water resources (both surface and groundwater).
(2) Green water footprint: Measures the consumption of green water resources (ie., water that is precipitated and stored in the root zone of the soil). It is predominantly relevant for forestry and agricultural products.
(3) Grey water footprint: Measures the volume of freshwater that is required to assimilate the load of pollutants, given the concentrations and the existing water quality standards,. It is computed as the amount of water which is required to dilute the pollutants in order to maintain the quality of the water above the agreed water quality standards. Therefore, the higher the grey water footprint, the more polluted the water body. In the context of country level data, the higher the grey water footprint is, the more polluted the water bodies of a particular country are.

To illustrate this relationship between air and water pollution, a set of 124 countries is considered. CO2 emissions from fuel combustion and grey water footprint have been taken as proxies for air pollution and water pollution respectively.

Correlation between air pollution and water pollution

Data on CO2 emissions from fuel combustion has been obtained from the International Energy Agency and that on grey water footprint was taken from the Water Footprint Network. This network provided an average for the years 1996-2005 for grey water footprint[573]. As a result, the average of the CO2 emissions from fuel combustion was also calculated for the corresponding years for 124 countries to compute correlation between air pollution and water pollution.

[571] A.Y Hoekstra et.al, 'The Water Footprint Assessment Manual: Setting the Global Standard' [2011] Earthscan
[572] Consumption here refers to the amount of water body lost (or evaporated) from the available water in a catchment area of a ground surface water body.
[573] The reason why the grey water footprint could not be used to measure the regulatory stringency for water pollution as: (1) Disaggregated data was not available. Only an aggregated average of the years 1996-2005 was available (2) Even if the data were to disaggregated, it is only available till 2005. Extrapolating it for the next 11 years would have resulted in bias in the results.

What is correlation?

Correlation is one of the simplest yet most beneficial concepts in statistics. Correlation helps in understanding the nature of linear relationship (positive or negative) between variables. This measure also conveys information on the strength of the existing relationship. It quantifies the extent to which two variables (for instance, X and Y) 'go together'. Therefore, when high values of X are associated with high values of Y, a positive correlation exists. And when high values of X are associated with low values of Y, a negative correlation exists[574]. Correlation coefficients are computed for identifying the correlation between two variables. The value of the correlation coefficient ranges from -1 to +1. The closer the value is to +1 the stronger is the positive correlation and the closer the value is to -1, the stronger is the negative correlation.

For this study, the correlation coefficient for air and water pollution was computed as 0.834[575]. This result establishes that there is a strong positive correlation between air pollution and water pollution. In other words, countries with higher air pollution also have higher water pollution, however it does not imply that one causes the other.

Difference between regression and correlation analysis:

Although, regression and correlation are closely related, they are conceptually very different. They are closely related in the sense that both methods deal with relationships amongst variables. Correlation coefficient measures the linear relationship amongst two variables. Regression analysis, on the other hand, identifies the relationship between the dependent and one or more independent variables. This includes hypothesizing a model of the relationship, estimating the parameter values and using these to develop an estimated regression equation. Once tests are conducted to verify suitability of the model, the equation is used for predicting the values of the dependent variables given the values of the independent variables[576]. For instance, correlation is used to determine the relation between lung cancer and smoking, high school grades and college grades and scores on statistics and mathematics examination. But, regression analysis would be

[574] San Jose State University lecture notes < http://www.sjsu.edu/faculty/gerstman/StatPrimer/correlation.pdf > 1
[575] The correlation between air and water pollution was run using data for each variable on the STATA software.
[576] University of Oregon, Lecture Notes < http://abyss.uoregon.edu/~js/glossary/correlation.html>

used to predict a student's average score on a statistics examination by using the student's score on a mathematics examination[577].

4.6 Models

The study involves analysing the regulatory quality of India's rivers at the national level with the help of two econometric models, as stated in Chapter 2. Both the models have been estimated using time series analysis over the time period, 1990 to 2016.

4.6.1 **First Model**

Model Description

In this model, at time 't', India's river pollution is expressed as a function of regulatory quality (RQ), rule of law (RL), government effectiveness (GE), free media (FM), industrialization (Indst) and population (Pop). The model is expressed as follows:

$$waterpoll_t = \beta_0 + \beta_1 RQ_t + \beta_2 RL_t + \beta_3 GE_t + \beta_4 FM_t + \beta_5 Indst_t + \beta_6 Pop_t + u_t$$

where, u is the error term.

Variable and data description

India's water pollution data has been obtained from CPCB ENVIS. Individual water quality data for medium, major and minor rivers was averaged for each year. BOD is considered as the parameter for measuring water quality in the next two chapters. This is done so as to ensure consistency in this study, as in the previous chapter also the same water quality parameter was used.

RQ is considered as one of the explanatory variables in the model as numerous papers have maintained that though India has enough environmental regulations but, because of weak legal instruments, they have failed to be implemented[578]. In addition, there is also a lack of time-based priority for environmental regulations. One of the papers claims that prevalence of command and control regimes in environmental regulation leads to lack of compliance with environmental

[577] D. N. Gujrati, '*Basic Econometrics*' [2004] (McGraw Hill Companies, Fourth edition) 34
[578] Bowonder and Arvind (n 420) 182

regulations. This is further aggravated by the fact that India's environmental laws have an all-or-nothing approach with no consideration of the magnitude of the violation of law[579]. Also, there does not exist umbrella legislation for protecting the environment in India. The EPA (1986), which was supposed to fill this void, works only as an enabling legislation and not as an operative measure[580]. To capture RQ of river basin management in India, stringency of environmental regulations is taken as a proxy. The stringency is calculated as mentioned previously in the methodology section.

RL measures the quality of environmental policing. Corruption (Corr) has been considered as a proxy for rule of law. Corruption usually occurs in the natural resources management sector due to lack of respect for rule of law[581]. Many issues of resource depletion and environmental stress arise from inefficient institutions[582]. Corruption can worsen these conditions leading to further potential environmental degradation. It plays an enormous negative role in all environmental problems affecting not only the ecosystems but the dependent communities as well[583]. There is a vast literature which has empirically examined the undesirable environmental consequences of corruption[584]. Specifically for India, one study found that one of the reasons for a higher rise in water pollution compared to air pollution is because of financial mismanagement of resources in the form of underutilization, diversion and incorrect reporting of funding[585]. India's Environment Minister recently held corruption to be one of the main reasons for the increasing pollution levels in India[586]. Given that corruption plays a crucial role in pollution by diminishing the effectiveness of RL, it is taken as a measure for the latter. The measure of corruption is taken as percentile rank (lower bound of 90% confidence interval). This measure captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of

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[579] S. Ambhore et al, 'Environmental Protection: A Critical Analysis of Situation Prevailing In India' 2(7) 2013 Global Research Analysis 35

[580] For more details: Jayakumar (n 427) 33

[581] J. Dillion et.al, 'Corruption and the Environment' (Transparency International 2006)

[582] World Commission on Environment and Development (WCED), '*Our Common Future*' (Oxford University Press 1987)

[583] A. Leitao, 'Corruption and the Environment' (2016) 5(3) Journal of Socialonomics 1

[584] R. Damania, 'Environmental controls with corrupt bureaucrats' (2002) 7(3) Environment and Development Economics 407; A. Leitão, 'Corruption and the Environmental Kuznets Curve: Empirical Evidence for Sulfur' (2010) 69(11) Ecological Economics 2191; M. A. Cole (n 518) 637

[585] Greenstone and Henna (n 265) 3038

[586] A. Khandekar, 'Environment minister wants to clean corruption in pollution control offices' (The Freeexpress Journal 28 June 2017) < http://www.freepressjournal.in/india/environment-minister-wants-to-clean-corruption-in-pollution-control-offices/1092586 >

corruption. Percentile rank indicates the country's rank among all countries covered by the aggregate indicator, with 0 corresponding to lowest rank and 100 to highest rank. The higher the rank the more corrupt a country is. Percentile ranks have been adjusted to correct for changes over time in the composition of the countries covered by the WGI. Percentile Rank Lower refers to lower bound of 90 per cent confidence interval for governance, expressed in percentile rank terms. This dataset is compiled by the World Bank.

GE, as mentioned in Chapter 2, gauges the credibility of government's commitment to environmental policies. One paper points out that one of the reasons for failure of pollution abatement is institutional failure[587]. Another paper has pointed out the underlying reasons for institutional failure in water management in India as follows[588]:

(1) **Lack of technical expertise:** With the growing number of polluting industries and growing number of functions of the Boards, there is a lack of capacity building within the pollution control boards. The Parliamentary Committee has also noted this and has recommended multidisciplinary training for engineers of the pollution control boards.

(2) **Lack of manpower:** Along with lack of technical expertise, the Boards also suffer from lack of man power, an issue also addressed by the Parliamentary Committee and the Menon Committee. It has been observed that the District Environmental Engineers oversee more than one heavily industrialized belt. As a result, they are often not available immediately for addressing complaints of odor leaks from factories. According to former board officials, the recruitment process is lengthy and conducted through employment exchanges and, thus, it does not attract the right kind of manpower.

(3) **Lack of funding support and revenue generation:** The pollution control boards receive negligible amount of funding from MoEF and Central Government. In fact, most of the environmental statutes are not backed by funding support. As a result, it often leads to inefficient policing.

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[587] F. Lopez, 'Sustainable Development and Institutional Failure: The Case of Ecuador' (2005) 9(3) The Independent Review 339

[588] R. Rangarajan, 'A Review of Implementation Gaps in the Enforcement of Environmental Regulation in India' (2009) Environmental Policy: Citizens, Institutions & Implementation Working Paper, Institute for Financial Management and Research 26

Due to data limitations, funding support provided by the National River Conservation Directorate (NRCD) has been taken as a proxy for GE. Data on the variable comes from the MoEF. The NRCD is a part of MoEF and is responsible for implementing centrally sponsored schemes of NRCP.

Increasingly over the years, news media (FM) has been known to play a crucial role in influencing social movements and it has been able to bring about broader social change. The media can shape public opinion, by drawing attention towards a movements' issues, claims and opinions[589]. In terms of media affecting public opinion on several issues, there are two strands of thoughts amongst researchers. The first school of thought[590] is the elite opinion leadership concept. This concept hypothesizes that there is a two-step transfer of information. The first is from the mass media to the leaders or elites and the second step is from the elites or the leaders to the mass public. In this two-step process, information is first transferred from mass media to elites and then elites rebroadcast their opinions to the public. The second school of thought[591] says that media can directly influence public opinion. In other words, the media is capable of creating new public opinion and its effect is not limited to only reinforcing the existing opinion[592]. A study[593] attempted to understand which of these two schools of thought works specifically for environmental issues. The results demonstrated that both play a crucial role in raising environmental awareness and shaping public attitudes towards being pro-environment. There have been other studies which have attempted to analyse the effect of social media on environmental issues[594]. One US-based study[595] finds that media coverage prompts industries to lower their emissions as the latter reacts proactively to the 'threat of coverage'.

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[589] K. T. Andrews and N. Caren, 'Making the News: Movement Organizations, Media Attention, and the Public Agenda' (2010) 75(6) American Sociological Review 841

[590] P. F. Lazarsfeld et.al, *The people's choice: how the voter makes up his mind in a presidential campaign* (1948) (New York: Duell, Sloan, and Pierce)

[591] R. A. Brody, *Assessing the President the Media, Elite Opinion, and Public Support* (Stanford University Press 1991) 5

[592] J. Yin, 'Elite Opinion and Media Diffusion: Exploring Environmental Attitudes' (1999) 4(3) The Harvard International Journal of Press/Politics 62

[593] Ibid 64

[594] R. J. Brulle, J. Carmichael & J. C. Jenkins, 'Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010' (2012) 114(2) Climatic Change 169

[595] P. Campa, 'Media Influence on Pollution, and Gender Equality' [2013] (Doctoral dissertation, Stockholm University, Stockholm) < https://www.diva-portal.org/smash/get/diva2:617021/FULLTEXT01.pdf > 78

Another study[596] on India analyses whether news media plays a crucial role in promoting environmental awareness and pollution abatement. It concludes that media has played a very significant role. However, as Indian society is faced with other issues like poverty, people are often confused as to whether prioritizing environmental issues over other issues are worthwhile or not. But, going by recent Indian experiences, 'Swachh Bharat Abhiyan'-a campaign by the Indian government that aims to clean up the streets, roads and infrastructure of India's cities, smaller towns, and rural areas- has been successful because of media's role in promoting awareness regarding this campaign amongst citizens. In addition, the internet also plays a role in promoting environmental issues as all newspapers publish on online platforms as well. To capture FM, the proxy 'voice and accountability (VAP)' is considered. This measure is constructed for all the countries by the World Bank annually. The VAP measure includes perceptions of the extent to which a particular country's residents have freedom of expression and a free media.

The rationale for including population and industrialization as explanatory variables in the model has been provided in Chapter 3. The population variable considered is population growth (Popgrowth), data on which has been obtained from the UN Population Division (Department of Social and Economic Affairs). The variable for industrialization is percentage change in industry (Propindstry) (at constant prices), data on which has come from the Handbook of Statistics of Indian Economy by the Reserve Bank of India (RBI).

Therefore, the estimating equation for the first model can be expressed as follows, where waterpoll and GE have been expressed in their natural logarithms:

$lnBOD_t = \beta_0 + \beta_1 \mathrm{Emi}_t + \beta_2 \mathrm{lnCorr}_t + \beta_3 ln\mathrm{invstindwater}_t + \beta_4 VAP_t + \beta_5 Popgrowth_t + \beta_6 Propindstry_t + \mathrm{u}_t$

where, u is the error term.

4.6.2 **Second Model**

Model Description

The second model is formulated on the same lines as described in Chapter 2. The proxy for RQ is emissions per dollar of value added (Emi), similar to Model 1. The independent variables (IVs)

[596] A. Khan, 'Media's Support in Promoting Environment Awareness' (2016) 4(8) International Journal of Scientific Research and Education 5588

include Rule of law (RL), industrialization (Indst), Population (Pop), Free Media (FM) and total natural resources rent (NRR). The proxies for Rule of law (RL) and Free Media (MD) are corruption (Corr) and voice and accountability (VAP) respectively, similar to Model 1. The model is expressed as follows:

$RQ_t = \beta_0 + \beta_1 RL_t + \beta_2 Indst_t + \beta_3 Pop_t + \beta_4 \mathrm{FM}_t + \beta_4 \mathrm{NRR}_t + u_t$

where, u is the error term.

Variable and data description

In the case of this model too, corruption features as the proxy for rule of law (RL). One of the long-standing challenges for effective implementation of environmental regulations in India is corruption. As mentioned earlier, India's Environment Minister held corruption responsible in 2017 for ineffective implementation of pollution abatement measures and suggested imbedding information technology into the pollution control regime for enhancing transparency and efficiency for mitigating pollution[597]. Another paper confirms poor enforcement of environmental regulations and attempts to look at the underlying reasons for this. The SPCBs are, in fact, seen as offices where tasks are not completed without bribes[598]. A study on the lack of success of pollution control policy in India claims that poor monitoring and enforcement of environmental laws by the pollution control boards can be attributed to widespread corruption[599]. An Indian Water Portal article[600] points out that one of the reasons for the country's poor water governance is endemic corruption. Therefore, this study considers corruption as a proxy of RL to understand its impact on India's environmental regulatory quality, especially for river basin management. In this model, the corruption perception index developed by Transparency International has been considered as a measure of Corruption.

Industrialized (Indst) countries usually have higher pollution. In industrialized countries, environmental regulations and new technologies are helping in reducing pollution per unit

[597] Press Information Bureau (PIB), Ministry of Environment. Forest and Climate Change (27 June 2017)
[598] A. Khandekar (n 586)
[599] M. Karpagam, S. Thiyagarajan and G. Jaikumar, 'An Appraisal of India's Policy to Control Industrial Water Pollution' (2012) 9(1) International Journal of Education Development 85
[600] A.K Biswas, 'India needs to radically overhaul its water institutions' (India Water Portal, 23 November 2015)

produced but, unfortunately, industrial activities are growing at an unprecedented rate and putting further pressure on the natural resources base. Especially in developing countries, new issues are arising whereby old environmental problems (for instance, deforestation and soil degradation) remain largely unsolved and, at the same time, new pollution issues related to industrialization (such as, greenhouse gas emissions, water pollution, and desertification) are surfacing.[601] Therefore, industrialization has been considered as a variable to examine its effect on RQ. The proxy and data source for this is the same as in the previous model.

With an increasing population (Pop), the pressure on natural resources increases as per capita demand rises. As a result, a higher population should compel the authorities to ensure more stringent environmental regulations. The data source and proxy for this variable is the same as in the previous model.

Recently, many studies have highlighted the importance of FM and social disclosure which pushes the government in supplying public goods. A study based on India demonstrates that in states which have better media coverage, government officials are compelled to act in the public interest as it makes it easier for politicians to be held accountable for not doing so[602]. It also stresses the importance of the role of media in diminishing political agency issues by providing information to voters. In the Indian democracy, media is considered as the fourth estate and plays a crucial role in informing the public and, thereby, making the government accountable. Also, in India, there exists no government regulator for media except the Press Council of India. Though this is an advantage as the government cannot influence the media in this way, this has also resulted in controversies over 'paid news'[603]. Given this situation, it would be interesting to see whether FM has any impact on RQ of river pollution.

Total natural resources rent (NRR) is an economics concept. The World Bank defines it as a concept which involves accounting for the contribution of natural resources to economic output. Countries with abundant natural resources have enormous earnings from fossil fuels, minerals and

[601] European Commission, 'Environment Factsheet: Industrial Development' [2006] < http://ec.europa.eu/environment/archives/wssd/pdf/fs_industrial_development.pdf > 1
[602] T. Besley and R. Burgess, 'The Political Economy of Government Responsiveness: Theory and Evidence from India' (2002) 117 (4) The Quarterly Journal of Economics 1415
[603] M.H Ansari, 'Indian media in a challenging environment' (The Hindu, 16 July 2017)

forests. These earnings form a sizeable share of GDP and most of these earnings originate in the form of economic rents, that is, revenues earned above the cost of extracting these resources. Natural resources give rise to economic rents because they are not produced manually. When goods and services are produced, competitive forces increase supply until economic profits are driven to zero. But, as natural resources are fixed in supply, they command returns much higher than their cost of production. Rents from non-renewable resources as indicate the liquidation of a country's capital stock. When countries use these rents to support their current consumption rather than using new capital to substitute what is being used up, they are borrowing against their future. Therefore, if natural resources rents for a country are high it implies that the environmental regulations there are weak[604]. There exists virtually no study, in the global as well as Indian context, which explores the relationship between natural resources rent and water pollution regulatory quality. So, it would be interesting to see what type of relationship the models' results yield.

The estimating equation for the second model after including the proxies can be expressed as follows:

$$Emi_t = \beta_0 + \beta_1 \mathrm{Corr}_t + \beta_2 \mathrm{Propindst}_t + \beta_3 Popgrowth_t + \beta_4 FM_t + \beta_5 NR_t + u_t$$

where, u is the error term.

4.7 Results and Discussions

4.7.1 **Model 1**

The model is initially estimated by the OLS method. But the Durbin-Watson test for autocorrelation detected the problem of first order autocorrelation and, therefore, the OLS estimates have not been used to draw inferences. Subsequently, the model has been re-estimated using Prais-Winstein regression to correct for autocorrelation. Furthermore, as there was a possibility of reverse causality between water pollution and RQ and that between water pollution and corruption, a Granger-causality test was run. In both the cases, the Granger causality test results indicate that there does not exist any reverse causality.

[604] World Bank, World Development Indicators definition (n 19)

Table 4.1 Time-series model estimation results for India (Model 1)

Independent Variables (IVs)	OLS (First Model)	Prais-Winstein (First Model)
Emi_t	2.123	4.24*
Corr_t	0.659*	1.01***
$lnNRCD_t$	0.05	-0.026
VAP_t	-0.10*	-0.009***
$Popgrowth_t$	1.23***	1.06***
$Propindst_t$	1.17	0.598
	Ramsey RESET Test H_0 : Model has no omitted variables P-value = 0.103 **Multicollinearity Test** Mean VIF = 2.17 **Durbin Watson d-statistic** H_0 : Model has no first-order autocorrelation d-statistic: 2.71 **Granger Causality Test** H_0 : Emi_t does not affect BOD_t p-value: 0.275 H_0 : BOD_t does not affect Emi_t p-value: 0.10 H_0 : BOD_t does not affect $Corr_t$ p-value: 0.600 H_0 : $Corr_t$ does not affect BOD_t p-value: 0.477	

Note: Dependent Variable is lnBOD_t. According to VIF estimate our model does not suffer from multicollinearity problem as the value of the mean VIF is less than 10. ***, ** , * represent statistical significance at 1%, 5% and 10% level of significance respectively.

The results show that the effect of emissions per dollar of value added (Emi) on water pollution is statistically significant which implies that the regulations in place for river pollution in India have contributed for the wrong reasons towards water pollution abatement. A one unit decrease in RQ will lead to a 0.042 per cent increase in river pollution. However, it should be noted that the effect of RQ on river pollution levels is marginal as the effect is significant only at 10 per cent level. It is surprising that, despite the country having more than 200 Central and State legislative measures which deal with environmental issues, the RQ fails to affect river pollution abatement. It could well be the case that multiple legislative measures have led to further complications in their

enforcement[605]. This has compelled India's Supreme Court to step in repeatedly attempting to improve the implementation of environmental statutory law. This '*judicial led ad-hoc*[606]*'* approach prevents effective implementation. As a result, over the years, the Indian Courts' role has been transformed to that of a policy maker and educator[607], especially in the context of polluting industries[608]. For instance, in an SC order of 2014, the Federal Government was advised to establish a national environment regulator with offices in every state which would be responsible for appraising and approving projects for environmental clearances. India's judicial activism also ensured inclusion of 'right to a healthy environment' under fundamental rights in Article 21[609].

A study attempted to understand the SC's role in resolving environmental issues in India. It concluded that the SC has been able to play a critical role by using various methods, such as, implementing the principles of sustainable development and holding the statutory authorities accountable for performing their duties under Article 48A of the Indian Constitution[610]. Even, as recently as 2017, the SC ordered the shutdown of industries if they are unable to get their effluent treatment plants in working order within three months. It also reprimanded the pollution control boards and environment secretaries to abide by the court's orders[611].

However, legal experts cite the interference of the Supreme Court as an encroachment on Executive policy making[612]. In addition, dealing with environmental challenges requires administrative and police accountability, coordination at the grass-root level, civic sense and corporate responsibility. Nevertheless, the judiciary's role is critical in improving regulatory quality and it also ensures that the public and judiciary lie on the same side and political authorities

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[605] V.K Agarwal, 'Environmental Laws in India: Challenges for Enforcement' (2005) 15 Bulletin of the National Institute of Ecology 227

[606] S. Divan and A. Rosencraz, *Environmental law and policy in India* (2nd Edition, Oxford University Press 2002) 1

[607] Ibid 1

[608] Research Foundation for Science, Technology and Natural Resource Policy v/s Union of India and ors. , Writ Petition (civil) 657 of 1995

[609] R. Jain, 'The Indian Supreme Court as Environmental Activist' (The Diplomat, 24 January 2014)

[610] M. Parikh, 'Environmental Governance and the Role of Indian Supreme Court, with special focus on the period from 1988 to 1996: A Critical Analysis' (2016) 6(7) International Journal of Humanities and Social Science Invention 2319

[611] A. Vaidyanathan, 'Clean Up or Shut Down: Supreme Court's Ultimatum to Polluting Industries' (NDTV 22 February 2017)

[612] R. Rangarajan (n 588) ; Geetanjoy Sahu, 'Implications of Indian Supreme Court's Innovations for Environmenal Jurisprudence' 4/1 Law, Environment and Development Journal (2008), p. 1,
available at http://www.lead-journal.org/content/08001.pdf ; Desai and Muralidhar (n 461) 159

on the other, when legal redress is sought against institutional acts of omissions, unlike in case of China (as evidenced in Chapter 5)[613].

The NGT, India's environmental court has also made substantial efforts in terms of improving regulatory quality for river pollution. For instance, upon hearing a plea by the Gram Panchayat of Araba village, which claimed that unregulated sewage waste was discharged in the river Jojari in the state of Rajasthan, the NGT imposed a fine of 30 lakhs (45312.51 US $[614]) on Rajasthan's state government. In the case of *Jalbiradari & Anr. v. The MoEF*[615](with regards to pollution of Mithi river in the city of Mumbai caused by industries), the NGT reprimanded the city's Municipal Corporation for failing to set up treatment plants despite directions from the SPCB[616]. The NGT has also recently addressed the issue of severe pollution caused by Hindu cremation procedures near the river banks. It suggested using environmentally friendly methods like electric crematoriums instead[617]. However, the NGT is a tribunal and consequently its powers are limited. As it is vested only under the seven environmental laws, a PIL action filed at the NGT lacks high ranging powers (like the power of contempt and all enacted laws) as compared to those filed at the high courts.

As the SC and NGT actively contribute towards improving the implementation of environmental/water statutory law, RQ has probably contributed towards reducing river pollution. These results are not consistent with GAP's case study probably due to the fact that though Ganges river water quality has deteriorated over time, it is not the case of all Indian rivers. In other words, some rivers have experienced an improvement in water quality. For instance, an industrial estate in Gujrat called Vapi was included in the top 10 globally worst polluted places in 2007. However, because of improvements in pollution management, it has now been removed from that list. This industrial estate has two rivers, Damangaga and Kolak, whose pollution levels have decreased significantly as a result of implementation of new, improved regulations in terms of Common

[613] Jain (n 609) 1
[614] At the current exchange rates
[615] Jalbiradari & Vanashakti Vs. MoEF & others (Appeal No. 7 of 2015)
[616] National Law School of India, 'NGT on Mithi River pollution' (12 March 2014) < http://nlsenlaw.org/2014/03/12/ngt-on-mithi-river-pollution/ >
[617] India TV news Desk (3rd February 2016) < https://www.indiatvnews.com/news/india/national-green-tribunal-hindus-cremation-air-water-pollution-57385.html >

Effluent Treatment Plants (CETP)[618]. As a result, it can be safely concluded that, despite the fact that RQ has not contributed towards pollution abatement in GAP, it has contributed towards pollution abatement in other Indian rivers, although by a smaller margin.

As far as corruption-river water pollution nexus is concerned, the results yield that if we increase the control of corruption index by one unit, water pollution will increase by 10.1 per cent. As the control of corruption indicates that the higher the score, the more corrupt a country is, therefore, our results imply that corruption has a positive relationship with river pollution in India. This result is in line with the existing literature. Corruption has not only been linked to economic and social development, but it also affects the environment adversely[619]. Though corruption is not environmentally destructive, poor governance does lead to inefficiencies in policy formulation, management and enforcement. Despite there being numerous links between corruption and environment, there are very few empirical analyses based on India,[620] which explores this relationship between the two.

A recent paper suggests two possible channels through which corruption affects air and water pollution[621]:

(1) A direct effect where corruption inhibits pollution abatement activities such as enforcement, and monitoring. As a result, more corruption corresponds with higher pollution levels. This is also because corruption encourages producers and consumers to evade responsibility for causing environmental harm.
(2) An indirect effect where corruption is negatively related to economic growth which, in turn, has a multifaceted relationship with numerous measures of pollution.

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[618] Blacksmith Institute, 'World's worst polluted places report 2009' [2009] < http://www.worstpolluted.org/files/FileUpload/files/2009-report/Blacksmith-Institute-Green-Cross-Switzerland-WWPP-Report-2009.pdf >

[619] R. Lopez and S. Mitra, 'Corruption, pollution, and the Kuznets environment curve' (2000) 40(2) Journal of Environmental Economics and Management 137; R.P.G Damania et.al. 'Trade liberalization, corruption, and environmental policy formulation: theory and evidence' (2003) 46(2) Journal of Environmental Economics and Management 490

[620] S. Morse, 'Is corruption bad for environmental sustainability? a cross-national analysis' (2006) 11(1) Ecology and Society 22

[621] H. Welsh, 'Corruption, growth, and the environment: a cross-country analysis' (2004) 9 Environment and Development Economics 663

As a result, the effect of corruption on pollution is strong especially for less developed countries[622]. There have been various instances in India where pollution control board officials have been involved in corruption cases [623] . For instance, in December 2014, two officials from the Maharashtra Control Board were arrested for taking bribes from a scrap dealer for issuing environmental clearance certificate[624]. The Tamil Nadu Pollution Control Board has also faced bureaucracy issues. In February 2018, one of its district environmental engineers was arrested for accepting and demanding bribes for renewing licenses of stone crusher units. An unaccounted amount of 47964 US $ was recovered from the officer's house by the police, who suspected that the former took the aforesaid amount as bribe[625]. In 2007, the then Minister for Environment admitted that officers from pollution control boards accept bribes from industries with regards to water pollution[626]. Ten years later, the situation has still not improved, as evidenced by the Environment Minister's comment in 2017, that there is an urgent need of clearing the pollution control boards of corruption and bringing transparency in pollution abatement efforts[627]. This demonstrates clearly that higher corruption, and thereby less stringent rule of law, results in higher river pollution in India.

Expenditure of NRCD (considered as proxy for GE) seems to be ineffective in terms of river pollution abatement. A few reports suggest that despite India's high expenditure in river cleaning action plans, the pollution levels have been increasing over time. This could be attributed to the fact that the 'structure of expenditure' remains an issue. For instance, as mentioned in the previous chapters, the Ganges flows through five states and, as a result, lack of coordination between different levels of government (at the Federal, state, local and municipalities levels) has led to ineffective pollution abatement efforts. Further, as the other river action plans are based on GAP,

[622] Ibid 664
[623] Outlook, 'Two pollution control board officials held for bribe' (8th March 2017)
[624] TNN, 'Two MPCB officials held for graft' (The Times of India 20 December 2014, Aurangabad)
[625] TNN, 'Pollution control board engineer caught taking bribe' (The Times of India, Trichy 2 February 2018)
[626] P. Hamine, 'Trap corrupt pollution control board officials' (DNA, Mumbai 26 July 2017)
[627] PTI, 'IT to bring transparency in pollution control efforts, says Environment Minister Harsh Vardhan' (Financial Express, New Delhi 27 June 2017)

they suffer from similar issue[628]. There is also a lack of coordination amongst the Federal organisations such as the CPCB and the Central Water Commission (CWC)[629].

Apart from poor coordination, the NRCP has also been criticized for disproportionate funding of sites and its inability to keep pace with sewage generation in India[630]. For instance, of the 34 most polluted rivers, NRCP allocated the majority of the funding to only 10 rivers. The funding decision was made arbitrarily, without conducting any form of survey of the pollution levels of the rivers[631]. The implementation of river cleaning projects by the NRCP at the State and Federal level, leaves much to be desired.

The initial project reports on the river action plans prepared by the MoEF, which would have aided in implementation, were not vetted by technical experts. The implementation of projects at state level experienced cost escalations, poor quality work and delays. There was no provision for maintenance of assets after creation. It also lacked continuous monitoring of water quality. The issue was further aggravated by failure to establish a network for tracking river water quality, failure in terms of updating and defining water quality parameters, inadequate dissemination of data and absence of a comprehensive database for supporting the NRCD activities[632]. The absence of a comprehensive inventory of rivers along with the corresponding ecosystems affected the planning process adversely. In addition, the Federal water pollution ministries such as the MoEF, COCB and SPCB's have not carried out an inclusive quantification and identification of human activities which pose a serious threat to river water quality.

As mentioned earlier, MoEF is yet to adopt a basin level approach for river pollution except in the case of the Ganges. In addition, water quality guidelines and parameters are yet to be developed for every river specifically[633].

Given these issues, it is not surprising that India's GE with respect to river pollution abatement remains ineffective.

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[628] S. Dutta, 'India's Rivers In Danger, But Revitalisation And Cleaning Efforts Possible, Say Panelists At The Banega Swachh India Cleanathon' (NDTV, 6 October 2017)
[629] A. Kelkar, 'Half of India's interstate rivers plagued by pollution and poor water quality' (India Water Portal, August 2018)
[630] S. B. Suresh et. al., *Sewage canal: How to Clean the Yamuna* (Centre for Science and Environment, 2007)
[631] Ibid 20
[632] Comptroller and Auditor General of India, 'Water Pollution in India' [2011]
[633] Ibid 257

The results also indicate that FM affects river pollution negatively which probably lends support to the argument that India's media has encouraged environmental activism,[634] which, in turn, has compelled the government to undertake river pollution abatement measures. According to the model estimates, a one unit increase in environmental activism leads to 0.9 per cent decrease in river pollution. Globally, a series of case studies indicate that media plays a significant role in environmental protection by reminding government agencies of their respective responsibilities, along with promoting environmental activism[635].

Firstly, the reason FM seems to affect pollution abatement efforts in India is probably because a majority of the media houses are privately owned and not state-owned, unlike those in China. Furthermore, the shareholders of the independent media houses are either individuals or corporate bodies[636] who are usually not censored by the government. Therefore, India's media can freely influence people and promote environmental activism.

Environmental degradation and pollution in India have taken many different forms of organized environmental movements[637]. India's first environmental activism movement can be traced back to 1974 when a group of women in Reni village, in the state of Uttaranchal, protested by hugging trees[638] to prevent the government from cutting them down as these trees were the villagers' livelihood. This led to the rise of nationwide environmental movements in the 1980s and 90s, with protests against deforestation, growing pollution and the construction of dams[639].

India's philosophy of environmental activism has always been very different from its western counterparts. The western world's philosophy of environmental activism lies in 'protectionist

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[634] To understand the relation between free media and environmental activism, refer to: N. Zhang and M.M Skoric, 'Media Use and Environmental Engagement: Examining Differential Gains from News Media and Social Media' (2018) 12 International Journal of Communication 380

[635] J. Hills and R. Welford, 'Coca-Cola and Water in India' (2005) 12 Corporate Social Responsibility and Environmental Management 168; L. Rajamani, 'Public Interest Environmental Litigation in India: Exploring Issues of Access, Participation, Equity, Effectiveness and Sustainability' (2007) 19(3) Journal of Environmental Law 293; T. Swerts, 'The Democratic Deficit of Transnational Environmental Activism: A Case Study of E-Waste Governance in India' (2013) 13(4) Global Networks 498

[636] NL Team, 'Who owns your media?' (5 February, 2014) < https://www.newslaundry.com/2014/02/05/who-owns-your-media-4 >

[637] M. Gadgil and R. Guha, 'Ecological Conflicts and Environmental Movement in India' (1994) 25(1) Development and Change 101; V.K Sridhar, 'Political Ecology and Social Movements with Reference to Kudremukh Environment Movement' (2010) 40(3) Social Change 371

[638] Also famously known as the 'Chipkoo movement'

[639] S. Narain, 'Changing Environmentalism' Seminar 516 < accessed on 6 May 2018> http://www.india-seminar.com/2002/516/516%20sunita%20narain.htm

conservationism'. The Indian environmental movement, however, is based on 'utilitarian conservationism', merely because of the huge number of deprived people who depend on their environment. These people are directly dependent on the nature for basic necessities, such as, water, food, medicines, fodder for their animals, etc.[640].

There are various studies[641] which point out that environmental activism in India has also critically engaged the 'urban-middle' class. On one hand, they are the leading voices for protecting the environment and, on the other, their affluent and resource intensive lifestyles lead to environmental destruction[642]. However, both groups have contributed towards environmental activism in India.

In terms of activism against river pollution in the country, it has been focused on three major discourses: (1) preservation of the floodplains and protecting them against building developments; (2) questions regarding minimum water flow in the river; and (3) pollution abatement and ecological restoration[643].

(1) **Preservation of the floodplains and protecting them against building developments:** The strongest environmental movements in India have centered on dams. The biggest example of this is the 'Narmada Bachao Andolan'. It is a powerful mass movement which was initiated in 1985 against the construction of a dam on Narmada River which flows through Gujrat, Maharashtra and Madhya Pradesh. This river is one of the largest west flowing Indian rivers which supports a wide variety of people with distinctive cultures and traditions, ranging from the indigenous people inhabiting the jungle to the rural populations. Although this protest was against the huge displacement of settlements that would take place if the project was sanctioned, during the course of the movement the lead environmental activist, Medha Patkar, realised that MoEF was required to look at the project details after it was approved by the government. Further, when the MoEF looked at the project, its impact assessment lacked stakeholder analysis of the people being affected. The project also contained incorrect and unverified information regarding land records. This project was initially being funded by the

[640] Ibid
[641] A. Baviskar, 'Between Violence and Desire: Space, Power and Identity in the Making of Metropolitan Delhi' (2003) 175 International Social Science Journal 89
[642] A. Follmann (n 524) 1
[643] Ibid 3

World Bank, but after several hunger strikes and environmental activists testifying against it, the Bank set up the Morse Commission in 1989 to look at it. In 1993, the Indian government cancelled the loan sanctioned by World Bank[644]. Although the dam was constructed, the environmental movement ensured that the Indian government conducted a thorough environmental impact assessment before commencing the project.

(2) **Questions regarding minimum water flow in the river:** In 2006, a PIL action[645] was filed by Vijay Chandra Srivastava and others, against the state government of UP for failing to ensure reasonable minimum water flow in the downstream Ganges River to Allahabad. The claim stated that water was being diverted from the river by canals and, as a result, it is merely a stream now with water levels reaching 'danger' limits. The Court realised that this PIL raised a serious issue regarding the extent to which states can withdraw water from the main river to feed the canals. This case prompted the Allahabad High Court to issue an affidavit to the Chief Secretary of UP seeking a clarification on the stand of the state with regards to three issues namely: (a) whether the state can draw an unlimited quantity of water from a river even to the extent of reducing the main stream to a dry zone?; (b) can important natural sources such as the River Ganges be allowed to be destroyed as a result of drawing unlimited quantity of water for agricultural purposes?; and (c) as a result of water withdrawal from the Ganges, can the state allow it to get polluted downstream to the extent that it is unfit even for bathing purposes? Such intervention by the court after filing of the PIL indicates that environmental activism, in terms of ensuring minimum waterflow in the river, has been a success in India. Further, it also supports the point made earlier that India's courts have a played a significant role in improving river pollution's RQ.

(3) **Pollution abatement and ecological restoration:** India's environmental movements, with regard to pollution abatement in rivers, usually consist of peaceful protests. For instance, in March 2016, Rajendra Singh (known as the Waterman of India) started an initiative known as the 'River March', where more than 15000 people walked along Dahisar, Poisar, Oshiwara and the Mithi rivers in the state of Maharashtra to highlight their deteriorating river water quality. The participants were later urged to write a letter to the then Chief Minister along with the Prime Minister, informing them of the condition of the rivers witnessed by the public,

[644] EcoIndia: http://www.ecoindia.com/education/narmada-bachao-andolan.html
[645] Ganga Pollution vs State of U.P. And Others on 13 July, 2010

which might have prompted authorities to take action[646]. A year later, in April 2017, 70 citizens and civic body workers got together and collected more than 1,20,000 kgs of trash (containing mostly plastic) from the Poisar riverbed. At another spot along the river (Dhunkarwadi), another group of citizens calling themselves the 'tanker group' collected 15 truckloads of waste consisting of liquor bottles and plastic[647].

In October 2017, over 250 residents along with environmental activists, and civil societies formed a human chain at Elliot's beach in the state of Tamil Nadu requesting the state government to protect the rivers and wetlands from destruction[648]. In another state in Southern India called Kerala, the residents along with the Budhanur gram panchayat in Alappuzha district revived the Kuttamperoor stream connecting the Pampa and Achankovil rivers. It was stagnant for more than a decade as a result of dumped waste. More than 700 local men and women worked together to bring it back to life and dispose of this waste[649].

There are several other examples where citizens/residents along with environment activists have initiated various river cleaning programs[650]. Given the numerous instances of environmental activism in India, it is not surprising that it seems to affect pollution abatement efforts positively.

The econometric results reveal that population growth affects BOD significantly and there exists a positive relationship between the two variables. This implies that growth in population leads to an increase in the river water pollution. The model predicts that a one unit increase in population would lead to 10.6 per cent increase in the river water pollution levels. These results are similar to

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[646] V.A Singh, 'Around 15,000 people take part in walk demanding clean-up of rivers in Mumbai' (DNA, 7 March 2016)

[647] B. Chatterjee, 'In Mumbai: Citizens, BMC remove 1.2-lakh-kg trash from Poisar river in two weeks' (Hindustan Times, 10 April 2017)

[648] P. Thirumurty, 'Residents of Chennai form human chain to 'Save Ennore Creek' (The News Minite, 29 October 2017)

[649] S. Lekshmi Priya, 'In Kerala, 700 People Worked 70 Days to Revive a River Considered 'Dead' for over a Decade!' (The Better India, 2 May 2017)

[650] For instance: K.A Shaji, 'After 40 years, 'Thampu' returns, to save a river' (The Hindu, 10 January 2018); V. Mawani, 'Ahmedabad City WaterWalks – Sabarmati beyond the Barrage' (Veditum, 28 February 2017); IANS, 'Women rally in Agra to demand saving of Yamuna' (Business Standard, 9 March 2018); South Asia Network on Dams, Rivers and People (SANDRP), 'Positive Rivers Stories 2017: Citizens Reconnecting with Rivers' https://sandrp.in/2018/03/13/positive-rivers-stories-2017-citizens-reconnecting-with-rivers/ <accessed on 6 May 2018)

those obtained in Chapter 3. It is expected that the underlying reasons for population affecting BOD in both cases are the same.

The results further demonstrate that the proportion of industries does not seem to have any effect on river water quality for all Indian rivers. These results are further verified, by conducting tests of the results' robustness.

However, in Chapter 3, the results demonstrate that the proportion of industries contributes to a rise in Ganga river pollution. The cause for this difference between the two is that the states through which the Ganges flows (Uttar Pradesh, Uttarakhand, West Bengal, Bihar and Jharkhand) have lesser number of river treatment facilities and a higher proportion of Grossly Polluting Industries (discharging their effluents in rivers), than the rest of India.

Table 4.2 Depicting the percentage treatment facilities and number of industries discharging their effluents in rivers and lakes for 2008-09 (Data taken from CPCB Annual Report 2008-09).

States	Percentage treatment facility (Sewage Treatment Plants)	No. of industries discharging their effluents in rivers and lakes
Other states (average)	35.82	5.89
Uttar Pradesh (UP)	33	62
Uttarakhand	14	16
West Bengal (WB)	21	7
Bihar	11	0
Jharkhand	0	3

The table above depicts the national average data as well as individual states' data on the existence of infrastructure in terms of 'percentage of availability of sewage treatment plants'. It also depicts the average number of industries discharging their effluents in rivers and lakes at the national level as well as at the state level. It is clearly evident that Uttar Pradesh, Uttarakhand and West Bengal have a much higher number of polluting industries as compared to the national average. On the other hand, when the percentage of treatment facilities are considered, the corresponding three states have considerably fewer sewage treatment plants available when compared to the national average. This clearly indicates that the states through which river Ganges passes (barring two states) have a higher number of industries discharging effluents in rivers and lakes and a comparatively lower number of treatment facilities (as compared to other rivers) which results in industrial growth affecting water pollution in the case of Ganges but not for the entire country.

4.7.2 **Model 2**

An OLS regression is run to estimate Model 2. As the test for autocorrelation did not reveal anything, the OLS results are considered final. Further, as there was a possibility of reverse causality between regulatory quality and corruption, the Granger-causality test was run. The results indicate that there does not exist any reverse causality between water pollution and regulatory quality.

Table 4.3 Time-series model estimation results for India (Model 2)

Independent Variables (IVs)	OLS (First Model)
$No.ofNGO_t$	0.00008
$Resrent_t$	-0.0019
VAP_t	0.006
$Corr_t$	-0.0000015*
Pop_t	0.161***
$Indst_t$	-0.149
	Ramsey RESET Test H_0 : Model has no omitted variables P-value = 0.16 **Multicollinearity Test** Mean VIF = 2.52 **Durbin Watson d-statistic** H_0 : Model has no first-order autocorrelation d-statistic: 2.58 **Granger Causality Test** H_0 : Emi_t does not affect $Corr_t$ p-value: 0.097 H_0 : $Corr_t$ does not affect Emi_t p-value: 0.277

Note: Dependent Variable is Emi_t. According to VIF estimate our model does not suffer from multicollinearity problem as the value of the mean VIF is less than 10. ***, ** , * represent statistical significance at 1%, 5% and 10% level of significance respectively.

The results for Model 2 show that the number of NGOs have no effect on RQ. This result is surprising as NGOs are expected to play a crucial role in the management of rivers given their interactions with government institutions, communities and media in creating awareness on environmental issues and, thereby, reinforcing the environmental protection lobby in the local

community[651]. However, in India's case, environmental NGOs seem to have an ambiguous position with regard to people's perception.

On the one hand, NGO's are being blamed by India's Intelligence Bureau (IB) for reducing the country's annual growth rate by a staggering 2-3 per cent as a result of campaigning against projects that are deemed integral to the country's growth[652]. This has further led to accusations against the NGOs that they are '*serving as tools for foreign policy interests of western governments*[653]' by sponsoring campaigns for protecting environmental rights. Prior to the IB's report, the NGO's were already under scrutiny. The Foreign Contribution Regulation Act (FCRA), introduced in 2010, required NGOs to apply for a license if they receive foreign funding. NGOs require local support to thrive, but, in India, the support is lukewarm towards foreign-funded NGOs. According to Biraj Patnaik-a human rights activist, '*'NGOs, especially which receive foreign funding do not enjoy societal credibility*''. He further adds that '*'Indian society is fundamentally xenophobic, and faces a post-colonial hangover''* and hence there is the prejudice towards internationally funded NGOs which protest against development activities harming the environment[654].

The attack on foreign funding of NGOs has further led to a fall in domestic donations and supporters resulting in a clampdown on many environmental organisations. Furthermore, at least 10,000 FCRA licenses have been revoked. Some of these cancellations can be attributed to administrative issues (as organizations failed to submit appropriate paperwork) but some of these might have been tactical on the part of the government by introducing digital returns and shorter turnaround times to obtain FCRA licenses, all of which presented a huge barrier to small organisations[655]. The last government had made the FCRA law stricter by requiring licenses to be renewed every five years and allowing the states to suspend permits and freeze accounts for 180 days during investigations. The current government, however, is more openly hostile to NGO's[656].

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[651] H. Joshi and A. Kumar, 'Role of Non-Governmental Organizations in Restoration and Management of Fresh-Water Ecosystems' in M. Sengupta and R. Dalwani (Eds.), *Proceedings of Taal 2007: The 12th World Lake Conference: 1880-1884* (2008) 1880

[652] V. Doshi, 'India accused of muzzling NGOs by blocking foreign funding' (The Guardian, 24 November 2016)

[653] D. Doane, 'The Indian government has shut the door on NGOs' (The Guardian, 7 September 2016)

[654] Ibid

[655] Doane (n 653)

[656] R. Mohan, 'Narendra Modi's Crackdown on Civil Society in India' (The New York Times, 9 January 2017)

Also, because campaigning in India requires constructive engagement with the government, NGO's have been severely constrained. Suman Sahai states that '*the current climate is one of total disengagement. The government has shut the door on the NGO sector*[657]'.

To add to the constraints on the environmental NGO's sector, it faces other limitations in India, such as, lack of trained personnel in the field of environmental protection, shortage of research and development facilities and difficulty in mobility in the absence of transport facilities, especially in rural areas[658].

Given that Indian environmental NGOs are facing a credibility crisis with a number of embezzlement cases coming to the fore along with lack of cooperation from governmental agencies, it can probably be asserted that they do not seem to be playing any substantial role in river pollution abatement. However, whether the NGO's are making an impact through Right to Information (RTI) and PIL actions remains to be seen later in this chapter.

Although NGOs do not seem to be overall effective in river pollution abatement in India, they do exert a significant impact in the case of the River Ganges. The reason for this could be that, given the lack of funding and public support faced by NGOs in India currently, they are taking up causes which help to promote them more and to weather public scrutiny. For instance, the River Ganga is a religious river in India which resonates with deeply ingrained sentiments amongst the public. Therefore, taking up the cleaning initiatives for the Ganges could provide NGOs with better funding opportunities and serve to change public perceptions. It is also believed that, with the country's obsession with cleaning up the Ganges, the NGOs take up issues which the media is quick to follow up on[659].

Despite all the ethical issues plaguing environmental NGO's it cannot be denied that they have played a crucial role in improving GAP's RQ, even if they do not seem to be affecting the RQ for the rest of the Indian rivers. Moreover, given the hostile governmental attitude towards NGOs and the lack of local funding, it cannot be denied that NGO's are probably obligated to only concentrate on issues which get them the maximum media attention which will, in turn, lead to garnering more

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[657] Ibid

[658] A. Agarwal, 'Role of NGO's in the protection of environment' (2008) 2(4) Journal of Environmental Research And Development 933

[659] D. Sandhu and P. Arora, 'Role and Impact of Environmental NGO's on Environmental Sustainability in India' (2012) 1(3) Gian Jyoti E-Journal 93

public support. Until then, their effect would probably be visible only in few specific cases like that of the Ganges.

The results also indicate that NRR do not seem to affect RQ. According to political economy literature, natural resources rent (NRR) interacts with state institutions and governance in two ways. Firstly, extraction of natural resources induces deterioration of RQ. The underlying reason for this is that resource wealth earned from resource rents might affect governance quality by triggering bureaucratic battles amongst different interest groups and amongst states for control over these natural resources. However, this theory does not hold true for authoritarian regimes. Secondly, even if resource dependence does not degrade governance, it would affect the quality of institutions and governance through lax natural resource management policies and their implementation throughout the value chain. Therefore, institutional quality and the government's ability regarding implementing and drafting effective natural resources regulations would affect outcomes, not only in the natural resources sector like fossils fuels from where rents can be earned but also other resources sector such as water, air and land. This is because, as natural resources revenues generate huge profits, the government might be tempted to make policy and public decisions which would have long-term consequences in terms of environmental degradation of other resources[660].

In India's case, however, NRR does not seem to be interacting with state institutions and governance in either of the two aforementioned ways. This is probably because India's mining and quarrying activities seem to have grown at a negligible rate (as evidenced in the graph; at an average rate of 0.03%) since 1959. Consequently, the model does not show any significant impact of NRR on RQ.

[660] N. H. Barma et.al, 'Rents to Riches? The political economy of resource led development' [2012] World Bank 45

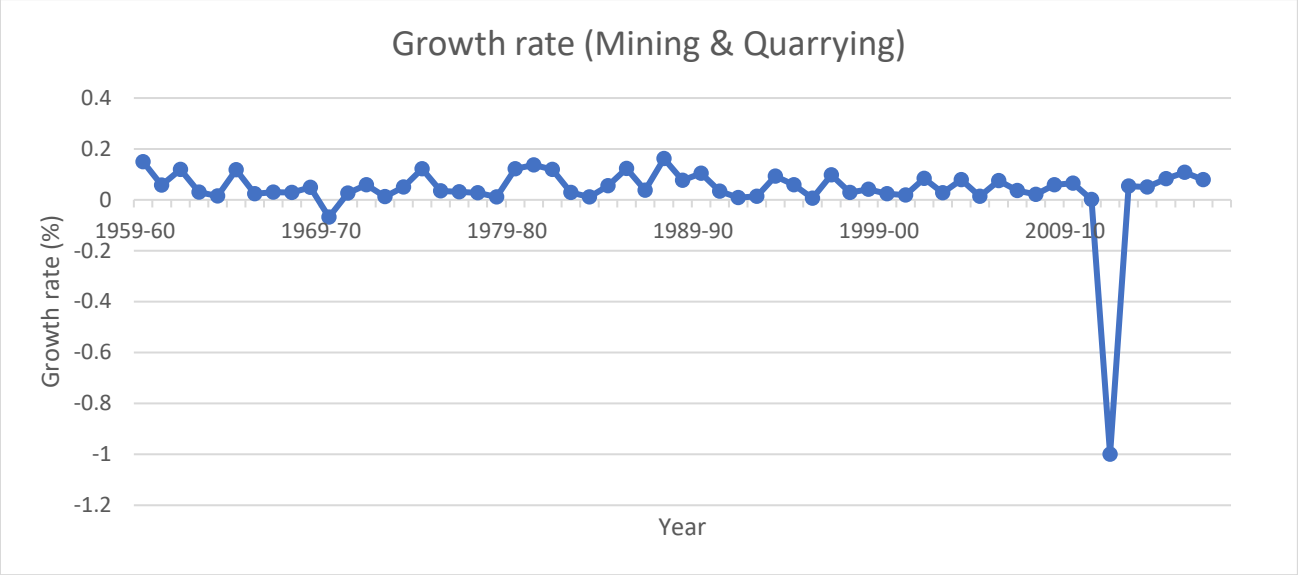


Figure 4.2: Growth rate of India's mining and quarrying sector (1959 to 2017) [Source: Reserve Bank of India (2017)]

The growth rate of mining and quarrying activities shows a steep decline in 2011, because activities were stalled due to environmental and land acquisition issues addressed by the Supreme Court[661]. Following this, the Supreme Court imposed a blanket ban across India on mining following claims that illegal mining was damaging the environment[662]. This ban was lifted in phases from 2013 onwards.

This is yet another example of the Indian judiciary stepping in to protect the environment where the Executive fails to implement statutory law.

Model 2 results also indicate that if corruption perception increases by one unit, emissions per dollar of value added decreases by 0.000015 units. This implies that if the country's corruption levels drop by 1 unit (the corruption perception indicates that the higher the score, the lower the level of corruption in the country concerned), then RQ of river pollution improves by 0.000015 units (the lower the emissions per dollar of value added, the higher the regulatory stringency and the better the regulatory quality). This result supports our earlier model results where we found that RQ is marginally significant in terms of pollution abatement. This model result points out that the reason for failure of RQ in India is corruption along with other factors.

[661] A. K. Hazra et. al., 'Development of Indian Mining Industry – The Way Forward' [2013] FICCI Mines and Metals Division

[662] The Financial Times, 18th April 2013

The underlying causes of corruption in the implementation of environmental statutory law are as follows.

As mentioned earlier, India's governance of water issues is fragmented and decentralized. It is fragmented owing to the presence of multiple authorities, departments and institutions which are responsible for water and the multiple statutory laws which, in turn, results in ambiguous regulations regarding water resources. Further, the governance of Indian rivers is decentralized as states have primary jurisdiction over water within the states[663]. Experts suggest that this fragmented institutional structure is one of the primary reasons for bureaucratic corruption in river pollution abatement. India's executive branch, in fact, has the highest level of corruption[664].

India's bureaucratic corruption thrives on discretionary powers, complicated procedures and red tape. Governance in India is characterized by complex procedures and bureaucracy which exercises wide-ranging discretionary powers and a lack of transparency in terms of rules. According to a 2009 report by Trace International on bribery demands in India, 90 per cent of bribes were demanded by government officials, of which 65 per cent were for avoiding harassment, 50 per cent were for timely delivery of services to which the individuals were already entitled and 10 per cent were meant to provide further benefits. Bureaucratic corruption in India's administration system includes wide-spread practices of nepotism, bribery and misusing official resources and positions[665]. Therefore, it is not surprising that India's corruption levels exert a negative impact on RQ.

The FM variable does not seem to have any effect on RQ. This is not surprising in India's case at all, as implementation of environmental statutory law (RQ) has not improved over time, otherwise river pollution levels would not have declined (as evidenced by our Model 1 results where RQ seems to be affecting water quality by a very small margin, probably as a result of the Supreme Court's interference in environmental matters). However, in our previous model, we found that FM plays a crucial role in terms of pollution abatement. This could be because, though FM's role in prompting the Executive to act for river pollution abatement has not worked, it has affected river

[663] P. Hanasz, 'The Politics of Water Governance in the Ganges-Brahmaputra-Meghna Basin' (2015) 112 ORF Issue Brief 32

[664] J.S Rajak, 'Corruption in India: Nature, Causes, Consequences and Cure' (2013) 18(5) IOSR Journal Of Humanities And Social Science 20

pollution abatement through another channel. FM in India via media coverage has encouraged numerous environmental PIL's[666] which might have led to improvement in river water quality.

The innovative methods used in Indian courts for resolving environmental outcomes have procedural characteristics. Procedural innovations are those judicial initiatives which expand on the existing procedures of environmental jurisprudence for environmental protection. For example, it includes entertaining petitions on behalf of pollution victims and inanimate objects, encouraging petitioners to bring environmental litigation to the Courts and appointing expert committees. One of the most important procedural innovations in environmental jurisprudence is the introduction of the concept of PIL[667]. After the introduction of PIL in the 1980s, the Court's approach changed completely, and it has been ruled that any member of public having adequate interest would be allowed to initiate legal proceedings in order to assert individual or collective rights. This has also permitted concerned individuals to bring cases to the Court's notice where, despite absence of any personal injury. In these cases, where multiple parties were affected, the individual generally has sufficient interest in initiating legal proceedings in order to assert meta-individual and collective rights in environmental problems[668].

India's Executive on the other hand has failed miserably in terms of pollution abatement. For instance, a performance audit by CAG in 2017 revealed deficiencies in planning, implementation, monitoring and financial management which led to delays in achieving the goals of the GAP. One of the main points of the current government's election manifesto included cleaning up the Ganges in 2015. However, the targets are nowhere near to completion. For instance, the river action plan had set a target for awarding sewage treatment plant contracts by 2016, but even by August 2017, it had not approved projects to be able to treat approximately 1400 million litres of sewage daily. The deadline for cleaning up the river is 2018, but the new water resources Minister was quoted as saying that the river water quality will probably only improve by March 2019[669].

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[666] Apart from PILs, media reports in India at times have also prompted the courts to initiate hearing on environmental issues such as the 'News Item "Hindustan Times" And quiet flows the Maily (A.Q.F.M.) Yamuna v/s Central Pollution Control Board and Another Ias Nos. 5-10 In Writ Petition (C) No. 725 of 1994'

[667] U. Baxi, 'Taking Suffering Seriously: Social Action Litigation in the Supreme Court of India', in Tiruchelvam and Coomaraswamy eds., *The Role of the Court in Plural Societies*, (St. Martin's Press, 1987)

[668] G. Sahu (n 612) 375

[669] Reuters, 'PM Modi's promise to clean up Ganga nowhere close to being fulfilled; river 'dying' from pollutants' (New Indian Express, 29th December 2017)

PIL has encouraged initiation of a number of environmental actions, as mentioned earlier specifically for river pollution abatement [670]. Most of the cases have been initiated by environmental activists on behalf of other individuals or the public at large to ensure implementation of statutory acts and constitutional provisions for environmental protection. An Indian Supreme Court report states that 104 environmental cases were filed from 1980-2000, of which 54 were filed by individuals who were not the directly affected parties[671]. PILs have also encouraged environmental activists to play a crucial role in environmental protection. In such cases, the polluter has been asked to pay damages and restore the environment to its former position[672].

Therefore, it indicates that though FM has failed to affect RQ (according to Model 2 result, RQ still affects river pollution (though the effect is almost insignificant: according to Model 1 results) through support in the form of litigation to the general public.

The results demonstrate that a rising population affects RQ significantly and negatively. This implies that, with everything else being constant, a one unit increase in population leads to a 0.161 unit weakening of regulatory quality in India. This result is similar to the Model 2 result obtained in Chapter 3. Therefore, the underlying reasons for this is expected to be the same in both cases.

The results also show that industrialization does not seem to affect regulatory quality at all. India's industries comprise of services, manufacturing, electricity, gas and water supply and construction. Of these, services accounts for 44.60 percentage of GDP, and manufacturing accounts for 25.75 percentage of GDP[673]. Services' contribution to CO2 emissions is almost negligible[674], whereby CO2 emissions in manufacturing during the last 10 to 15 years have reduced on an average in the range of 3 to 3.5 per cent per annum. Further, during 2009-10 to 2012-13, India's manufacturing plants[675] (in the organised sector) reduced CO2 emissions by 10 per cent or more[676]. On the other

[670] IANS, 'Supreme Court issues notice on PIL against pollution of Ganga' (UCAN, 13th January 2014); M. C. Mehta, Petitioner v. Union of India and others Writ Petition. No. 3727 of 1985, D/- 22-9-1987;
[671] All India Reporter from January 1980 till December 2000, Supreme Court Cases
[672] Indian Council for Enviro-Legal Action v. Union of India (n 490)
[673] D. Jain et.al., 'Factors Affecting GDP (Manufacturing, Services, Industry): An Indian Perspective' (2015) 3 Annual Research Journal of Symbiosis Centre for Management Studies, Pune 38
[674] P.M Cunanan, 'Carbon Intensive Industries – The Industry Sectors That Emit The Most Carbon' (April 12, 2018) < https://ecowarriorprincess.net/2018/04/carbon-intensive-industries-industry-sectors-emit-the-most-carbon/ > 77
[675] A plant usually comprises of one or more buildings which has facilities for manufacturing
[676] B. Goldar et. al., 'Reduction in Carbon Emissions Intensity and Impact on Export Competitiveness: Evidence from Indian Manufacturing Firms' (2017) 8(2) Journal of International Commerce, Economics and Policy 1750012-1

hand, it should be noted that before 2007, the country's CO2 emissions from industries were growing. As the time period for this study has been considered from 1990 to 2016, we can safely say that the underlying reason for the average relationship between CO2 emissions and RQ being insignificant, is because, the positive and negative growth in CO2 emissions before and after 2007, respectively seem to have cancelled each other out. Therefore, industrialization does not seem to affect regulatory quality significantly.

4.8 Conclusion

A quantitative analysis of the determinants of river pollution in India reveals that the impact of RQ is marginally significant. Other factors such as RL, FM and population growth seem to be affecting river pollution levels very significantly. It is predicted that the reason for the less significant effect of RQ on river pollution is that, despite institutional failure and a fragmented water law, the Courts have stepped in time and again as self-regulatory institutions to ensure effective implementation of pollution abatement laws. Several examples of this have been cited above. Furthermore, GE does not seem to promote river pollution abatement. The reason behind this lack of impact is the existence of corruption (taken as a proxy for rule of law), as evidenced by the results. FM seems to affect India's river pollution levels through encouragement of environmental activism movements as discussed above. As expected, population growth leads to an increase in river pollution levels. This finding is in line with that of various other studies.

In the second model, an attempt was made to understand which factors are responsible for affecting the formal regulatory quality of the Indian rivers. The results indicate that only corruption and population seem to play a significant role in this regard. Other variables such as the number of NGO's, NRR, industrialisation and FM do not seem to have any impact on it. It is believed that, because environmental NGO's in India have lately gained disrepute amongst the public along with facing other limitations in terms of financial resources, trained personnel and shortage of research development facilities, they have failed to affect river pollution law's RQ. Furthermore, the reason why the NGO's have had an impact on the effectiveness of GAP's RQ is that, because given the financial constraints and public disapproval they are facing, they are taking up causes which promote them more, help them change public opinion and get more financial support. NRR, on the other hand, has an insignificant relationship with RQ as India's mining and quarrying activities seem to have grown at a negligible rate since 1959. As a result, NRR failed to interact with state

institutions and governance in any of the two ways discussed before. Industrialisation does not seem to affect formal RQ as manufacturing, which forms the second major proportion of industries, has seen a decline in the production of emissions. The fact that FM, through encouraging freedom of expression and environmental activism, does not seem to have any effect on RQ is not surprising in India's case at all. That is because implementation of statutory laws [as expected in the way voice and accountability (VAP) affects regulatory quality] does not seem to have improved over time. Otherwise, river pollution levels would have declined over time. However, it should be noted that our Model 1 estimates show that FM plays a crucial role in river pollution abatement. Thus, it is expected that, though FM has failed to prompt the executive, it has played a crucial role in improving river water quality through the judiciary (via PILs). Further, the fact that corruption plays a role in influencing RQ is substantiated by our Model 1 results which confirms that corruption does play a significant role in reducing the river water quality. The results also demonstrate that a rising population affects RQ significantly and negatively[677]. Population growth lowers per capita resource availability and thus puts pressure on the existing natural resources resulting in their over-exploitation. This is evident from the results of our first model which demonstrate that a rising population results in deterioration of the river water quality. In addition, with a rising population, the pollution control boards are suffering from lack of man power, funding support, revenue generation and technological capacity (as evidenced by our previous model results, which demonstrates that GE fails to affect water pollution levels) which contribute to a rising river pollution in India.

4.9 Policy Implications

India's current water legislation is a moderately old and complex area of law and is characterized by substantive gaps. The country has neither a national water law nor any river basin laws. Though the River Boards Act was enacted in 1956, it was meant only for developmental purposes. Though the Act led to the establishment of river basin boards, none of these boards have taken up integrated river basin management. There are laws which do exist and could have been used for river pollution abatement such as the Water Act 1974, Wildlife Act 1972, Forest Conservation Act 1980, Electricity Act 2003 and EPA 1986. Unfortunately, they are not employed most of the times, not

[677] 'significantly and negatively' means, that RQ affects population negatively and the relationship is significant (as per the statistic results).

even in the most deserving cases. Given the dire conditions of the Indian rivers, there is an urgent need for enacting river basin laws in India which would concentrate solely on river pollution. There is also a need for each state to set up separate river water quality standards, as rivers' water qualities are influenced by its different geological and biological characteristics. Though the Water Act requires each state to set up their own standards, the states have instead adopted an approximate ISI standard which fails to address the different rivers' characteristics. Further, none of the water/environmental laws have provided provisions for public participation. Given that FM plays a crucial role in India in pollution abatement by promoting environmental activism as evidenced from the results of Model 1, it is important to ensure public participation in the planning and implementation of river action plans. Fragmentation of water law also leads to a fragmented institutional structure as it creates a dichotomy of control whereby no single agency is accountable for nationwide river pollution. This is evidenced by the fact that the CPCBs and SPCBs are under different institutional directions. The CPCBs are under the MoEF whereas the SPCBs are under the state government. Although the SPCB's are expected to operate under CPCB's overall policy framework, the latter is provided only with a coordination and advisory role. Further, the SPCB's are not allowed to generate their own financial resources. Instead they are financially dependent on the Federal and state governments. In addition, given that water is a state subject in India, it raises significant questions regarding the state's authority with respect to the manner in which the power is to be utilised. This often results in inter-state water disputes with regards to pollution abatement measures. Hence, it is recommended that the river basin law should set up an independent river basin organization which will be independent of the Executive. Also, it should provide the CPCBs and SPCBs with an advisory role. This would ensure diminished corruption or red tape-factors found to be significant promoters of river water pollution and ineffective formal regulatory quality.

Surely, one could argue that another bureaucratic organisation would not necessarily improve things in the rather complex and complicated water law protection regime already in place in the country. However, setting up of a river basin organization is recommended as till date India does not have a single organisation which is only dedicated to river pollution abatement, the earlier river board organisation only looked at the economic development aspect of the rivers. Further, the river basin organisation could also be made accountable under the river basin law for the country's river pollution abatement, as till date no specific organisation is responsible for the same. This

organization would also act as a coordinating mechanism between the Federal, state and the local government.

Finally, the ‘dual management’ institutional system needs to improve as it results in greater bureaucracy.

Rationale for Chapter 5

After conducting an analysis for understanding the effectiveness of formal RQ, GE and RL in the context of river pollution abatement in India, it was felt that there is a need to do a comparative analysis with another emerging economy of a comparable size which is facing similar pollution issues and struggling with sustainable development. Therefore, the second case study was chosen as China. Furthermore, despite China being a more developed economy (in terms of GDP) than India, China's pollution levels (CO2 emissions) have decreased over time, unlike in India, where higher economic development has led to higher pollution levels (especially since 2010) over time. This is evidenced by Figure 4.1, where the CO2 emission (kt) production of India and China have been plotted from 1990 to 2013. Therefore, it would be interesting to see how China's river water management has developed over time and in what ways do RQ, GE and RL affect river pollution in China. This chapter attempts to analyse China's river pollution formal regulatory quality and the institutional framework.

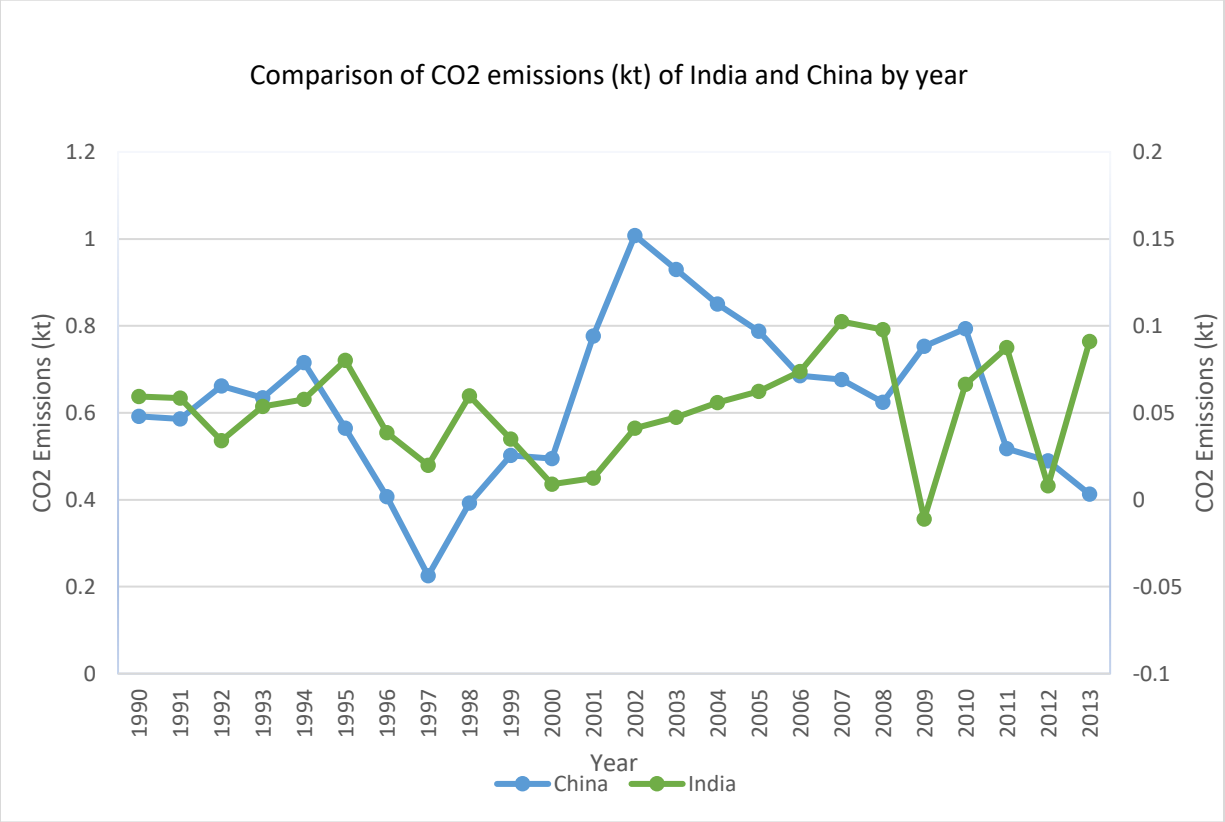


Figure 5.1: Plots the CO2 emissions produced by India and China between 1990 to 2013. (Data source: World Bank Indicator)

Chapter 5: Effective environmental protection and regulatory quality: A case study of China (For all the rivers)

5.1 Introduction and Background

Before China initiated market-oriented reforms in 1978, its economy grew at a relatively fast pace, but after 1978, the growth rate was unprecedented. During 1952-1978, the average annual growth rate of GDP in China was estimated to be 6.2 per cent[678]. In addition, China's exports grew at an average annual rate of six per cent[679]. However, since China's implementation of the 'open door policy[680]' in 1978 there have been remarkable strides in terms of economic development. In the early years of reform, as a result of the household responsibility system[681] and partial liberalization of agricultural prices, agricultural production and rural incomes rose. The introduction of liberal policies for non-state enterprises and initiation of market forces into state-owned enterprises resulted in growth of industrial output, exports and employment. China's 'open door policy', which encouraged trade and foreign investment, resulted in an export boom. In addition, the pre-1978 mono-banking system[682] became fragmented as a result of the 'open door policy' and, instead, a central bank was set up separate from other specialized banks and other non-bank financial institutions. As a result of these policy changes[683], China's average annual growth rate increased to 9.9 per cent during 1979-95, while the average annual growth rate for imports and exports increased to 16.6 per cent during the same period, and average life expectancy grew from 43 years in 1960 to 65 years in 1979[684].

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[678] T. G. Rawski, *Economic Growth and Employment in China* (Oxford University Press 1979) 79

[679] A. H Amsden et. al, 'China's Macroeconomy, Environment, and Alternative Transition Model' (1996) 24(2) World Development 273

[680] For a detailed study on this refer to: G. Huan, 'China's open door policy: 1978-1984' (1986) 39(2) Journal of International Affairs 1

[681] For more details on household responsibility system, refer to: J. Y. Lin, 'The Household Responsibility System in China's Agricultural Reform: A Theoretical and Empirical Study' (1988) 36(3) Economic Development and Cultural Change 199

[682] For further information regarding the monobanking system: V. lo Lo and X. Tian, *Law and Investment in China: The legal and business environments after WTO accession* (RoutledgeCurzon, 2005) 31

[683] L. Deming, 'Economic Growth and Sustainable Development in China' (1999) 34(45) Economic and Political Weekly 3213

[684] State Statistical Bureau, 'A Statistical Survey of China 1996' (China's Statistical Press 1996); World Bank, 'World Development Report' (Oxford University Press 1996) 22

Unfortunately, this development came at the cost of a degraded environment. Since the 1990's, China's environmental health has deteriorated steadily which has jeopardized public health and safety of millions of people[685]. Water is one of the critically important natural resources which has faced acute degradation in China.

5.1.1 **Rivers of China**

More than fifty-thousand rivers exist in China, each covering a catchment area of[686] 1000 km^2 or more. Influenced by topography and climate, these rivers are disproportionately distributed across China. A majority of these rivers are found in Eastern China as the monsoon in this region produces high precipitation. The northwest region, on the other hand, is arid with very few rivers as precipitation is far less[687].

China's water scarcity

As a result of an economic growth at an average rate of 9.5 per cent per annum for the last twenty-eight years (four times the rate of developed economies), water demand has risen steeply. From 1980 to 2007, there has been a thirty per cent increase in total water usage with the domestic sector's water demand increasing by more than 100 per cent and the industrial sector's water demand increasing by more than 150[688] per cent[689]. China is expected to exploit all of its available water resources by 2030[690]. Currently, 60 per cent of China's 660 cities face severe water shortage due to a lack of waste water treatment. The situation is expected to worsen further. By 2033, China's per capita natural freshwater resource availability is expected to decline to 1875 m^3, down

[685] D. Sun et al., 'Spatial analysis of China's eco-environmental quality: 1990–2010' (2013) 23(4) Journal of Geographical Sciences 695

[686] Department of Water Resources (Ministry of Water Resources) *Water resources assessment for China* (China Water and Power Press, 1992) 7

[687] D. Shen, 'River basin water resources management in China: a legal and institutional assessment' (2009) 34(4) Water International 484

[688] The greatest drivers for China's increasing water demand are industrialisation and urbanization. Increasing domestic water demand could be attributed to an increasing population and improved standards of living. Increasing industrial demand on the other hand is the result of increasing number of water-intensive industries such as mining and quarrying. In addition, local Chinese governments are also promoting water-intensive industries to increase the country's GDP.

[689] Shen (n 687) 488

[690] C. Buckley, 'China says water supplies exploited by 2030' *Reuters* (Beijing, 14 December 2007)

from 2156 m^3 in 2007 (this is the lowest per capita freshwater availability for a country)[691]. More than 100 cities, including major cities like Beijing and Tianjin, are already facing a severe water shortage. Currently, Beijing has 230 m^3 per capita availability of freshwater. This is far below the world water poverty mark[692]. This shortage has resulted in further depletion of both surface and groundwater with devastating consequences[693], including ecosystem deterioration[694] and salinity intrusion[695].

5.1.2 **River water pollution**

More than three-quarters of China's surface waters in urban areas are considered unsuitable for drinking and fishing[696]. In 2009, the country's Ministry of Environment Protection (MEP) declared that approximately 42.7 per cent of all rivers are unsuitable for drinking and fishing[697]. Rivers in China have been polluted by industrial and municipal wastewater discharges and agricultural runoff from fertilizers and pesticides. During 1990-2004, the consumption of fertilizers and pesticides nearly doubled, causing higher levels of river pollution from agricultural runoff[698]. China's rural industries[699] have played a crucial role in economic production but, unfortunately, they are also responsible for discharging over 10 billion tonnes of wastewater per year which is approximately half of the country's total industrial wastewater discharge[700]. In addition, it has been

[691] World Bank, 'Addressing China's Water Scarcity: Recommendations for Selected Water Resource Management Issues' [2009] 18
[692] Ibid 20
[693] China Water Risk, 'China's Water Crisis Part I – Introduction' [March 2010] 42
[694] X. Cai and C. Ringler, 'Balancing agricultural and environmental water needs in China: alternative scenarios and policy options' (2007) 9(S1) Water Policy 95
[695] S. Foster et.al, 'Quaternary Aquifer of the North China Plain—assessing and achieving groundwater resource sustainability' (2004) 12(1) Hydrogeology Journal 81; Changming Liu and Jun Xia, 'Water problems and hydrological research in the Yellow River and the Huai and Hai River basins of China' (2004) 18(12) Hydrological Processes 2197
[696] J. L. Turner, 'In deep water: Ecological destruction of China's water resources' in E. R. Peterson, & R. Posner (Eds.), *Water and energy futures in an urbanized Asia: Sustaining the tiger* (Centre for Strategic and International Studies 2007) 6
[697] Ministry of Environment Protection P.R. China, 'State of the Environment Report' [2009] 7
[698] China Statistical Publishing House (2005), *China Statistical Yearbook* (China Statistical Publishing House 2005)
[699] Rural industries are defined as small scale industries which use outmoded technology and obsolete equipment (G. Ding, J. Yu and F. Liu, 'Water Shortage and Pollution in China' (2016) 4(2) Academia Journal of Environmental Sciences 18
[700] M. Wang et.al, 'Rural industries and water pollution in China' (2008) 86(4) Journal of Environmental Management 648

observed that China's 'cancer villages[701]' tend to cluster around major rivers and their tributaries[702]. This parallel coexistence of polluted river water and cancer villages has resulted in an interest in the correlation between this phenomena[703]. Urban China is also struggling with water pollution issues. Chinese cities are grappling with both treatment of sewage and drinking water[704]. Majority of cities' untreated sewage and wastewater produced by households and industry are discharged directly into rivers without any adequate treatment.

The table below briefly summarizes the pollution issues of Chinese rivers. It also highlights the North-South divide in terms of river pollution in China:

Table 5.1 China's Southern rivers and the pollution issues[705]

River	Description	Issues
Yangtze River (Chang jiang)	It originates in the Tibetan plateau and is the longest river in China at 6,300 km. It is the third longest river in the world. It has a catchment area of 1.8 million km^2 (approximately around 20 per cent of China's landmass) and has 8 major tributaries. This river flows through, Qinghai, Tibet, Yunnan, Sichuan, Hubei, Hunan, Jiangxi, Anhui and Jiangsu before entering the East China Sea in Shanghai.	(1)Environmental impacts of large-scale hydropower projects, such as the Three Gorges Dam. (2)Sewage and industrial waste discharge; more than 14 per cent of the water quality is poor i.e. it cannot be used for drinking and swimming.
Pearl River (Zhu jiang)	This river is 2,214 km in length. China's third longest river[706], covering a basin area of approximately over 400,000 km^2. It flows through densely populated areas of Yunnan, Guizhou, Guangxi, Guandong. It finally empties into the South China Sea between Hong Kong and Macau, where it forms a delta.	(1) Highly polluted with many of its tributaries' water quality of much inferior quality than the lowest national surface water quality standard

[701] Cancer villages in China are villages that have exceptionally high cancer rates; that is these clusters have unusually high rate of mortality and the cause of death are different forms of cancer (S. Sharma , 'Development and Disease: A Study of Cancer Villages in China' (2016) 29 Politikon: IAPSS Political Science Journal 189

[702] The Ministry of Environmental Protection (MEP), 2012

[703] Various studies have been undertaken which try identifying the relation between the two such as, Shagun Sharma (n 701); Jenifer Huang McBeath et al., 'Environmental Pollution, Cancer Villages and the State's Response' <http://aacs.ccny.cuny.edu/2014conference/papers/jenifer%20mcbeath.pdf > accessed on 22nd September 2017

[704] Guodong Ding et al. (n 699)

[705] This table has been taken from China Water Risk (n 693)

[706] The World Bank, 'Cleaning up China's polluted Pearl river' <http://www.worldbank.org/en/results/2016/05/26/cleaning-up-china-polluted-pearl-river > accessed on 23rd September 2017

		(Class V[707]); unfit as a drinking water source[708]
Brahmaputra River (Yaluzangbu jiang)	Starting from Tibet, the 2900 km long river flows east and then it flows south through India and Bangladesh and finally into the Indian Ocean.	(1) Apart from the fact that it gives rise to transnational tensions between India and Bangladesh, it poses threats from dam building and river diversion as well.
Upper Mekong River (Lancang jiang)	This 2300 km river is the longest river in South East Asia. It starts from Qinghai and leaves China in Yunnan. It then flows through Laos and Cambodia and empties out into the sea in South Vietnam.	(1)Facing social and environmental impacts of dams and hydropower projects. (2) Threat of river flow diversions from downstream countries especially Vietnam. (3) Transnational tension between Cambodia, Vietnam and Laos.

Table 5.2 China's Northern rivers and the pollution issues[709]

Name of the Rivers	Description	Issues
Yellow River (Huanghe)	China's second longest river is approximately 5,500 km in length. It originates from the Qinghai province and covers nine provinces before reaching the ocean in Shandong province.	(1)Immense impact of agri-chemicals due to the runoff from fertilisers. (2) Consistently decreasing water volumes and river flows are less predictable. (3) Greater than 30 per cent of the water quality is poor and cannot be used for drinking purposes.
Songhua River (Songhua jiang)	It flows from the Northeast and is 2,308 km long. It originates in the Changbai Mountains and is the largest tributary of the Heilong jiang River.	(1) Pollution caused by heavy industries due to lack of sewage treatment (2)More than 60 per cent of water quality is poor and cannot support drinking (3) Potential transnational tension with Russia
Hai River (Liaohe)	It is a sediment rich river.	(1)The flood control measures put in place for the Hai river have substantial economic and

[707] The environmental standards set up in China, classifies water quality with a series of benchmarks, of this Class I is denoted as the 'cleanest' and Class V as the 'dirtiest'.
[708] The World Bank (n 706)
[709] This table has been taken from China Water Risk (n 693)

		environmental impacts on Beijing and Tiajin. (2) Substantial water treatment is required for industrial pollution as already more than 70 per cent of the water quality is poor and cannot support drinking.
Huai River (Huaihe)	This river is 1078 km in length. It originates in the Tongbai Mountains in Henan province and flows through Anhui. It finally enters the Yangtze river at Jiangdu, Yangzhou	(1)As more than 60 per cent of water quality is poor, this river cannot support water for drinking purposes.
Heilongjiang River (Helong jiang)	This river is known as the Black Dragon river. It runs along the border of Russia and China, running east across northern China and emptying into the Sea of Okhotsk. It is 4,300 km long and is the 11th longest river in the world.	(1)It faces pollution from heavy industries due to lack of water treatment.

North-South River Pollution divide

As is evident from the two tables, there is a significant north-south river pollution divide in China. For instance, 45 per cent of the water in Northern China is considered unsuitable for human consumption as compared to only 10 per cent of that in Southern China[710]. Moreover, 40 per cent of the industrial output is produced in Northern China which has access to only 23 per cent of the available water resources, thus further exacerbating the situation[711].

5.1.3 **Progress of environmental management with different stages of economic development**

According to the differences in the guiding ideologies and the corresponding development of the legislation and institutional system, the development of China's environmental management system can be divided into a three-part process[712]as follows:

[710] China Water Risk, 'China's Water Crisis Part II – Water Facts At A Glance' [March 2010] 11
[711] China Water Risk website < chinawaterrisk.org/big-picture/north-south-divide/ >
[712] X. Zhou 'Water Pollution Control in China: Review of laws, regulations and policies and their implementation' (2009) Economic Analysis Team, Institute for Global Environmental Strategies (IGES) 3

First Stage (1972- 1982)

This stage marks the foundation of China's environmental laws. The commencement of this phase can be attributed to several pollution accidents in 1972[713]. There are several milestones which ensured the setting up of an institutional, legislative and management framework for pollution abatement in the country:

(a) Following the Stockholm Conference on the Human Environment (1972), political pressure compelled the central government to be more sensitive towards environmental pollution.
(b) The introduction of the trial version of the Environmental Protection Law (1979) in Chinese legislation was the first step towards a pro-environmental legislative framework.
(c) The setting up of the Leading Group on Environmental Protection of the State Council (LGEP) in 1974 led to the establishment of various environmental administrative organisations. The Environmental Protection Agency (EPA) was also established in 1982 under the Ministry of Urban and Rural Construction (renamed now as the Ministry of Urban and Rural Construction and Environmental Protection).[714]
(d) The first China National Conference on Environmental Protection (CNCEP) was held in 1973 which raised awareness about environmental pollution at all levels of the government.
(e) The guiding principles of China's environmental policy-making were defined for the first time by thirty-two terminologies[715].

During the 1970's, China's economic development was greatly dependent on heavy industries like chemical, machine manufacturing, and iron and steel industries. These industries produced enormous amounts of the 'three-wastes[716]'- solid waste, gaseous waste and waste water. Therefore, the pollution abatement measures undertaken in this phase concentrated solely on end-of-pipe

[713] For instance, acid rains, sandstorms and arsenaisis pollution in drinking water [L.H Shi, 'Discussion on the Development of Chinese Environmental Protection Policies in Modern Times' (2007) (Master's Thesis, Inner Mongoliar Normal University)] 20
[714] Shi-qiu Zhang, 'Environmental regulatory and policy framework in China: an overview' (2001) 13(1) Journal of Environmental Sciences 122
[715] These terminologies included, public participation, rational layout, overall planning, recycling, comprehensive utilization, initiative action, environmental protection and benefits for the whole society [Zhou (n 712) 4]
[716] D. Wu and Chun-Yu Wu, 'Analysis of the evolution of Chinese environmental policies since the founding of new China' (2006) 27 Journal of Dalian University of Technology (Social Sciences) 106

abatement which included[717] a pollution levy system, environmental impact assessment (EIA) and the three-simultaneity system[718]. The first measure focused on economic stimulation while the other two measures attempted to control pollution without harming the economy[719]. These measures play a crucial role even today in China's pollution abatement efforts.

Second Stage (1983 – 1991)

This stage is possibly the most important stage in development of environmental policy-making in China. The development of the environmental management system during this period was as follows:(a) During the second CNCEP, environmental protection was adopted as an essential policy priority and, as a result, the need for strengthening environmental management was acknowledged.

(b) Consequently, the Law on Prevention and Control of Water Pollution (1984), Forestry Law (1984), Grassland Law (1985), Fisheries Law (1986), Mineral Resources Law (1986) and Land Administration Law (1986)[720] were enacted followed by the revised Environmental Protection Law (1989).

(c) In addition, the National Environment Protection Agency (NEPA) was founded in 1988 and many local Environment Protection Bureaus (EPB's) were also set up[721]. Furthermore, environmental protection was included as a priority in the seventh five-year plan[722].

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[717] The fundamental core for prevention of industrial pollution in China consists of 8 national policies. Of these eight systems, three of these systems (As mentioned above) were developed in the 1970s and announced officially in the Trial version of the Environment Protection Law. These three policies are also referred as the 'Three Old Systems' [Zhang (n 714)] 32

[718] The 'three-simultaneity system' is a term which specifies that environmental protection facilities must be designed, implemented and operated at the same time as the corresponding development project with which the facility is associated. (K. Zhang et. al., 'Environmental Policies in China: Evolvement, Features and Evaluation' (2007) 17(2) China population, Resources and Environment 1

The fundamental core for prevention of industrial pollution in China consists of 8 national policies which are implemented by the environmental bureaus. Of these eight systems, three of these systems (As mentioned above) were developed in the 1970s and announced officially in the Trial version of the Environment Protection Law. These three policies are also referred as the 'Three Old Systems' [Zhang (n 714) 123]

[719] Ibid 123

[720] Z. Mu, S. Bu and B. Xue, 'Environmental Legislation in China: Achievements, Challenges and Trends' (2014) 6 (12) Sustainability 8967

[721] H.G Chen and G.Z Pia, *Foundation of Environmental Law* (China Environmental Science Press, 1994) 41

[722] Zhou (n 712)

In terms of economic development, China's economy during this period was growing at an average annual growth rate of ten per cent. This resulted in high energy and materials consumption which led to high emissions. Consequently, the implementation rate for the three end-of-pipe abatement measures[723] multiplied rapidly during this period. For instance, the implementation rate[724] for EIA regarding large and medium-sized projects was 100 per cent and that for the three-simultaneity system was 96 per cent[725]. In addition to these measures, five new end-of-pipe abatement measures were proposed, namely an emission permit system, a centralized control system, a target responsibility system, quantitative examination of the environmental management system[726] and enforcement of pollution abatement measures for non-compliance by the designated date. Apart from these, numerous economic instruments were also implemented along with administrative orders, such as, resource taxes, compensation fees, subsidies on pollution abatement and preferential tax policies for comprehensive utilization of wastes produced[727].

Third Stage (1992- present)

The Rio Earth Summit, held in 1992, could be considered as a milestone as it ensured inclusion of sustainable development in China's environmental protection policy-making[728]. During this stage, the legislative basis and institutions for environmental protection were developed further through enactment of 26 new environmental laws and more than 50 environmental protection administrative regulations[729]. In March 1998, after the new Premier took over, the governmental agencies were reorganized. NEPA was restructured as an agency from a semi-ministry level to ministry level and was renamed as the State Environmental Protection Administration (SEPA). In the overall process of reorganizing ministries, SEPA was the only agency which was raised in terms of hierarchy in official ranks. This indicates that the Chinese Government, had begun considering environmental protection as a critical issue during this period. In the course of these

[723] The pollution levy system, environmental impact assessment and the three-simultaneity system, as mentioned in the earlier phase
[724] For EIA: the ratio of projects which carried out EIA amongst all projects that required to carry out EIA; for three-simultaneity : the ratios of projects which implemented the 'three-simultaneity' amongst all construction projects
[725] K.M Zhang, 'The Environmental Policies in China' [1994] World Environment 3
[726] In 1989, when the Environment Protection Law was amended and it's trial status was removed, along with the 'Three Old Systems' (n 718) five new systems were developed under this law(As mentioned above) to deal with issues which the earlier three systems were unable to handle [Zhang (n 714)]
[727] Ibid 124
[728] Shi (n 713)
[729] Ministry of Environmental Protection (MEP), 'Policies, Laws and Regulations' [2009]

changes, the main responsibility of SEPA shifted from developing the regulatory system to monitoring and supervising the environmental performance of other organisations[730]. Later, in 2008, China's environmental administrative authority was upgraded to the MEP[731]. During this phase, despite the efforts made by the government to curb pollution, industrial pollution continued to increase significantly.

5.2 River Basin Management in China

China's water resources management from an institutional and legal perspective is both basin and region based[732]. As water-related issues and problems are increasingly recognised in China, the river basin approach is gradually being acknowledged as the most appropriate approach for water resources management. Therefore, rivers are categorized into nine major river basins for the purpose of water resources management.

Table 5.3 Chinese river basins along with their catchment areas[733]

River Basins	Catchment area (km^2)
Songhua–Liao	1,248,445
Hai–Luan	318,161
Yellow	794,712
Huai	329,211
Yangtze	1,808,500
Southeast rivers	239,803
Pearl	580,641
Southwest rivers	851,406
Inland rivers (including the Tarim basin)	3,374,443

These river basins face numerous water pollution issues [734]. According to the MEP, in 2007, the total untreated wastewater discharge (industrial and urban) released into rivers was 55.67 billion tonnes. Of this, 31.02 billion tonnes were from the urban domestic sector and the remaining 24.65 billion tonnes were from the industrial sector[735]. The poor river water quality in the river basins is

[730] Zhang (n 714) 2
[731] Zhou (n 712)
[732] Shen (n 687) 488
[733] This table has been adapted from C.M Liu and Z.K Chen, *Assessment for current situations of water resources and analysis of supply–demand trend in China* (China Water and Power Press, 2001) 25
[734] Such as low per capita availability of water and lower development ratio
[735] Ministry of Environmental Protection, 'SOE (State Of Environment) report' [2008]

further worsened by reduced flows as a result of over abstraction[736]. As water resources management in China is based on river basins, many inter-jurisdictional issues arise. Water conflicts between regions are arising as a result of competition for water and disputes about trans-boundary pollution. For instance, between 1972 and 1988, the Yellow River Basin ran dry because of the absence of organized management for water abstraction. In the upper stream of the Hai River Basin, water conflicts amongst three provinces over pollution resulted in social instability in that area. Trans-boundary pollution between two provinces also resulted in blockage of a river stream in the Tai-Lake basin[737].

5.2.1 **The legal framework of river basin management**

At the National Level

China's history of water legislation is not old and the laws governing the river basin management framework are even newer. The fundamental law dealing with water resources management in China is also the country's first Water Law. It was enacted in 1988 and then amended in 2002. This law was issued with the purpose of ensuring the development, utilization and protection of water resources, the prevention and control of water disasters, and to derive benefits from water resources in order to meet the needs for national economic development and livelihoods for the people[738]. It also sets the requirement for water resources management planning, institutions, protection, utilization and development, dispute resolution, allocation and saving, enforcement and legal liabilities. The earlier version of the Water Law (1988) did not define river basin management clearly. It simply stated, *'in the development and utilization of water resources as well as in controlling water disasters, overall planning shall be undertaken with river basin or region as basic units.'*[739] The management institutions were mentioned as the 'nine dragons of the water resources department'. Later, when the Water Law was amended in 2002, it became China's first law to define river basin management in detail. It lays down[740] the details of the river basin

[736] Shen (n 687) 487
[737] Ibid 488
[738] Article (1) Water Law of the People's Republic of China (1988)
[739] Article (11) Water Law of the People's Republic of China (1988)
[740] For instance, Article 14 clearly lays down on the basis of river basins and regions, unified plans should be laid out. It also specifies the different categories of plans under both; Article 15 elaborates on the basin, regional

management system including, planning, allocation, saving and protection of water resources.[741,] Further, Article 12 mentions clearly that '*The institutions for river basin management……shall perform the duties of water resources management and supervision, within the limits of their jurisdiction*[742] *'*. This implies that river basin management is based on basin and regional boundaries. This law delegates the primary responsibility for supervision and administration of water resources to the Ministry of Water Resources (MWR) under the State Council. In addition, it also states that as water pollution control plans are based on regions and river basins[743], therefore the provincial water resources protection agencies shall be accountable for the monitoring of water resources[744]. This points is also reaffirmed by the Water Prevention and Control Law (2008). 'River basin management' in China has been mentioned in a number of other decrees and administrative regulations issued by the State Council based on these and other related laws[745].

At the Basin Level

Apart from these laws, due to the importance of some river basins, certain additional administrative regulations have been implemented specifically[746].

When compared to laws and regulations at the national and local levels, progress in terms of legislation at the river basin level is lagging. The *Tarim Basin Water Resources Management Regulation*[747] is the only comprehensive legislation on river basin management amongst the seven river basins. Consequently, River Basin Commission's (RBC) role in river basin management is limited[748]. Recently, the idea for a 'river basin law[749]' has been widely advocated by legal scholars

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comprehensive and special planning systems; Article 17 mentions that the River Basin Organisations (RBO's) are responsible for devising the cross-province comprehensive plans.

[741] Shen (n 687) 489

[742] Article (12) Water Law of the People's Republic of China (2002) [English translation: http://www.mwr.gov.cn/english/01.pdf]

[743] Article (15) Water Pollution Prevention and Control Law of the People's Republic of China (2008)

[744] Ibid Article (26)

[745] For instance, the Water Abstraction Permit and Water Resources Fee Collection and Management Regulation and the Decree on the Yellow River Water Resources Regulation

[746] An example of this would be the regulation issued by the State Council for the Yangtze river, *Yangtze River Channel Sand-mining Regulation* [People's republic of China, State Council, River Channel Sand-mining Regulation, Order 320, 10 October 2001

[747] The Tarim river basin is a part of the inland river basins

[748] People's Republic of China Changjiang Water Resources Commission, Water Legislation Plan in China's River Basin, Order No. 293 (7 June 2004)

[749] River basin law is referred as a legislative framework / instrument based on individual river basins as the defining feature of the measure's regulatory scope of application. It is believed that river basin laws in a country

to improve administrative efficiency and cooperation at the local level[750]. However, even after many years of efforts, no formal legislative progress has been made because of the complex nature of establishing a comprehensive river basin law.

At the sub-basin level, on the other hand, the Taihu Lake Basin Management Regulation (TBRM) was enacted as a river basin law as a result of wide-spread criticism of the government for a man-made ecological disaster in this lake[751].

At the Sub-Basin Level

The Taihu Lake Basin is a sub-basin of the Yangtze River Basin. Although, geographically, it can be termed as a tributary of the Yangtze, it is regarded as one of China's seven major rivers given the lake's economic significance and physical position. The Taihu basin have 4.3% of China's population, 0.4 per cent of the country's total land and generated around 10.8 per cent of the total GDP in 2010[752]. In 2007, the Wuxi water incident[753] resulted from this rapid economic development and the associated high population density. This prompted the enactment of China's first comprehensive river basin regulation (the TBRM) in 2011. This was a result of ten years of negotiation and research on river basin regulation[754]. This law represents a crucial shift towards an integrated river basin management system. The TBRM requires local governments (at and above the county level) to include '*water resources protection, water pollution prevention and control, flood prevention and drought relief, water area and waterfront protection, and safety of water for*

not only facilitates basin wide water quality regulation but also contributes towards improving national water protection and developmental issues across all levels of government (B. Boxer, 'Contradictions and Challenges in China's Water Policy Development' (2001) 26(3) Journal of Water International 335). For detailed information, refer to: L.A Teclaff, *The River Basin in History and Law* (Martinus Nijhoff/The Hague, 1967)

[750] Boxer (n 749) 335

[751] X. He, 'Developing Sustainable Water Legal Framework in China: Prepare for Adaptation' in *Legal Methods of Mainstreaming Climate Change Adaptation in Chinese Water Management* (Springer, 2016) 53

[752] Taihu Lake Basin Bureau (Ministry of Water Resources) The Background of Taihu Lake Basin Management Regulation [2011]

[753] The Wuxi water incident was a very serious ecological disaster. As a result of a large bloom of blue-green algae in the Tai river, the water quality deteriorated severely. It was alleged that this was not a natural but a man-made disaster caused by the serious eutrophication of the Tai river. During the 1980's the river was very clean, but soon after the industries were set up near the river they started discharging untreated wastewater into the river. This polluted the river severely and left it's water suitable for only 'rinsing rice and vegetables.' Despite investing millions of Yuan, the river was not cleaned up properly which resulted in this ecological disaster [China Dialogue, 'Disaster in Taihu Lake' (2007)]

[754] X. He (n 751) 33

daily use, protection and ecology in the national economic and social development plan[755].' Compared to its counterpart, the 2002 Water Law requires the local governments (at and above the county level) to incorporate only construction of water infrastructures and not the other factors as mentioned in TBRM into their plans for national economic and social development[756]. Therefore, TBRM demonstrates a significant development in terms of river basin legislation by progressing from fragmented management in Water Law towards integrated management[757].

In addition, in TBRM, there has been an improvement in the objectives for protecting water resources. It states that the objective of regulation is to protect water resources, prevent water pollution and improve the ecological environment of the Taihu Lake Basin[758]. This is appreciably different from the Water Law, where water resources are considered only as a tool for promoting economic development[759]. Though this new regulation fails to provide full integrated river basin management and a consolidated administrative management regime, it advocates a more collaborative mechanism in terms of administration of the Taihu Lake Basin[760]. If this regulation can be implemented effectively in practice it could provide useful experiences for other river basins, besides enabling and encouraging further legislative development of river basin laws in China.

Review of the Water Law

The 2002 Water Law, which developed from the 1988 Water Law, signifies a remarkable improvement in China's history of water management. It is the first law which has provided the RBCs with legal status. This law also provides a clear legal structure to water resources planning by ensuring that water supply and demand planning as well as national strategic water resources planning should be divided into river basin plans (specific planning and comprehensive planning) and regional plans[761].

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[755] Article (6) Regulation on the Administration of the Taihu Lake Basin [2011] (English translation)
[756] Article (5) Water Law of the People's Republic of China (2002) [English translation: http://www.mwr.gov.cn/english/01.pdf]
[757] X. He (n 751) 34
[758] Article (1) Regulation on the Administration of the Taihu Lake Basin [2011] (English translation)
[759] Article (1) Water Law of the People's Republic of China (2002). Further explanation for this in the 'Review of the Water Law in terms of river basin management' section; He (n 751) 34
[760] Article (4) Regulation on the Administration of the Taihu Lake Basin [2011] (English translation)
[761] Article (14) and (15) Water Law of the People's Republic of China (2002)

The Water Law, which lays out the river basin management structure's legal framework is often criticised for, specifying the dominant reason for water resources management as 'economic growth', both at the national as well as the local level[762]. For instance, the objective states that '*This law is enacted for the purposes of rationally developing, utilizing, conserving and protecting water resources…..and meeting the need of national economic and social development*[763]*'*. The Water Law is also criticised due to its failures in improving water shortage, in water pollution abatement and in providing good water governance. One of the central causes for this is the 'dual management' model of water pollution control and water utilization in China. This model isolates management of water utilization from water pollution control which results in institutional confusion and legal conflicts. This inconsistency and lack of coordination in terms of water quality monitoring, quantitative control of sewage discharge and formulation of water plans are evidenced in the 'Water Law' and the 'Water Pollution Prevention and Control Law.[764]' It is further exacerbated by the country's obsolete legislative philosophy and technique, whereby only general principles and frameworks are provided for water resources management. It lacks instruments and procedures for implementation. China's water laws also lack clear definition of critically important terms. For instance, China's water legislation has failed to define 'water right' clearly. As a result, some decipher it as the right to own and use water while others refer to it as an authorized acquisition of the property right to use ground or surface water[765]. The flawed separation of responsibilities and the ambiguous language employed amongst the various levels of government (RBCs as well as the water administrative authorities) have also resulted in numerous overlaps and vacuums[766]. For instance, Article 12 of the Water Law (2002) states that the MWR shall guide the RBCs in terms of undertaking administrative water management responsibilities for the corresponding river basins. However, as a result of ambiguous language, the law does not clearly

[762] X. He (n 751)
[763] Article (1) Water Law of the People's Republic of China (2002) [English translation: http://www.mwr.gov.cn/english/01.pdf]
[764] J. Wang, 'Coordination of legal system between water resources protection and water pollution prevention and control' (2012) 18(6) Journal of Central South University 89
[765] J. Zhou, G. Peng and C. Zhen, 'Trading water in thirsty China' (2008) China dialogue <http://www.chinadialogue.net/article/show/single/en/2144-Trading-water-inthirsty-China> accessed on 2 October 2017
[766] P. Wouters et.al, 'The new development of Water Law in China' (2004) 7(2) University of Denver Water Law Review 243

state the powers and responsibilities that should be allocated to the RBCs[767]. In addition, there is a lack of a legal basis regarding the missions, responsibilities and stability of the RBCs, as evidenced by the absence of rules of organization regarding river basin organizations[768]. Apart from this, numerous rules and regulations devised under the 1988 Water Law have not been revised or updated in the recent Water Law, resulting in further confusion regarding administrative responsibilities[769].

In reality, water pollution incidents in China have accelerated the adoption of legislative measures to address significant water pollution issues. For instance, the Songhuajiang pollution incident and Nujiang dam construction dispute were largely responsible for the enforcement of the temporary *Regulation on Public Participation in Environmental Impact Assessment*[770]. Similarly, the Wuxi Water Incident led to *TBRM's* adoption[771]. Though this practice is welcome, it has resulted in inconsistencies between different legislative instruments[772]. Although there has been an improvement in terms of China's water management philosophy and mechanism, the new Water Law is merely a compromise with quasi-formed ideas and institutions. One of the underlying reasons for this is that China is still in its water resources management's transitional phase[773] and this process is further made worse by a powerful administrative system and a weak legal tradition[774].

5.2.2 **Institutional setting of the RBM**

China has adopted a dual environmental management system. This system attempts to separate the water related and other responsibilities into two divisions (MWR and MEP) for better coordination, supervision and administration. Of these two divisions, the MWR handles the water

[767] X. Yang and M. Muller, 'Taming the Yangtze River by Enforcing Infrastructure Development under IWRM' in R. Lenton and M.Muller, *Integrated water resources management in practice: better water management for development* (Global Water Partnership 2009) 37
[768] H. Dawei and C. Jingsheng, 'Issues, perspectives and need for integrated watershed management in China' (2001) 28(4) Environmental Conservation 368
[769] Wouters et. al (n 766) 301
[770] China water Net,' Incidents like Songhuajiang pollution induce the formulation of related environment laws and regulations' [2005]
[771] X. Yang and I.M. Griffiths, 'A comparison of the legal frameworks supporting water management in Europe and China' (2010) 61(3) Water Science and Technology 745
[772] He (n 751) 31
[773] Ibid 37
[774] He (n 751) 32

related responsibilities and the MEP takes care of the other environmental management responsibilities.

As the 2002 Water Law declares the water resources of China to be state-owned[775], the RBC's are under state administration under the MWR's authority. The RBCs are responsible for water resources management and supervision as per the laws and regulations of the MWR[776]. China's river basin approach is a very complicated multi-level administrative system which includes various levels of local governments and water authorities (at the county, provincial and prefecture level). Other authorities such as the MEP and the Ministry of Agriculture (MOA) are responsible for their respective sectoral interests. The present institutional setting for water management can be described as '*vertically fragmented and subject to primarily sectoral management*[777]'.

Vertical institutional setting

China has a vertical institutional setting for water resources management. Vertical institutional settings denote that responsibilities are distributed amongst different levels of government and water authorities ranging from the central to regional and local levels. For river basins and lakes of national significance, the central government plays a dominant role in the centralized administrative system. At the national level, the MWR is responsible for preparing water plans and issuing water abstraction permits. The RBCs in turn are responsible for implementing these water plans and laws at the basin level. They are also provided with certain powers with respect to establishing key plan elements for sub-basins and trans-provincial tributaries along with the provincial water authorities[778]. However, the powers provided to the RBCs are inadequate. Firstly, they are not provided with the authority for controlling pollution at source. For instance, though the Hai River Basin Management Commission is liable for inter-provincial flood control, the responsibility for operative control lies with the county, prefecture and provincial governments in most cases. Secondly, the RBCs also do not have any authority over economic or administrative issues. This is because various levels of local authorities are responsible for water resources

[775] Article (3) Water Law of the People's Republic of China (2002) [English translation: http://www.mwr.gov.cn/english/01.pdf]
[776] Ibid Article (12)
[777] He (n 751) 35
[778] Article (17) Water Law of the People's Republic of China (2002) [English translation: http://www.mwr.gov.cn/english/01.pdf]

management along with the RBCs[779] , where given the hierarchical administrative structure RBC's are at the lowest tier and therefore do not have any powers over the other authorities.

Apart from the issues with regards to the RBC's lack of powers, there also exists inadequate coordination in water management amongst the environmental protection agencies, provincial water resources bureaus and other agencies involved[780]. This situation is further complicated as laws, policies and regulations adopted by the central government face difficulties in being implemented at the local level. Furthermore, apart from regional conflicts regarding costs of storing and transferring water and regarding other regions free-riding on the benefits[781], bureaucratic inadequacies and discrepancies in terms of capacity also threaten to derail the water quality initiatives. Inter-governmental rivalries, along with corruption and the tendency to favour economic development over protection of water resources, have undermined China's efforts in implementing its water management plans[782]. Inter-jurisdictional rivalries also influence water-related authorities' decisions where needs of individual jurisdictions are given preference over the interests of the basin as a whole[783].

Involvement of the local government

As per the Water Law[784], where local governments are responsible for the development of water resources, the RBCs are required to collaborate with local governments. Similarly, provincial water authorities are responsible for water resources development at the provincial level. These provincial water authorities are under MWR's professional and technical guidance. However, due to lack of administrative hierarchy between RBCs and provincial water authorities (and ambiguous language in the 2002 Water Law defining the RBC's responsibilities), it is challenging for RBCs

[779] He (n 751) 35
[780] H. Dawei and C. Jingsheng (n 768) 368
[781] For instance, in 1954 it was proposed to build a dam on the upper reaches of the Yellow River so that poor farmers in Ningxia have access to its water. Gansu province was able to prevent the construction of dam stating that the dam would flood some of their best farmlands. They were able to do so by lobbying different elements of the Central government against those who had earlier supported the construction of the dam. This dispute remained unresolved till 2010. Finally, after 56 years Ningxia's representatives presented a petition to the China People's Political Consultative Conference for building a dam. [Scott Moore, 'Issue brief: water resources issues, policy and politics in China' (Brookings, 12th February 2013)]
[782] Ibid
[783] S Moore (n 781)
[784] Article (23) Water Law of the People's Republic of China (2002) [English translation: http://www.mwr.gov.cn/english/01.pdf]

to get involved in water management at the local level. Therefore, this entire process is far too dependent on voluntary collaboration instead, which hinders the RBC's interests in managing water resources for the entire basin. That is because local interests dominate over national interests at the provincial level. In addition, as water authorities are part of the local government, they are highly influenced by the corresponding local government decisions as financial resources are provided by the local government and, more often than not, economic growth takes precedence over pollution issues when allocating funds at the local level[785]. Also, acting on the basis of a culture of 'local protectionism', local industrial enterprises are often sheltered by local governments. As a result, the water authorities are unable to intervene and enforce their policies and regulations. In short, at the local level, local interests are prioritized over the interests of the whole river basin[786].

Critique of the 'roles' allocated to the RBC's

According to He and Chen[787], an effective RBC should be provided with a comprehensive administrative authority within the river basin. As per this criterion, China's RBCs have failed as a result of not only an ambiguous legal basis but also because of an ineffective institutional structure[788].

As per the 2002 Water Law[789], the MWR is responsible for designating administrative water management responsibility to the RBCs. However, because of ambiguous language and a lack of clear specifications regarding the powers and responsibilities to be provided to them, they are instead required to perform the duties which include, '*organizing the preparation of basin master plan and specialty plans, and oversee their implementation*[790]', constructing and managing the central government funded water projects and '*organizing the implementation of soil conservation*[791]'. As is evident, the duties and responsibilities of RBCs defined by the MWR frequently include words like 'organise' and 'managing' which demonstrate that the duties

[785] He (n 751) 39
[786] T.M Johnson, 'Clear water, Blue skies' [1997] The World Bank
[787] He and Chen (n 768)
[788] Wu Xie, 'Analysis on the Current Status and Regulatory Measures of Water Pollution in the Xiang River Basin of China' (2016) 15(4) Nature Environment and Pollution Technology 1435
[789] Article (3) Water Law of the People's Republic of China (2002)
[790] Changjiang Water Resources Commission, The Introduction of CWRC < http://eng.cjw.gov.cn/ eng-introduction-mission.asp
[791] Ibid

entrusted to the RBCs are more procedural rather than substantive powers[792]. Despite having powers with regard to formulating regulations, distributing water amongst provinces and operating water projects, they have inadequate powers in terms of designing water resources planning at the basin level and managing water resources maintenance at the local level[793]. Water pollution prevention and river basin control duties have instead been assigned to the EPBs which are under the authority of the central government ministries, the MWR and the MEP. It cannot be denied though that RBCs do have procedural powers like offering scientific guidance to the river basin plans, overseeing the implementation of laws and regulations, and managing conflicting interests. It is also true that being entrusted with procedural powers is essential for the RBCs to negotiate conflicting interests, but it cannot be denied that they would never be able to operate in the interest of the whole basin until further powers are allocated to them[794].

Moreover, as RBCs are an affiliated institution of the MWR, it prevents them from undertaking actions outside the MWR's scope. This includes managing the river basins for agriculture and forests (as agriculture and forests are managed by different ministries)[795]. This also implies that, as RBCs are confined within the scope of responsibility of the MWR, they only have a single focus on water resources and cannot design an integrated river basin management plan which includes land and ecosystems. Consequently, RBCs are limited to only providing technical support for the river basin plans instead of an integrated economic, legal and technical approach. As a result of this, RBCs have been mainly functioning only as scientific and technical advisory agencies[796].

After a visit to the Hai RBC in China, a river basin governance study group indicated that in spite of having the word 'commission' in their title they are not made up of county or provincial stakeholders[797] unlike US, European and Japanese river commissions. An important part of an RBC's role, such as public participation and community involvement, is also not in place. There exists no mechanism to involve the relevant NGOs, public and stakeholders in water planning and management[798].

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[792] He (n 751) 37
[793] Yong Jiang, 'China's water scarcity' (2009) 90(11) Journal of Environmental Management 3185
[794] He (n 751) 37
[795] J. L. Turner, 'River Basin governance in China' (2004) 7 China Environment Series 106
[796] He and Chen (n 768) 105
[797] Ibid 106
[798] He and Chen (n 768) 371

Horizontal setting

The institutional system at the horizontal level is referred to as the '*Nine Dragons Governing the Water*[799]'. The nine dragons include the MWR, MEP, State Oceanic Administration, Ministry of Housing and Urban and Rural Construction (MHURC), Ministry of Finance, Ministry of Agriculture (MOA), Ministry of Land and Resource, Ministry of Transportation (MOT), State Forestry Administration and National Development and Reform Commission (NDRC). As these nine authorities are from different sectors and have varied interests in water resources management, it results in fragmented water management[800]. Due to a lack of clarity regarding the boundaries between the institutional jurisdictions, it results in conflicts and overlapping responsibilities. This has not only affected the effectiveness of water resources management but has also increased administrative costs. For instance, the MWR and MEP are both responsible for monitoring water quality of major rivers, but each of these institutions have their own monitoring stations and do not share their respective water quality data. This results in discrepancies in the data. For example, the water quality data provided by the MEP and MWR for the Huai River for the time period 1998-2004 differ completely[801]. In addition, this multi-agency sharing of water resources management implies that all agencies are only partly responsible for their respective interests and no single agency is liable for the entire water resources management[802].

5.3 Literature Review

In the global context, there are quite a few papers which have attempted to examine the effect of formal regulation on water pollution as mentioned in Chapter 3.

This section therefore only discusses those papers that examine the effectiveness of formal regulation in environmental issues in the context of China. One study[803] has collected a dataset from three Chinese municipal EPBs to investigate the determinants of effective formal

[799] F. Yan, H. Daming and B. Kinne,'Water resources administration institution in China' (2006) 8(4) Water Policy 291
[800] He (n 751) 40
[801] China Statistical Yearbook (various years) and MWR Statistical Yearbook (various years)
[802] J. Xie et.al, 'Addressing China's Water Scarcity: Recommendations for Selected Water Resource Management Issues' [2009] The International Bank for Reconstruction and Development / The World Bank 30
[803] L. Lin, 'Determinants of Effective Environmental Regulations: Evidence from China' [2011] The Economy and Environment Program for Southeast Asia (EEPSEA) 45

environmental regulation. This paper uses the pollution rates levied, the frequency of inspections done, and the actual pollution standards imposed on firms as proxies for environmental regulations. This study determines that environmental agencies prioritize public interests when planning their enforcement and monitoring strategies. Another study published by the Economic Research Institute for ASEAN and East Asia (ERIA) has theoretically analysed the environmental laws and regulations in China with respect to water pollution prevention and control. It suggests possible implementation measures which can be employed for successful enforcement of environmental laws and regulations in China[804]. Another paper[805] does a theoretical evaluation of the legal and institutional arrangements for river basin management. This study finds that there exist critical issues like lack of sufficient human and institutional capacities, lack of transparency and equity in project decision making, lack of legal clarification of the duties of the RBCs, and jurisdictional management and law enforcement, as far as implementation of river basin management laws and regulations are concerned. A case study[806] based on the Xiang River Basin claims that the reasons for degrading water quality in this basin are not only population growth and urbanisation, but also ineffective government control measures. It further concludes that these measures could be efficient if the water management legislation clearly defines terms like scientific decision, public participation and administrative organization.

Enforcement gaps in terms of effective implementation of environmental regulations are a result of pro-growth environmental priorities, ineffectual administrative capacity of the environment agencies, and inadequate societal support for a cleaner environment[807]. Many studies have attempted to understand the underlying causes of such ineffectiveness of the existing environmental regulatory measures in China. One study[808] examines this issue from the perspective of local enforcement officials. This paper also attempts to understand how local environmental officials perceive enforcement effectiveness. This empirical study is conducted using a sample of officials from rapidly growing cities such as Guangzhou, Dalian and Chengdu. The study finds that regulatory enforcement does not play any role in the differences in perceptions

[804] Zhou (n 712) 1
[805] Shen (n 687) 495
[806] W. Xie (n 788) 1435
[807] C. Wing-Hung Lo, G. E. Fryxell and W. Wai-Ho Wong, 'Effective Regulations with Little Effect? The Antecedents of the Perceptions of Environmental Officials on Enforcement Effectiveness in China' (2006) 38(3) Environmental Management 388
[808] Ibid 388

of enforcement effectiveness amongst the officials. Instead, it is dependent on the environmental values of the officials, the existing organizational capacity for enforcement and the extent to which their respective local governments prioritise environmental protection. Another study,[809] based on enforcement styles amongst environmental protection officials in China, concludes the same. Li et al's[810] study based on the county level cities in China's Suzhou Municipality examine the central government's implementation of environmental regulations at the local level. For this purpose, it analyses the National Model City of Environmental Protection program. The results indicate that though at the local level, economic development is still prioritized over environmental protection, but recently some areas have demonstrated an increased commitment towards environmental protection.

One of the papers[811] conducts a case study of Guangzhou city in China. It theoretically analyses the effectiveness of environmental agencies in enforcing environmental regulations. This study finds that though environmental agencies are inferior institutions within the bureaucratic setting in China, they can obtain bureaucratic support for environmental protection through gaining public support and involving people's representative bodies. Though public participation is not a legal part of environmental regulations, the environmental community in Guangzhou has expanded to include the mass media, the municipal people's congress (MPC) and members of the municipal people's political consultative conference (MPCC). This study further concludes that though public opinion is an important tool for enabling greater environmental protection, Guangzhou's bureaucracy is still strongly resistant towards public involvement in such issues.

Another study[812] attempts to understand the implementation of water pollution laws in China. It determines that there exists an enforcement gap which prevents the laws from becoming a reality. This could be attributed to factors like powerless EPBs and NGOs, prioritizing of the economy

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[809] C. W.H Lo and G. E. Fryxell, 'Enforcement Styles Among Environmental Protection Officials in China' (2003) 23(1) The Journal of Public Policy in Perspective 81

[810] Yu-wai Li, B. Miao and G. Lang, 'The Local Environmental State in China: A Study of County-Level Cities in Suzhou' (2011) 205 The China Quarterly 115

[811] C. Wing Hung Lo and S. Wing Leung, 'Environmental Agency and Public Opinion in Guangzhou: The Limits of a Popular Approach to Environmental Governance' (2000) 163 The China Quarterly 677

[812] T. Ni, 'China's ineffective water pollution policy: an issue of enforcement' [2016] Honors Program Thesis (University of Puget Sound) < http://soundideas.pugetsound.edu/cgi/viewcontent.cgi?article=1020&context=honors_program_theses > accessed 9 September 2017 44

over the environment, centralization of enforcement power, low levels of public awareness, and corruption. A paper by Canfa[813] claims that though there exists sufficient environmental laws and regulations, they lack proper enforcement due to the existence of unwarranted delay between non-compliance and enforcement, inadequate punishment for non-compliance, improper compensation for the injured parties, and several environmental crimes receiving administrative punishments instead of criminal punishments. Another study by Ryan[814] agrees with the above, and in addition to the reasons mentioned in the previous paper for lack of proper enforcement of environmental laws, claims that political patronage also acts as a deterrent to enforcement. Ongley and Wang[815] agree. Their paper claims that every environmental law only provides administrative power to the MEP for pollution and to the MWR for water quantity management, and not the RBCs (which function at the local level). RBCs are only provided powers for flood emergencies. They are not even authorized for managing river basins in their entirety. They further point out the deficiencies in the Water Pollution Prevention and Control Law. The law is criticized in this paper on the basis of an inadequate definition of pollution, lack of administrative transparency, lack of easily accessible data, and lack of trans-boundary water quality standards.

Though there exist numerous studies analysing environmental regulations of China, very few papers have attempted to look specifically at regulations concerning river water pollution. Of the few theoretical studies which have attempted to analyse China's river basin management, none of them have examined these measures using an econometric approach. This chapter attempts to do so by constructing a regulatory stringency index[816].

5.4 Methodology and Variable Description

The methodology used for analyzing China's river basin management is explained in Chapter 2. Further, the basis on which the two models have been formulated is also provided in Chapter 2. However, a very specific proxy for RQ (i.e CO2 emissions) has been considered in this chapter.

[813] W. Canfa, 'Chinese Environmental Law Enforcement: Current Deficiencies and Suggested Reforms' (2006-2007) 8 Vermont Journal of Environmental Law 59

[814] E. Ryan, 'The Elaborate Paper Tiger: Environmental Enforcement and the Rule of Law in China' (2013) 24 Duke Environmental Law & Policy Forum 183

[815] E. D. Ongley and X. Wang, 'Transjurisdictional Water Pollution Management in China: The Legal and Institutional Framework' (2004) 29 (3) Water International

[816] The methodology for doing so is explained in detail in Chapter 4

The rationale and the underlying concept behind it has been explained in detail in the methodology section of Chapter 4.

In this chapter, the two models have been estimated using time series analysis over the time period, 1990 to 2016.

5.4.1 **Model 1**

Model description

The first model is formulated in the same lines as explained in Chapter 2. At time 't', China's river pollution is expressed as a function of regulatory quality (RQ), rule of law (RL), government effectiveness (GE), free media (FM), industrialization (Indst) and population (Pop). The model is expressed as follows:

$$waterpoll_t = \beta_0 + \beta_1 RQ_t + \beta_2 RL_t + \beta_3 GE_t + \beta_4 FM_t + \beta_5 Indst_t + \beta_6 Pop_t + u_t$$[817]

where, u is the error term.

Variable and data description

There is a lack of easily accessible data on water pollution in China. River water pollution data on China is available only from two sources. The Institute of Public and Environmental (IPE) Affairs provides this data but this was not used due to discrepancies in the dataset. The other data source is the 'State of the environment report' published annually by the MEP. In these reports, data for river water quality is not provided by pollutant (that is, BOD, fecal coliform, etc.), instead it is provided as per the system of environmental standards set up in China which classifies water quality with a series of benchmarks, of which Class I is denoted as the 'cleanest' and Class V as the 'dirtiest'. For the purpose of this study, the percentage of water in the Grade V category has been considered as a proxy for river pollution.

[817] This model attempts to understand the effect of regulatory quality (RQ), rule of law (RL), government effectiveness (GE), free media (FM), industrialisation (Indst) and population (Pop) on China's river pollution (waterpoll).

See Chapter 2 for the definition of RQ. It is included in the study as most studies, which have attempted to analyse the legal arrangements for river basin management in China, have concluded that the regulations face critical issues in terms of implementation[818]. With respect to environmental issues, China's legal system has been widely criticized for lack of transparency, poorly trained advocates and judiciary, ill-defined laws and weak enforcement capacity[819]. Even according to environmental protection officials and experts in China, most Chinese environmental protection laws are very broad, offering local officials with little or no guidance on implementation[820]. Legal experts have even suggested that '*China's environmental laws are like policy statements rather than laws in the Western sense --- which may also account for their inconsistent enforcement*[821]*'.* For a long time, Chinese legislators considered that general is better than specific. Thus, legislation was drafted vaguely which permitted it to be flexible, lacking feasibility and further resulting in overlapping authority and enforcement[822]. Stringency of environmental regulations is taken as a proxy for RQ of river basin management in China. The stringency is calculated by obtaining the emissions per dollar of valued added averaged across all manufacturing and construction industries (Emi)[823].

RL measures the quality of environmental policing. Corruption (Corr) has been considered as a proxy for rule of law. The justification for considering corruption as a proxy for RL is the same in this chapter as set out in Chapter 4. Only one study[824] has empirically analysed the effect of corruption on the environment in China. This study finds that a rise in anti-corruption cases seems to result in lowering SO_2 emissions in China. Given that this study finds that corruption plays a crucial role in reducing environmental degradation in China through improving the rule of law, corruption is taken as a measure for the same in this study. Corruption perception index measures

[818] Shen (n 687) 495

[819] F. Ching, 'Rough Justice: The Law Is No Longer An Ass, but Many Judges Still Are' [1998] Far Eastern Economic Review 13; J. A. Cohen and J. Lange, 'The Chinese Legal System: A Primer for Investors' (1997) 17 New York School of International and Comparative Law 345; The Honorable Sam Hanson, 'The Chinese Century: An American Judge's Observations of the Chinese Legal System' (2001) 28 William Mitchell Law Review 243

[820] E. C. Economy, '*The River Runs Black: The Environmental Challenge to China's Future'* (Second Edition, Cornell University Press 2010)

[821] Ibid 107

[822] Economy (n 820) 109

[823] A detailed analysis of this methodology is provided in Chapter 4, which also justifies why emissions have been used for understanding stringency of water pollution regulations.

[824] X. Liao, E. Dogan, and J. Baek, 'Does corruption matter for the environment? Panel evidence from China' (2017) 11 Economics: The Open-Access, Open-Assessment E-Journal 1

were employed for measuring corruption. This index, developed by Transparency International, assigns scores to countries depending on the level of public sector corruption. Therefore, the higher the score, the less corrupt a country is.

GE gauges the credibility of the government's commitment to environmental policies as mentioned in Chapter 2. In terms of institutional capability for environmental management, the Country Policy and Institutional Assessment (CPIA) study conducted by the World Bank found that low-income countries have an average environmental CPIA score of around 3.1, with the majority of countries belonging to the range of 2.5-3.5. To put it in perspective, the high-income countries have a score of 5 out of 6[825]. This implies that, in low income countries, institutional capacity with respect to environmental management is very weak and fragile and further analysis is required to understand and quantify the factors that determine these characteristics[826]. As there is no established dataset for understanding GE in terms of environmental management, investment in anti-pollution projects, specifically 'investment in treatment of industrial wastewater (invstindwater)', is taken as a proxy for GE in China. The data source for the same is China's National Bureau of Statistics. This proxy is considered as a characteristic of well-functioning institutions as direct successful investment through the institutions should prevent water quality degradation.

Increasingly, over the years, news media (FM) has been known to play a crucial role in influencing social movements and has been able to help to bring about broader social change. The justification behind the inclusion of FM in the model has been explained in Chapter 4. A paper[827] on the China's media coverage of environmental issues concludes that there is a growing market in China for reliable and transparent coverage of environmental issues which has prompted the media to play an important role in environmental affairs. Given the important role of media in pollution abatement, FM is taken as an independent variable in this model. To capture FM, the proxy 'voice

[825] The World Bank's Country Policy and Institutional Assessment (CPIA) is conducted annually and covers core governmental functions in the environmental sector. But as it does not conduct it annually for China, the CPIA could not be used as a proxy for GE in this study.

[826] OECD, 'Assessing Environmental Management Capacity: Towards a Common Reference Framework' [2009] Environment Working Paper No. 8, Environment Directorate 5

[827] B. Tilt and Q. Xiao, 'Media coverage of environmental pollution in the People's Republic of China: responsibility, cover-up and state control' (2010) 32(2) Media, Culture and Society 56

and accountability (VAP)' percentile is considered. This measure is constructed by the World Bank annually for all countries. VAP measures perceptions of the extent to which a country's residents have freedom of expression and a free media.

Population (Pop) is one of the key drivers of water pollution. An increase in population density results in a higher demand for per capita natural resources. This places pressure on natural resources, like water, ecosystems, and land, as the demand for agriculture, industry and energy continues to grow with a higher population[828]. Many studies have attempted to understand the relationship between water pollution and population. A case study[829] on Lake Victoria in Kenya concludes that increasing population along with an increasing GDP increases pollution discharge, thereby polluting the lakes in the absence of waste management policies and services. Another case study[830] based on North-East India also concludes that, if the population rate rises unabated, the quality of waters in North-Eastern India are likely to deteriorate further. Population growth (Popgrowth) has been taken as a proxy for Population. The data source is UN Population Division (Department of Social and Economic Affairs).

Rising industrialization (Indst) contributes to increased economic growth. However, industrialization results in environmental degradation. There are many studies[831] which have examined the relationship between water pollution and industrialization. Almost all the studies have concluded that rapid industrialization results in severe deterioration of water quality. Proportion of industry as a percentage of GDP (Propindst) has been taken as a proxy for industrialization. Data on Propindst has been obtained from the World Bank statistical yearbook.

[828] D. Wafula Juma et. al, 'Impacts of population growth and economic development on water quality of a lake: case study of Lake Victoria Kenya water' (2014) 21(8) Environmental Science and Pollution Research 5737
[829] Ibid 5737
[830] U.C Sharma, 'Impact of population growth and climate change on the quantity and quality of water resources in the northeast of India' [2003] Water Resources Systems—Hydrological Risk, Management and Development (Proceedings of symposium HS02b held during IUGG2003 al Sapporo. July 2003) IAHS Publ. no. 281. 2003
[831] M. A Khan, 'Pollution of water resources due to industrialization in arid zone of Rajasthan, India' (2001) 13(2) Journal of Environmental Sciences (China) 218; Avraham Ebenstien, 'The Consequences of Industrialization: Evidence from Water Pollution and Digestive Cancers in China' (2012) 94(1) Review of Economics and Statistics 186; H. Hayzoun et.al, 'Impact of rapid urbanisation and industrialisation on river sediment metal contamination' (2014) 186(5) Environmental Monitoring and Assessment 2851

The estimating equation for the first model, after including the proxies, can be expressed as follows:

$lnwaterpoll_t = \beta_0 + \beta_1 \mathrm{Emi}_t + \beta_2 \mathrm{lnCorr}_t + \beta_3 ln\mathrm{invstindwater}_t + \beta_4 VAP_t + \beta_5 Popgrowth_t + \beta_6 Propindst_t + u_t$ [832]

where, u is the error term.

Waterpoll, Corr and invstindwater have been expressed in their natural logarithms.

5.4.2 **Model 2**

Model Description

The reason for formulating the second model is discussed in Chapter 2. The proxy for RQ is emissions per dollar of value added (Emi) similar to Model 1. The independent variables(IVs) include RL, industrialization (Indst), Population (Pop), FM and NRR. Similar to Model 1, the proxies for RL, Indst, Pop, FM are corruption (Corr), proportion of industry as a percentage of GDP (Propindst), population growth (Popgrowth) and voice and accountability (VAP) respectively. The model is expressed as follows:

$RQ_t = \beta_0 + \beta_1 RL_t + \beta_2 Indst_t + \beta_3 Pop_t + \beta_4 \mathrm{FM}_t + \beta_4 \mathrm{NRR}_t + u_t$

where u is the error term.

Variable and data description

Once again, corruption has been taken as a proxy for RL. One of the long-standing challenges encountered by China for effective implementation of environmental regulations is corruption. In fact, in 2013, approximately 1000 environmental officials were implicated in corruption cases[833]. Over the course of the 2000s, the number of corruption cases in environmental regulation has doubled [834] . One illustrative example of China's corruption levels in implementation of

[832] This model represents the earlier model, but only replacing the independent variables with their respective proxies such as Emi (prpxy of RQ), lnCorr (proxy of RL), lninvstindwater (proxy of GE), Popgrowth (proxy of population) and Propindst (proxy of industrialisation).

[833] M. Yan, 'Who Polluted Environmental Agencies? Chinese Discipline Inspection Report' [2014] (in Chinese)

[834] Z. Chen, 'The power of the environmental agencies rises sharply and becomes high-corruption area' (Outlook Weekly, Xinhua News Agency 2009)

environmental regulations is that the former Director of the Dongguan EPB was arrested in 2013 on charges of accepting bribes amounting to 8.7 million yuan from two companies in exchange for applying additional stringent environmental regulations on their competitors[835]. Therefore, this study considers corruption as a proxy for RL to understand its impact on China's environmental RQ, especially for river basin management.

Industrialized (Indst) countries usually have higher pollution. In industrialized countries, environmental regulations and new technologies are helping in reducing pollution per unit produced. But unfortunately, industrial activities are growing at an unprecedented rate and putting further pressure on the natural resources base. In developing countries especially, new issues are arising, whereby old environmental problems (for instance, deforestation, soil degradation etc.) remain largely unsolved and at the same time new pollution issues related to industrialization are surfacing such as, greenhouse gas emissions, water pollution and desertification.[836] In such a scenario, it is worth looking at whether in China, where industrial output has been growing at a rate of 11.4 per cent since 1978,[837] and industrialization has prompted the Chinese government to improve their environmental RQ.

With an increasing population (Pop), the pressure on natural resources increases as per capita demand rises. As a result, a higher population should result in an improvement in environmental regulation.

Recently, there have been many studies which highlight the importance of a free media (FM) and social disclosure in pushing the government in supplying public goods, as detailed in Chapter 4. In China's case however, coverage of environmental disasters caused as a result of industrial negligence did not generate the same attention as it would have in the European countries or in the USA. This is because the State controls news coverage in the country. As a result, officials did not have any incentive to force industries to comply with environmental regulations and to invest in costly pollution abatement infrastructure. However, in recent years, the Chinese media have paid considerable attention to environmental issues at the national as well as the international

[835] Ibid 48
[836] European Commission, 'Environment Factsheet: Industrial Development' [2006] < http://ec.europa.eu/environment/archives/wssd/pdf/fs_industrial_development.pdf >
[837] H. Shei and L. Zhang, 'China's environmental governance of rapid industrialisation' (2006) 15(2) Environmental Politics 271

levels. This should incentivize politicians and the government to make more effort in supplying environmental regulation[838]. Thus, the variable FM has been included in this model to see whether it has had any resulting effect on environmental RQ.

The relation between NRR and RQ is described in detail in Chapter 4. There exists almost no study which explores the relationship between NRR and water pollution RQ either for China or for any other country. Therefore, it would be interesting to see the nature of relationship the model's results yield. The data for this variable has been provided by the World Bank.

Data sources for this model are the same as in the previous model.

The estimating equation for the first model, after inclusion of the respective proxies, can be expressed as follows:

$Emi_t = \beta_0 + \beta_1 \mathrm{Corr}_t + \beta_2 \mathrm{Propindst}_t + \beta_3 Popgrowth_t + \beta_4 FM_t + \beta_5 NR_t + u_t$

where, u is the error term.

5.5 Results and Discussions

5.5.1 **Model 1**

We start by estimating the model using OLS method. However, the Durbin-Watson test indicate towards the presence of first order autocorrelation in the OLS estimates and, therefore, those results have not been used to draw inferences. Instead, the model is re-estimated using the Prais-Winstein regression to correct for auto-correlation. Further, as there was a possibility of reverse causality between water pollution and regulatory quality, the Granger-causality test was employed. This test shows that there does exist reverse causality between water pollution and regulatory quality. Therefore, lagged values[839] for regulatory quality's proxy, emissions per dollar of value added (Emi), is considered.

The OLS and Prais-Winstein results are presented in the table below:

[838] S. Zheng and M. E. Kahn, 'Understanding China's Urban Pollution Dynamics' (2013) 51(3) Journal of Economic Literature 731

[839] For further information about why lagged variables are used for fixing reverse causality refer to: M.F Bellemare et. al, 'Lagged Explanatory Variables and the Estimation of Causal Effect' 79(3) (2017) The Journal of Politics 949

Table 5. 4 Time-series model estimation results for China (Model 1)

Independent Variables (IVs)	OLS (First Model)	Prais-Winstein (First Model)
Emi_{t-1}	0.154	0.110
lnCorr_t	-2.37**	-2.39**
$ln\text{invstindwater}_t$	0.267	0.29
VAP_t	-0.007	-0.009
$Popgrowth_t$	3.36*	3.59**
$Propindst_t$	0.47***	0.50***
	Ramsey RESET Test H_0 : Model has no omitted variables P-value = 0.12 **Multicollinearity Test** Mean VIF = 4.87 **Durbin Watson d-statistic** H_0 : Model has no first-order autocorrelation d-statistic: 2.12 **Granger Causality Test** H_0 : Emi_t does not affect $lnwaterpoll_t$ p-value: 0.63 H_0 : $lnwaterpoll_t$ does not affect Emi_t p-value: 0.00	

Note: Dependent Variable is lnwaterpoll_t . According to VIF estimate our model does not suffer from multicollinearity problem as the value of the mean VIF is less than 10. ***, ** , * represent statistical significance at 1%, 5% and 10% level of significance respectively.

The results show that the effect of emissions per dollar of value added (Emi) on water pollution is insignificant. That implies that the regulations in place for river pollution in China have failed to contribute towards water pollution abatement. This is not surprising given that China's environmental legislation has generally been described by Wang Jing in the following terms: '*everything looks perfect and extensive, but it's difficult to find a specific solution to the problem in the law provisions when facing real problems*[840]'. In addition, China's environmental legislation suffers from many legislative gaps along with apparent non-coordination between laws and regulations. Some laws often cannot be implemented due to the fact that specific regulations

[840] J. Wang, 'Thirty Years' Rule of Environmental Law in China: Retrospect and Reassessment' (2009) 9 Journal of China University of Geosciences(Social Sciences Edition) 3

required by the corresponding laws are not elaborated/adopted in a timely manner. For instance, given the total number of environmental laws published to date, more than 140 corresponding regulations should have been formulated by the State Council and other ministries. However, in reality less than 100 have been formulated up to now. This indicates that the average completion rate of regulations is less than 70 per cent. As a result, many regulations are formulated with considerable delays even after the law has been introduced. This in turn results in a long waiting period and, therefore, the corresponding environmental laws are not as effective as they are required to be[841]. Furthermore, the problem of repetition exists in environmental laws and regulations. For instance, before the Environmental Protection Law was revised in 2014, 31 of the 47 articles were repeated in other environmental pollution control laws[842]. Consequently, this results in inconsistencies between different laws and regulations with respect to basin procedures and fundamental principles[843]. Environmental laws also suffer from inconsistencies between different versions of the same law. For instance, inadequate consistency is demonstrated quite starkly between China's Water Law (2008) and its earlier version in terms of quantity control of pollution discharge, formulating water plans, drinking water protection, water quality monitoring and information disclosure[844]. Ambiguity in laws results in intentional exploitation by institutions and other actors[845]. In fact, a study on environmental regulation makes the following remark: '*The Chinese even have a common saying, ''National policies, local countermeasures [shang you zhengce xia you duice]'', to describe the practice of exploiting the ambiguity of national laws and regulations to figure out ways around them*.[846]'The issue of ambiguity is also evident in China's water legislation which is routinely criticized for its ambiguous legal provisions. For instance, the 2002 Water Law states that the MWR is responsible for guiding the RBCs in undertaking administrative water management responsibilities for the corresponding river basins. However, as a result of ambiguous language, the law does not clearly state the powers and responsibilities that should be allocated to the RBCs and, instead, their role now is limited only to offering scientific

[841] You-Hai Sun, 'Basic Experience and Problems of Environmental Legislation after the Reform and Opening-up in China' (2008) 8 Journal of China University of Geosciences (Social Sciences Edition) 41
[842] Z.L Mu, 'Research on the Interests of Environmental Legislation' [2014] (Ph.D. Thesis, Renmin University of China, Beijing, China) 50
[843] Mu et. al. (n 720) 8967
[844] Wang (n 764)
[845] Economy (n 820) 108
[846] X. Ma and L. Ortolano, *Environmental Regulation in China: Institutions, Enforcement, and Compliance* (Rowmand and Littlefield publishers Inc, 2000) 91

guidance to the river basins. Furthermore, because the RBCs have been granted an ambiguous legal status, the legislative basis only provides them with procedural powers and no substantive powers, which have, in turn, left them incapable of negotiating conflicting interests in the administrative hierarchy of China's water resources management.

China faces equally challenging issues in drafting environmental laws. The consultative process of law drafting involves lobbying for substantial changes amongst various levels of administrative personnel, ranging from ministry representatives and local officials to technical experts, which results in the law being watered down to a level where it is of no actual use anymore[847]. A prime example of this is provided by the negotiations over the energy efficiency law which lasted for more than four years and even now it is not well implemented[848].

On the other hand, China's judiciary, which also determines the country's environmental regulatory quality, has always operated '*under the rule of men [rather] than the rule of law[849]'*. It is probably because, historically under Mao Zedong's tenure, law was used as a means of oppression whereby qualified judges were terminated in favour of party officials with strong political ideologies. Later in 1978, , the legal system was developed under Deng Xiaoping's leadership as per the models of western countries. However, unlike the common law countries, past cases still don't serve as binding precedents and are only sometimes referred to for guidance[850]. Similar to the bureaucracies for water pollution management, China's judiciary is also highly decentralized. The Supreme People's Court, though the highest judicial authority, only has a supervisory role and does not have any real power over the budgets or personnel of the local courts. Such control lies exclusively with the local governments. As a result, the courts are not independent. One study[851] observed that the judges of the Chinese Court system relies greatly on the Chinese Communist Party's (CCP) policies and the local government's views regarding a particular issue while deciding the outcomes of the different cases. Because the courts are financially dependent on the local governments, judges are usually forced to support the views of

[847] EPNRC Official (interview with Elizabeth C. Economy at Cambridge in January 1999) Economy (n 820) 109
[848] Ibid 109
[849] Economy (n 820) 117
[850] J. A. Cohen and J. A. Lange (n 819) 350
[851] P. L. Chang, 'Deciding disputes- Factors that guide Chinese Courts in the adjudication of rival responsibility conduct disputes', *Law and Contemporary Problems* 52, No. 3 in Xiaoying Ma and Leonard Ortolano, *Environmental Regulation in China* (Roman and Littlefield publishers Inc. 2000) ; J. C. Nagle, 'The Missing Chinese Environmental Law Statutory Interpretation Cases' [1996] Notre Dam Law School NDLS Scholarship 517

the latter. For instance, an environmental lawyer has drawn attention to the fact that, in all the suits that they lost, the court has not followed the law. In fact, all the technical and legal merits of the cases were ignored so as to be able to support the local enterprises[852]. In addition, as China's water management is based on river basins, it leads to numerous inter-jurisdictional issues. For instance, the Water Law provides the local governments with sufficient administrative powers to influence the local court's decisions. In addition, the local governments also compete amongst themselves for water allocation rights and 'local protectionism' of their respective industries to promote economic growth without considering the issues of the basin as a whole, but instead prioritizing their respective jurisdictions. This further exacerbates the problem of river water pollution.

As a result, the ambiguity in China's water legislation and the intertwining of governmental powers at different levels of government prevents effective statutory interpretation of cases concerning river pollution which in turn leads to the ineffectiveness of China's environmental regulatory quality in the context of river pollution abatement.

Despite this, there is still hope in China in the form of environmental courts. Though experimental environmental courts existed in China in the 1980s, functioning environmental courts were established only recently in 2007 as divisions of the intermediate-level People's Courts[853]. Chinese legal scholars believe that setting up these environmental courts is only a mere attempt by the government to protect their image in the wake of numerous environmental protests in China[854], in addition to portraying the Chinese government globally as being sensitive towards environmental issues[855]. By March 2011, China had established 100 environmental courts in over 15 provinces and they are widely accepted by the people of China. Within a year of its establishment, 110 cases were heard at the Environmental People's Tribunal of the Qingzhen People's Court. These cases would not have otherwise received much attention even if they were accepted by the regular courts[856]. China's environmental courts differ from similar courts in other jurisdictions as the

[852] T. Plafker, 'Chinese activists take to the courts' International Herald Tribune (28 August 2002, USA)
[853] A. L. Wang and J. Gao, 'Environmental Courts and the Development of Environmental Public Interest Litigation in China' (2010) 3 Journal of Court Innovation 38
[854] The first three 'true' environmental courts were set up in Guiyang, Wuxi, and Kunming. The courts were set up here as an initiative of the local government's response towards water pollution incidents.
[855] D. J. Knudsen, 'Environmental Protection Bureau, 2.0": China's Environmental Courts as Enforcement Institutions' (2013) 15(4) Environmental Practice 441
[856] Z. Minchun and Z. Bao, 'Specialised Environmental Courts in China: Status Quo, Challenges and Responses' (2012) 30(4) Journal of Energy & Natural Resources Law 361

former are not required to distinguish between civil, criminal and administrative cases. As long as the cases involve an environmental breach they can be accepted at these environmental courts. In addition, the environmental courts have also been provided with enforcement authority [857]. This has important consequences as the environmental courts now have their own authority separate from the government and the Party. Moreover, as these courts function as a separate legal system unlike the main court system of China, it should provide consistency in terms of outcomes and enforcement[858]. Despite the success in establishing independent environmental courts in China, it is seen more as a mere step in the right direction rather than a complete solution for the country's existing environmental woes. Though the caseloads of environmental courts are increasing over time, even by 2010, these environmental cases accounted for only one per cent of total environmental disputes[859]. This is probably the reason why the econometric results of Model 1 do not detect any significant effect of regulatory quality on river water pollution. Moreover, Chinese courts are in general not supposed to interpret laws but only implement them. Given the ambiguity of the environmental legislation generally and the water pollution legislation specifically, it would limit the ability of the environmental courts in attempting to uphold general or vague laws in different situations. Despite China's environmental courts being provided with enforcement powers, they have not taken up any case against the state, therefore it remains to be seen whether over time the environmental courts can pass take actions and pass judgments against the government.

Regarding China's corruption-river water pollution nexus, the results suggest that if we decrease the corruption perception index by 1 per cent, water pollution will increase by 2.39 per cent. As the corruption perception index indicates that the higher the score, the more corruption free a country is, the results imply that corruption significantly affects water pollution in China. In other words, with every per cent increase in corruption levels, water pollution increases by 2.39 per cent.

The underlying causes of corruption in environmental sectors are usually a weak legislative basis (as evidenced by the results above that RQ does not have any significant effect on water pollution at all), lack of respect for the rule of law, a weak democracy (as China is an authoritarian regime),

[857] Wang and Gao (n 853) 40
[858] Ni (n 812) 21
[859] Zhang and Zhang (n 856) 374

poor enforcement, minimum transparency, and low levels of professionalism[860]. In the environmental sectors, public sector corruption aids in serving the private interests of the bureaucrats and the public officials by taking away the right from citizens to a clean environment and by misallocating funds from conservation and preservation. Corruption in the environmental sector usually occurs as a result of weak institutions liable for implementing environmental conservation and management programs and handling environmental policing and control[861]. Pollution control presents a very high-risk area in terms of corruption. In the context of the water resources management sector, a UNDP report[862] points out that corruption can range from bribery in relation to awarding licenses for waste-water discharges that pollute open water, bribery in the preparation of environmental impacts assessment reports for projects, misuse of funds (including funds for river bank protection), nepotism and bribes for appointment and promotion to rewarding positions.

During the last decade, several cases of corruption with regard to water pollution management have been reported in China. In 2009, a corruption case was reported in water pollution abatement projects which involved three large rivers and three lakes. China's National Auditing Office declared that approximately US$59 million, which was allocated for water pollution control, had been mishandled and misappropriated between 2001 to 2007. Furthermore, an amount of US$650 million was unaccounted for, which could have been either stolen, misdirected or never used. In addition, industrial river pollution fines totaling US$300 million were never paid by the companies. This money was meant to have been invested in water pollution abatement projects. It is noted that factories in China quite frequently prefer not to invest in treatment of wastewater as the penalties are much lower than the cost of operating effective treatment plants[863]. Many research studies on China have attempted to understand the effect of corruption on China's pollution levels. One study[864] attempts to examine whether corruption affects SO_2 emissions for 29 Chinese provinces between 1999-2002 and observes that a rise in the number of anti-corruption cases does

[860] S. Winbourne, 'Corruption and the Environment' [2002] Management Systems International < http://pdf.usaid.gov/pdf_docs/Pnact876.pdf > accessed 2 November 2017
[861] Ibid 8
[862] J. Vos, 'Fighting Corruption in the Water Sector: Methods, Tools and Good Practices' [2011] United Nations Development Programme (UNDP)
[863] Ibid 22
[864] X Liao et. al (n 824) 4

contribute towards driving down the SO_2 emission levels in China. Another study[865] on China finds that, not only institutional corruption, but the institutions responsible for efficient environmental management are also guilty of statistical corruptions. Between 2008 to 2013, they altered data for air quality in Beijing so as to portray to its citizens and the outside world that China as having minimal air pollution. Given the relationship between corruption and water pollution, it would be interesting to see the nature of their relationship.

The investment in treatment of industrial wastewater has been taken as a proxy for government effectiveness. This variable does not show any significant relationship with water pollution. This implies that the investments made through the institutions under the river basin management structure have failed to reduce water pollution effectively. We can assume, therefore, that these institutions are inefficient. One study[866], which attempted to determine the efficacy of the overall environmental management institutions in China, has also reached similar conclusions. With regards to investment in environmental management, it should be noted that it is not enough given that the country is growing at a rate of 80 to 120 per cent every five years[867]. Before 2007, investment in environmental protection plans accounted for less than 2 per cent of its GDP which was not enough to counter the effects of unprecedented growth on the environment. Though there has been a conscious effort to increase environmental spending since 2007, the increase of investment in water pollution control has been much lower than that in water resource allocation, flood control and soil erosion[868]. China started setting targets for urban sewage treatments in the 1990s. It targeted treating 25 per cent of urban sewage by the end of the 9th Five Year plan (FYP) in 2000. This target went up to 45 per cent and 70 per cent by 2005 (10th FYP) and 2010 (11th FYP) respectively. During the 9th FYP, China allocated RMB 60.27 billion yuan for the same which went up to RMB 159.5 billion yuan in the next FYP. If compared with the country's total fixed asset investments, the amount allocated for environmental management was negligible. For instance, road and bridge construction investment accounted for 43 per cent of all urban fixed investment during the 10th FYP (RMB 159.5 billion yuan) while sewage treatment accounted for

[865] T. Stoerk, 'Statistical corruption in Beijing's air quality data has likely ended in 2012' [2015] Grantham Research Institute on Climate Change and the Environment, Working Paper No. 194
[866] L. Guan, G. Sun and S. Cao, 'China's Bureaucracy Hinders Environmental Recovery' (2011) 40(1) Ambio 96
[867] Z. Ma, 'Strengthening the National Capability of Water Pollution Emergency Prevention and Control: Lessons Learned from Songhuajiang River Water Pollution Incident' [2006] World Bank 39
[868] J. Xie et.al (n 802) 31

only 4 per cent[869]. Moreover, funds allocated for environmental projects are often spent on unrelated projects. For instance, in 2007, the Chinese Academy for Environmental Planning (which reports to the MEP), revealed that merely half of the 1.3 per cent of GDP that China had allocated for environmental protection during the 10th FYP has been used for legitimate projects, while more than 60 per cent of those environmental funds were spent on constructing parks, gas stations and similar facilities rather than wastewater treatment facilities[870].

As accepted by the Chinese government, lack of investment along with poor supervision have contributed towards increasing water pollution[871]. Management of environmental protection in China is assigned to multiple agencies and different actors, as evidenced in the case of water management where there exists not only a vertical management system but a horizontal system as well. Therefore, instead of cooperating amongst each other, the different government bodies usually end up competing for the limited available resources and influence[872]. As mentioned earlier, China's water management structure is a 'dual system', consisting of a vertical and a horizontal institutional structure. The horizontal institutional structure involves the MWR (responsible for water allocation), the Ministry of Construction (responsible for handling wastewater and sewage treatment), the State Forestry Administration, the State Oceanic Administration, the Bureau of Fisheries under the Ministry of Agriculture, and the MEP (responsible for monitoring water pollution in areas not supervised by other ministries). In addition, the Ministry of Finance plays a crucial role in determining the level of water pollution fines for non-compliant factories whereas the Environmental Protection and Resources Conservation Committee (EPRCC) of the National People's Congress is responsible for managing and drafting water pollution laws and regulations. Nevertheless, the MEP and its local bureaus are still involved in the greatest possible way in environmental protection activities, ranging across the drafting of laws, enforcement, monitoring, EIAs and research[873]. As numerous ministries and agencies are involved, the entire water management system suffers from lack of coordination.

As the MEP is a cabinet level body, it can cast vote in the State Council in order to influence national policymaking. This ensures its superior position in the government bureaucracy and

[869] Ibid 38
[870] E. C. Economy, 'The Great Leap Backward?' [2007] Foreign Affairs 38
[871] W. Xie (n 788) 37
[872] K. Michalak, 'Environmental governance in China' [2005] China Governance Project, OECD 60
[873] Economy (n 820)

allows it to enforce environmental laws. However, the MEP still faces certain limitations. It cannot compel other ministries to adhere to its recommendations which makes the MEP's bureaucratic position insignificant in the context of environmental pollution. A number of other underlying factors have also contributed towards reducing the MEP's influence in water resources management. Firstly, the MEP faces a serious shortage of staff. China has a population of 1.3 billion but the MEP employs only around 300 employees in its Beijing headquarters and 150 employees in its 5 regional offices. The total number of personnel is around 2600 including its affiliated agencies and institutes[874]. In comparison, the US which has a population of 300 million yet its Environment Protection Agency employs 17,000 staff spread across the agency's headquarters, 10 regional offices and 18 laboratories. In short, the MEP has a work force which is less than one-sixth of the EPA's work force size but, at the same time, it is responsible for managing pollution issues and enforcing environmental laws for a population that is five times that of the US[875]. Secondly, despite the MEP having cabinet level status, it does not have jurisdiction over local EPBs. The local governments control their respective local EPBs and they prioritise the local economy over the environment. Though the EPBs are answerable to both the MEP and the local governments but the funding and other resources come solely from the local governments. Understandably, the EPBs are usually more responsive towards the needs of the local governments. In addition, despite recent regulations, the local governments are still evaluated on the basis of their economic performance (or, GDP growth) rather than environmental performance which provides them with no incentive to promote environmental protection[876]. As a result, the MEP only maintains a supervisory role for the EPBs. Further, the EPBs face staff shortages at the grass-root levels. For instance, though the number of EPB environmental inspectors rose by 116 per cent between 1997 and 2003, it is still insufficient to enforce environmental regulations properly[877]. In addition, the EPB's usually have a lower administrative rank than that of the enterprises it is supposed to oversee. This further reduces its efficacy at the grass root levels[878].

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[874] H. Gang, 'China's New Ministry of Environmental Protection Begins to Bark, but Still Lacks in Bite' [2008] World Resources Institute EarthTrends

[875] Economy (n 820) 112

[876] Organisation for Economic Cooperation and Development (OECD), 'Environmental Compliance and Enforcement in China' [2006] < https://www.oecd.org/env/outreach/37867511.pdf >

[877] Ibid 25

[878] OECD (n 876) 18

In addition to the water management's institutional structure dealing with bureaucratic issues, shortage of staff and reduced investment in China's environmental protection, it also faces challenges with regard to corruption. For instance, in a bid for 'local protectionism', local officials often support polluting enterprises within their jurisdictions. This puts pressure on the EPBs to protect these industries. At times, the EPB official may even develop a personal relationship with the head of an enterprise and levy them with a smaller fine than required. For instance, the county government officials had assured factory owners in Zhejiang province in 2006, who had an annual industrial output of over 10 million yuan ($ 1.2 million), that they would not be subjected to surprise inspections by the government without prior information[879]. The existence of corruption thus increases water pollution (as evidenced from the previous result) through making water pollution abatement institutions ineffective.

Because of all the above mentioned reasons, it can be safely stated that government effectiveness does not affect river pollution abatement efforts in China.

Voice and accountability, the proxy for a free media, shows no significant relationship with water pollution in China. This implies that VAP has failed to bring about any change in China's water pollution abatement. Media, particularly the newspapers, are considered as an influential means for promoting environmental education. The mass media not only encourages public concern for environmental issues but also raises public awareness[880]. In fact, information disclosure regarding pollution control should ideally force authorities into taking appropriate measures regarding pollution abatement[881]. But, in China's case, this does not hold valid. Firstly, most of China's media houses are state controlled; the ones which are independent are also controlled indirectly through financial incentives, legal restrictions and surveillance. Apart from a crackdown on local media, China has also strengthened its control over the country's narrative internationally by buying radio stations internationally, sending state media reporters abroad and establishing news start-ups which look and feel like independent news organisations but in reality are controlled by the Chinese Communist Party[882]. As a result, Chinese media has not been able to influence

[879] Economy (n 820) 115

[880] J.W Parlour and S. Schatzow, 'The mass media and public concern for environmental problems in Canada, 1960–1972' (1978) 13(1) International Journal of Environmental Studies 9

[881] T. Uchida, 'Information Disclosure Policies: When Do They Bring Environmental Improvements?' (2007) 13(1) International Advances in Economic Research 47

[882] J. Griffiths, From Xi to Shining Xi: China's Propaganda Machine Goes into Overdrive, CNN (February 23,

environmental activism or environmental engagement[883] and as a result has not been able to influence pollution abatement efforts.

One study[884] attempts to determine whether differences exist in the extent of media coverage of environmental issues by party papers (the papers which are affiliated to the CCP) and the non-party papers (the papers which are not affiliated to the CCP). The study finds that the Party newspapers cover environmental issues more than the non-party papers, but do not cover the issue of deterioration of the environment. Instead, they cover progress in terms of the State's efforts regarding environmental pollution abatement. In contrast, non-party newspapers portray environmental issues from a critical perspective. In fact, there has been a rise in coverage of environmental issues by the Party newspapers but they take on the role of a 'propagandizer', in that they try to influence the people to think about environmental issues in a government approved way. Secondly, at the local level, the local newspapers tend to have even lower coverage of environmental issues as compared to that at the national level. That is because sustainable development is currently given precedence over economic development at the national level. But that is not the case at the local level. As a result, the local newspapers support the local governments and refrain from covering environmental issues. Another study[885] on China attempts to understand media's role in environmental protection. The study posits that despite the minor degree of liberalization in environmental journalism achieved by the efforts of Chinese NGO's, political sensitivity concerning environmental issues forces the newspapers to exercise self-censorship, thereby keeping these issues out of print at the national level. At the local level, on the other hand, local governments attempt to direct journalists away from questionable activities as 'local protectionism' still takes precedence over environmental issues.

China's CCP arguably maintains one of the world's most restrictive media systems. The central government censors all forms of media so as to maintain its monopoly over power and information. The government's sophisticated means of censorship and control ensures prevention of all

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2016), http://www.cnn.com/2016/02/23/asia/china-xi-jinping-propaganda/ ; Pen America, 'Darkened Screen: Constraints on Foreign Journalists in China' (September 22, 2016) < https://pen.org/sites/default/files/PEN_foreign_journalists_report_FINAL_online%5B1%5D.pdf >

[883] refer to: N. Zhang and M.M Skoric (n 634) 380

[884] C. Rong, 'Newspaper coverage of environmental problems in China: An analysis of three Chinese newspaper' [2009] (Master's Thesis, Oklahoma State University)

[885] A. Palmer, 'The Role of the Media in China's Environmental Protection' [2004] (P.R.E.M.I.U.M program ,Stenson University)

potential sources of impartial reporting. The comprehensive censoring of independent reporting is not only limited to an oppressive political environment, as China also has a repressive legal environment for the media[886]. In fact, in 2016 China was ranked by French watchdog 'Reporters Without Borders' at 176 out of 180 countries in terms of freedom of the press. Weekly Censorship guidelines are distributed amongst prominent editors and media providers regarding the Communist Party's propaganda. Further, the Communist Party's Central Propaganda Department also issues media outlets with guidelines and directives which restrict the coverage of politically sensitive issues. For censorship of media, the government also resorts to lawsuits, fines, arrests, demotions, dismissals and forced television confessions. For instance, according to a report by the a US watchdog on freedom of press issues called 'Committee to Protect Journalists', 38 journalists were imprisoned in China in February 2017. In 2010, a prominent journalist, Tan Zuoren, was sentenced to 5 years imprisonment because of drawing attention towards government corruption which resulted in poor construction of school buildings that collapsed and killed school children during the 2008 earthquake in Sichuan province[887].

Similarly, as environmental issues are a very sensitive subject, many environmental activists have faced the same ordeal in China. For instance, Tang Xiang, one of the spiritual and philosophical leaders of China's environmental movement and a former reporter, came under political attack in 1957 under the anti-rightest movement and lost his wife when she was beaten to death by the opposition. He later published a book called *A Green World Tour* in 1993 which supports democracy as a way forward for environmental protection. This book encouraged many Chinese youths to make efforts for saving the environment, such as investing their own money for establishing nature preserves. Xiang faced the censorship of the government as the latter deleted certain excerpts from his book in both the Chinese and English editions. Though Xiang's book remains in print today, there are examples where books on the environment have been completely banned. He Bochuan, a lecturer in the department of philosophy at the Sun Yat-sen University in Guangdong published *China On The Edge*, which described China's grim environmental situation and predicts an even worse environmental situation in the absence of radical political and economic reforms. First published in 1988, the publication of this book was completely halted in 1989. Dai Qing, a former reporter and currently an environmental activist, is well known for her efforts in

[886] V. L. Nhan, 'Media in China: Methods of State Control' (2008) 3 The Orator 36
[887] B. Xu and E. Albert, 'Media Censorship in China' (2017) Council on Foreign Relations 62

seeking to avert the building of the Three Gorges Dam[888]. She published a book, titled '*Yangtze!Yangtz*e!', after no newspapers or journals were willing to publish the interviews she conducted with journalists, scientists and well known political figures of the CCP who were responsible for evaluating the dam's feasibility and disagreed vehemently with the government's final published report. This book was banned in China for critiquing the lack of political openness in conducting an EIA and the human rights violations for displacing millions of people from that area. In 1989, she was imprisoned for ten months in the maximum security Qincheng prison. Further, she is currently not allowed to publish, participate in any organization or to have a job in China[889].

Given the huge price that journalists have to pay in China for voicing their opinions about sensitive environmental issues, they usually refrain from publishing news regarding the country's environmental pollution. This is probably the reason why 'voice and accountability' in China fail to affect river water pollution by raising environmental awareness amongst people.

The results show that population has a significant relationship to water pollution. In the past 60 years, world population has almost tripled. Rapid population growth results in changing spatial dimensions and demographic factors. The growth of population is accompanied by a rising demand for food, water and land resources. As a result, there has been a rise in related human activities like, agriculture and livestock farming. This further results in adjusted river water usage and transfers. This is further accompanied by urbanization and natural resources exploitation which not only causes climate change but also quickens the pace of water pollution[890]. As a result, population growth accompanied with ineffective river basin regulations, inefficient institutions, corruption and a state controlled media has led to decline of the river water quality. China's per capita water availability is already below the world's average.

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[888] The Three Gorges Dam is the world's largest hydropower project. But it is also equally infamous for setting massive project records for the number of people displaced. This project not only displaced 1.2 million people, but also flooded 13 cities, 140 towns and 1,350 villages. This project has also drawn world attention because of corruption, spiraling costs, human rights violations and resettlement difficulties. [International Rivers: https://www.internationalrivers.org/campaigns/three-gorges-dam]

[889] Economy (n 820) 153

[890] TUDelft, 'The relationship between population and river water quality' < https://www.tudelft.nl/en/ceg/about-the-faculty/departments/watermanagement/research/chairs/water-resources/water-resources-management/research/phd-research/current-projects/the-relationship-between-population-and-river-water-quality/ >

There exist many theories which describe the relationship between population and natural resources. In fact, one study[891] states that the effect of population growth on environmental resources is as old as human civilization. Such theories were initiated by Malthus in the late 18th and early 19th century, when he claimed that population grows at a geometrical progression whereas food production tends to grow at an arithmetic progression[892]. Holdren and Ehrlich's theory[893] states that there are various underlying factors through which population growth affects the environment. These underlying factors could be diminishing returns from increasing the food production to feed a growing population. It could also be through an increase in per capita consumption due to a high population growth, which will further affect the per capita impact. Holdren and Ehrlich's theory pinpoints two main issues in the relationship between population growth and environment. Firstly, population growth definitely influences the environment[*894*]. Secondly, there is a crucial need for joint consideration of population growth, resources utilization and environmental deterioration.

There exist many empirical studies which lend support to these theories on population growth and water pollution. A study[895] based on Sri Lanka evaluates the correlation between population growth and water pollution parameters in the Kelani river basin and concludes that human activities along with a growing population pose a significant threat to rivers when pollution exceeds the threshold limits. A study[896] on China concludes that population growth rate indeed leads to an increase in water and air pollution. Another study[897] based on South Korea attempts to understand the impact of population growth on environmental degradation. The study determines that population growth affects the environment on two levels. Firstly, there is the direct impact of

[891] T. Dietz and E. A. Rosa, 'Rethinking the Environmental Impacts of Population, Affluence and Technology' [1994] Human Ecology Review 30
[892] Ibid 278
[893] J. P. Holdren and P. R. Ehrlich, 'Human Population and the Global Environment: Population growth, rising per capita material consumption, and disruptive technologies have made civilization a global ecological force' (1974) 62(3) American Scientist 282
[894] P. R. Ehrlich and J. P. Holdren, 'Impact of Population Growth' (1971) 171(3977) Science 1212
[895] C. P. Liyanage and Koichi Yamada, 'Impact of Population Growth on the Water Quality of Natural Water Bodies' (2017) 9 Sustainability 1405
[896] Z. Zhang, 'Linkage between population growth and air / water pollution in China' in S. Ramphal and S. W. Sinding (eds.), *Population growth and environmental issues* (Praeger, 1996)
[897] Y. Si Li, 'A research on population changes and environment of South Korea' [2003] (M.A Dissertation, Peking University)

population growth on the environment, and secondly, there is a compound impact of population change on environment through industrialization and urbanization.

China's industrialization also seems to affect water pollution levels significantly. The results indicate that if the proportion of industry as a percentage of GDP increases by 1 unit water pollution will increase by 5 per cent. Developing countries often have a high percentage of heavily polluting activities (usually due to lax regulations, ineffective institutions and significant levels of corruption, as evidenced in the results of this study) within its industrial sector. This combined with a sizable agricultural sector causes extreme pressures on the environment and thereby destroys the natural resources base. As mentioned earlier, developing countries are experiencing a double environmental effect: the old environmental issues remain largely unsolved and, at the same time, new environmental challenges are emerging every day[898]. Many studies have proven this relationship between industrialization and water pollution in the context of developing countries[899].

China is currently facing acute environmental issues after more than two decades of rapid economic growth. Of these issues, water pollution is one of the most important. China's industrialization has undoubtedly produced higher standards of living but it has also resulted in costly environmental consequences[900]. Many studies on China have supported this correlation between industrialization and water pollution. An empirical study[901] was conducted to understand the impact of urbanisation and industrialization on water pollution, where Panzhihua, a Chinese mining town was taken as a case study. The results reveal that urbanisation along with population growth and industrialization contribute to declining surface water quality. Another case study[902] on the Huai River Basin in China's Shangdong Province also confirm that industrialization contributes to water pollution. Rapid industrialization in China has not only resulted in water pollution issues but, consequently, has also caused many health-related issues. For instance, one

[898] European Commission (n 601)
[899] S. et. al. (n 294) ; Khan (n 831) ; B.S. Shankar and H.S. Usha, 'Environmental Degradation Due to Industrialization—A Case Study of Whitefield Industrial Area, Bangalore, India' (2007) 24(9) Environmental Engineering Science 1338
[900] R. C.G Varley, 'The World Bank and China's Environment 1993-2003' [2003] The World Bank Evaluations Department
[901] Y. Teng et. al, 'Impact of Urbanization and Industrialization upon Surface Water Quality: A Pilot Study of Panzhihua Mining Town' (2011) 22(5) Journal of Earth Science 658
[902] Na Li et al., 'Impact of industrialization on water protection in the Huai River Basin within Shandong Province, China' (2016) 81 Nat Hazards 1193

study[903] tries to understand how water pollution caused by industrialization can affect digestive cancer rates in China and finds that a deterioration of water quality by a single grade increases the digestive cancer death rate by 9.7%.

Given China's increasing economic growth rate and the undesirable effects of industrialization on the country's water quality, it is essential to understand why the country's river basin management regulations are unable to contribute significantly towards water pollution abatement, and what determines it's (in) effectiveness. The results of Model 2 attempt to provide an explanation.

5.5.2 **Model 2**

An OLS regression is initially run to estimate the model. Later, when the Durbin-Watson test for autocorrelation is run, it reveals first order autocorrelation and, as a result, the OLS results have not been used to draw inferences. Instead, the model is re-estimated using the Prais-Winstein regression to correct for auto-correlation. Further, as there was a possibility of reverse causality between water pollution and regulatory quality, the Granger-causality test was run. The results reveal no evidence of reverse causality.

The OLS and Prais-Winstein results are as follows:

Table 5.5 Time-series model estimation results for China (Model 2)

Independent Variables (IVs)	OLS (First Model)	Prais-Winstein (First Model)
Corr_t	-0.41*	-0.38**
NR_t	-0.05***	-0.64***
VAP_t	-0.009*	-0.008
$Popgrowth_t$	0.76**	0.89**
$Propindst_t$	0.52**	0.659***
	Ramsey RESET Test H_0 : Model has no omitted variables P-value = 0.19 **Multicollinearity Test** Mean VIF = 2.42 **Durbin Watson d-statistic** H_0 : Model has no first-order autocorrelation d-statistic: 2.09 **Granger Causality Test**	

[903] Ebenstein (n 831) 186

	H_0 : Emi_t does not affect NR_t p-value: 0.52 H_0 : NR_t does not affect Emi_t p-value: 0.44 H_0 : Emi_t does not affect $Corr_t$ p-value: 0.355 H_0 : $Corr_t$ does not affect Emi_t p-value: 0.207	

Note: Dependent Variable is Emi_t. According to VIF estimate our model does not suffer from multicollinearity problem as the value of the mean VIF is less than 10. ***, **, * represent statistical significance at 1%, 5% and 10% level of significance respectively.

The results indicate that if corruption perception increases by one unit the emissions per dollar of value added decreases by 0.38 units. In other words, if a country's level of corruption drops by 1 unit (as the corruption perception indicates a higher score, the lower the level of corruption a country suffers), then the regulatory quality of water pollution improves by 0.38 units (as the lower the emissions per dollar of value added, the higher the regulatory stringency and better the regulatory quality).

China's river basin management despite having a sufficient legal basis, suffers as a result of a fragmented structure of water laws. Despite this, there exists very rare cases where the interpretation of statute law has been disputed. If there were numerous such cases in China, that would have proved beneficial for the country's environment. For instance, in USA judicial statutory interpretation have developed alongside environmental legislative frameworks over the past 50 years. In China, on the other hand, there exists no corresponding case law to inform the application of environmental legislation. In fact, there are very few organisations in China which would be likely to sue the government. Despite China enacting many environmental law statutes, there are no Chinese environmental law statutory interpretation cases[904]. The underlying cause of this is not only the lack of an independent judiciary but also corruption at every single level[905]. For instance, a corruption scandal at the intermediate court of the Hubei Province in 2002 revealed that two vice-presidents of the court, seven mid-rank judges, one court clerk and three deputy divisional

[904] Nagle (n 851) 516
[905] Ibid 529

directors received bribes from forty-four lawyers on various occasions[906]. Corruption in China's courts is not an isolated act involving a handful of judges or court officials. Instead it is an institutionalized activity which is a consequence of:

> *'operation of a judicial decision-making mechanism that provides well-structured opportunities for manipulation and exploitation by all participants of the judicial decision-making process at each and every level of the judiciary. It is this institutionalization that has sustained corruption in China's courts and allowed it to be continuously produced and reproduced after previous offenders have been punished and removed[907]'.*

The underlying reasons for the existence of corruption in China's courts could be because of the following reasons:

A one-party system: The CCP rules the country. Whilst it allows other political parties, the CCP retains all political power. Therefore, the CCP is alone responsible for determining the content and nature of Chinese law. The Party influences not only the legislative process but also its enforcement. This issue raises particularly critical questions in environmental law as Party intervention is required to ensure local enforcement, but such intervention deprives the law of its independent force[908]. The Party's power over the legal system also extends to statutory law. This is because in China, statutes are used as a means by the CCP to decide what is acceptable or what is not. Though the CCP lacks the constitutional power to enact legislation, it is capable of initiating the process for drafting statutes, including environmental statutes[909]. This continuous influence of the CCP explains why there are few disputes concerning interpretation of environmental statutory laws. The notion, that the party's views are equivalent to the rule of law, still exists today and this in turn makes the system non-transparent giving rise to problems of corruption[910].

Non-existent independent judiciary: China's constitution, like that in most other countries, provides for an independent judiciary. But this independence is constrained by a lot of factors. Firstly, Chinese judges are very poorly trained and held in low regard in society, unlike in other

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[906] Sina, 'Investigation of 13 Judges Joint Crime in Wuhan Intermediate Court' (2003) < http://news.sina.com.cn/c/2004-03-12/13423016437.shtml>

[907] L. Li, 'The "Production" of Corruption in China's Courts: Judicial Politics and Decision Making in a One-Party State' (2012) 37(4) Law and Social Enquiry 848

[908] L. Ross and M. A. Silk, *Environmental law and policy in the People's Republic of China* (Quorum Books, 1987)

[909] Ibid 10

[910] Nagle (n 851) 531

countries. For instance, in many cases, judges are civil servants or demobilized soldiers who only have a high school education with no formal training in law. When a law professor once questioned the logic behind appointing military personals as judges, the People's liberation Army responded by pointing out the military's historical contribution to the country[911]. In fact, the National People's Congress (NPC), which selects the justices serving on the Supreme Court, can even remove the appointed justices at any time during their two consecutive terms without giving any valid justification[912]. This implies two things; firstly, the NPC more often than not would choose someone who has similar political ideologies to CCP. For instance, within the first eight months of 1998, nearly 10,000 cases were incorrectly prosecuted or wrongly decided in order to ensure that they do not go against the Party's ideologies[913]. N. Liu[914] points out that court rulings supported by poor reasoning are usually a by-product of judicial corruption. Secondly, because the justices might lose their position if they go against the Party, they usually do not have incentives to do so. In fact, Chinese Judges are heavily influenced by the executive and the legislature. Many observers have also described the judiciary as '*beholden to the party'*[915].

Apart from these issues, corruption also exists in the form of obstacles regarding private enforcement of Chinese environmental statutes. Private citizens in China, along with organisations and businesses, face numerous difficulties while bringing environmental cases to courts. Chinese courts can be better described as dispute resolution mechanisms rather than as courts. Chinese law places judges closer to law- interpreting bureaucrats, rather than enforcers of the rule of law. In fact, cases involving Party members are not even heard by the courts; they are only dealt with as internal corrective matters[916]. It is a rare privilege if the environmental dispute cases even get a single day in court. Judges at the case-filing division routinely refuse cases without providing a written rationale to the plaintiffs, although officially they are required to do so. The official reasons stated by judges for doing so usually involve lack of evidence, the intervention of another administrative bureau, or that there exists no appropriate law to deal with the matter. But, in reality,

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[911] Economy (n 820) 118

[912] F. Fook-Lun Leung, 'Some Observations on Socialist Legality of the People's Republic of China' (1987) 17 California Western International Law Journal 102

[913] C. David Lee, 'Legal Reform in China: A Role for Nongovernmental Organizations' (2000) 25(2) Yale Journal of International Law 363

[914] N. Liu, 'Trick or Treat: Legal Reasoning in the Shadow of Corruption in PRC' (2008) 34 North Carolina Journal of International Law and Commercial Regulation 179

[915] Nagle (n 851) 532

[916] S. B. Lubman, *Bird in a cage: Legal reform in China after Mao* (Stanford University Press 1999)

the judges usually do so to avoid arguments which might affect the country's social stability. It is also an open secret that at times the lower courts receive instructions from the Supreme Courts to turn away serious environmental cases. One man from Hunan province spent five months trying to get a pollution dispute into court in 2004. His unsuccessful attempts included 10 trips to the basic level court, three trips to the intermediate courts and two trips to the high court[917].

China's case filing division is also infamous for breaking up collective lawsuits into individual cases[918]. In the 1990s, the Chinese courts started establishing case filing divisions with the aim of making the act of bribing judges more difficult. But some litigants confess that this reform has only led to an increase in the number of people who need to be bribed so as to get their cases into court[919]. Under the Civil Procedure Law, citizens can file collective lawsuits for environmental issues led by two to five representatives. However, often judges in the case-filing division divide up these collective lawsuits in individual cases so as to maximise the court fees, boost the statistics of the number of cases handled and also disarm collective action[920].

The underlying reasons for corruption in the judicial institutions are inadequate salaries for judges[921], insufficient funding for courts[922], inadequate legal training of judges, lack of judicial independence and local protectionism[923]. Thus, corruption reduces the stringency of China's water pollution regulatory quality thereby making the RQ ineffective in water pollution abatement, as our model 1 result indicates.

The relationship between natural resources rent as a percentage of GDP and emissions per dollar of value added is positive and significant. The results suggest that a one unit increase in natural resources rent as a percentage of GDP would raise the emissions per dollar of value added by 0.64 units. This implies that an increase in natural resources rent weakens the regulatory quality by 0.64 units.

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[917] R. E. Stern, *Environmental Litigation in China* (Cambridge University Press 2013)
[918] Ibid 50
[919] Li (n 907)
[920] H. Wang, 'Linking up with the international track: What's in a slogan' (2007) 189 China Quarterly 1
[921] K. Zou, 'Judicial Reform versus Judicial Corruption: Recent Developments in China' (2000) 11 Criminal Law Forum 321
[922] He Xin, 'Court Finance and Court Responses to Judicial Reforms: A Tale of Two Chinese Courts' (2009) 31(4) Law and Policy 463; Y. Wang, 'Court Funding and Judicial Corruption in China' (2013) 69 The China Journal 43
[923] Zou (n 921) 323

Natural resources endowments such as gas, oil and minerals can serve as drivers of economic growth. As natural resource extraction is capital intensive, with related global investment amounting to 1 trillion dollars annually, it offers huge potential for rapid structural development and transformation in the context of developing economies. Profits from resource rents is estimated at 4 trillion dollars annually, which is approximately 7 per cent of the global GDP. But if 'resource-rich' countries are not well managed this can result in immense environmental hazards, weakened accountability of the state to society and even disruptions to local economies and communities[924].

According to political economy literature, natural resources rents interact with state institutions and governance in two ways. Firstly, extraction of natural resources induces deterioration in governance. The underlying reason for this is that resource wealth earned from resource rents may affect governance quality by triggering bureaucratic battles amongst different interest groups and the state for control over these natural resources. This theory does not hold true, however, for authoritarian regimes. Secondly, even if resource dependence does not degrade governance, it could affect the quality of institutions and governance through the lax natural resource management policies adopted[925] and their implementation throughout the value chain. Therefore, the institutional quality and the government's capacity with regard to drafting and implementing effective natural resources regulations would affect outcomes, not only in the natural resources sector such as fossil fuels from where rents can be earned, but also in other resources sectors such as water, air and land. This is because as natural resources revenues generate huge profits the government might be tempted to make policy and public decisions which would have long-term consequences in terms of environmental degradation for other resources[926].

In China's case, the latter theory applies. In 2013, the UNEP declared China the world's biggest consumer of primary materials, including minerals and metal ores. China's per capita consumption levels rose from 30 per cent of the global average in the 1970s to over 162 per cent of the global average in 2008. This resulted in a huge investment in infrastructure development and manufacturing (as predicted by the natural resources endowments theory)[927]and the mineral and metal resources which supported this boom have come from mostly domestic and some

[924] N. H. Barma et.al (n 660) 44
[925] It is not a necessary condition, but this could be a possibility
[926] N.H. Barma et. al (n 660) 45
[927] As mentioned earlier, as natural resource extraction is capital intensive it, it offers huge potential for rapid structural development and transformation in developing economies.

international reserves[928]. China's 2003 policy on mineral resources states that it has identified reserves of 54 types of metallic mineral resources, 10 energy related mineral resources and 91 reserves of non-metallic resources[929]. In fact, China's coal reserves are hugely responsible for the industrialization and manufacturing sector growth as electricity generated from these coal reserves propelled China to its current position[930]. The value of China's total mining production in 2010 amounted to over 69 billion US dollars[931]. Despite the opportunities associated with mining, it is also associated with degradation of the environment. Mining has serious environmental impacts on water resources mainly because large amounts of water are required in the various stages of mining and mineral processing. For instance, mining, washing and processing of coal are all very water-intensive. This is evidenced by the fact that 70 per cent of China's coal mines are located in 15000 previously water abundant regions, which are now water scarce regions. Chemicals used in mining also pose the risk of run-off and the poisoning of rivers and lakes. In recent years, a number of water pollution cases as a result of mining have been registered. In 2002, huge amounts of cadmium were found in the Longxiang river situated in Guangxi Zhuang Autonomous Region. Cadmium is a heavy metal used in mining and smelting operations. After 20,000 tonnes of cadmium leaked into the river from the upstream mining operations during a two-week period, it killed around 40,000 tonnes of fish. The drinking water supply of people who lived more than 300 km from the site of the spill was affected. Investigators pointed out that cadmium levels in the river were more than 80 times the legal limit. In July 2013, another spill of cadmium and thallium affected the Hejiang River in Hezhou, Guangxi. This affected the water supply of 30,000 people living downstream for almost three weeks[932].

Numerous environmental laws and regulations have been adopted for internalizing the environmental cost imposed by mining in China. Despite this, China's water quality has been affected significantly due to mining activities. This is a result of weak environmental controls caused as a result of the inefficient regulatory and institutional structure in China[933]. Zhu and

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[928] J. West et.al, 'Resource Efficiency: Economics and outlook for China' (2013) United Nations Environment Programme

[929] Information Office of the State Council, China's policy on Mineral Resources (2003)

[930] Greenovation Hub, 'China's mining industry at home and overseas' [2014] < http://www.ghub.org/cfc_en/wp-content/uploads/sites/2/2014/11/China-Mining-at-Home-and-Overseas_Main-report2_EN.pdf >

[931] International Council on Mining and Metals (ICMM), 'Mining's contribution to sustainable development' (2013)

[932] Greenovation Hub(n 930) 26

[933] S. Zhu and J. A. Cherni, 'Coal mining in China: policy and environment under market reform' (2009) 3(1) International Journal of Energy Sector Management 9

Cherni[934] further mention that there are three contributing factors which have led to weak enforcement of the coal mining regulations:

(1) Impairment of environmental governance during institutional reform;
(2) Uncoordinated environmental authorities; and
(3) Regulation failure on the part of town and village local enterprises.

Responsibility for handling the environmental consequences of coal mining rests with the MEP and MWR, (which are also responsible for water pollution and air pollution), apart from other ministries.[935] As the ministries handling river basin management and controlling the environmental consequences of mining are the same, a rise in NRR also therefore results in a decline in RQ of river basin management. This is because the failure in controlling the environmental consequences of coal mining has also led to a rise in river water pollution. Therefore, failure of one automatically guarantees failure of the other in terms of regulatory enforcement. Secondly, as mines are important sources of local financial revenues and employment, local protectionism comes into play again when enforcing environmental regulations related to it. Thereby, lowering the stringency of regulatory quality.

The results further indicate that a free media does not seem to affect the regulatory quality of water pollution significantly. Media is often seen to increase the accountability of the government to its citizens, through enhancing service delivery and state responsiveness, and altering social norms to address poor governance[936]. For news media to develop greater levels of accountability and increase the effectiveness of laws and regulations, it is important to understand the relationship between the two. For the government to be accountable to the people, the former in the first place need to demonstrate political will to establish adequate regulations and an enabling environment which permits media the freedom and space to speak and act freely. In the absence of this political will and freedom of space, the media fails to, or is unable to, hold the government accountable[937]. Given that China has media censorship, the media is unable to hold the government accountable

[934] Ibid 20
[935] Zhu and Cherni (n 933) 22
[936] J. Deane, 'Media and communication in governance: It's time for a rethink' in A governance practitioner's notebook alternative ideas and approaches [2015] OECD
[937] C. Beckett and L. Kyrke-Smith (eds.), '*Development, governance and the media: The role of the media in building African society*' [2007] POLIS

for deteriorating environmental quality and, as a result, is unable to affect the stringency of water regulatory quality in any way.

China's history of media censorship goes back to the third century B.C when Emperor Qin – the founder of the first unified China- declared that control of ideas is fundamental to his state building project[938]. China not only controls its news media but there are several legal restrictions for journalists, and sometimes even extra-legal forms of coercion are used. Financial incentives are used for self-censorship as well. The CCP is in charge of appointing top media managers as well as those in charge of the media industry. China's Central Organization Department and the Central Propaganda Department (CPD) is directly involved in the appointment of managers for national media (which includes CCTV, People's Daily and Xinhua News Agency), while appointments for media at the local level are made by the provincial secretaries and heads with direct involvement of the CPD. As a result, media managers appointed by the Party are responsible for censoring politically 'sensitive' content. If media managers fail to do so they are removed without recourse to legal procedures. In fact, the Propaganda Department also monitors editors and journalists through a national registration system and compulsory participation in ideological training sessions where the media professionals are evaluated for their loyalty towards the party. As mentioned earlier, propaganda circulars are distributed every week amongst the media houses and a media organization faces disciplinary action if they disregard it. Chinese journalists are expected to understand the party's priorities and expected to not report on sensitive issues which also include man-made ecological disasters. If these rules are not complied with, the journalists risk losing their jobs or paying hefty fines for censored materials[939].

The country has a history of banning media content on environmental pollution. For instance, 'Plastic China', a documentary directed by Wang Jiuliang in 2017, examined the dirty business of recycling imported plastic in China. This documentary was banned by the government soon after its release, without giving any justification for doing so. Similarly, 'Under the Dome' by the journalist Chai Jing, which provides a vivid account of how China's air pollution is taking a toll on its citizens, faced a similar fate as 'Plastic China'. In fact, a California website, called China Digital Times, quite frequently publishes leaked directives issued by China's state censors which include issues like removing reports on air pollution deaths, suppressing smog forecasts, and

[938] Deane (n 936) 265
[939] A. Esarey, 'Speak no Evil: Mass Media Control in Contemporary China' [2006] Freedom House

forbidding reports on lawsuits filed against officials who failed to regulate pollution. The government is also tightening restrictions on national and international NGOs as these organizations also, at times, publish news articles on environmentally sensitive issues[940]. As environmental issues are a very sensitive subject, many environmental activists have faced harsh consequences.

Therefore, given China's strict media censorship on environmental issues and the disincentives faced by journalists or media houses for standing up against the government, FM does not contribute towards improving river basin water RQ.

The results indicate that population growth as well as the proportion of industry as a percentage of GDP have a significant and positive relationship with emissions per dollar of value added. A one unit increase in population growth will result in 0.89 units increase in emissions per dollar of value added. A one unit increase in industry as a percentage of GDP will lead to 0.659 units increase in emissions per dollar of value added. This implies that an increase in population growth and industry as a percentage of GDP will lead to a decline in the stringency of the water pollution regulation in China's river basins. These results further reinforce our Model 1 results. Model 1 results revealed that an increase in population growth and industry as a percentage of GDP lead to an increase in water pollution levels. It is predicted that this is because the regulations and institutions in place were ineffective in water pollution abatement for reasons including corruption and lack of government capacity regarding the legal framework for river basin management. Model 1 showed that RQ and GE were ineffective in affecting water pollution. Further, Model 2 results reaffirm Model 1's results that RQ is ineffective in water pollution abatement. Model 2 results indicates that this is so because of an increasing population growth and an increasing industry as a percentage of GDP. The reasons for this are as follows.

When China embarked on its journey of economic reform in 1979, it had a share of only 1.8 per cent of global GDP[941]. Currently, it is the second largest economy in the world (second only to the US) and contributes around 15 per cent to the global economy[942]. China also accounts for more

[940] M. Standaert, 'As It Looks to Go Green, China Keeps a Tight Lid on Dissent' (Yale Environment 360, 2 November 2017)
[941] J. Yifu Lin, 'China and the Global Economy' (2011) 4(1) China Economic Journal
[942] T. Worstall, 'China's Only 15% Of the Global Economy but Contributes 25 - 30% Of Global Growth' Forbes (30th October 2016)

than one-fifth of the world population[943]. This unprecedented growth and huge population size have cost China its environmental quality[944]. Ideally, this increase should not have affected China's pollution levels if there existed stringent regulations. The underlying causes for lax environmental regulations are as follows[945]:

(1) **Ambiguous relationship between different ministries:** The interaction of various sector-specific laws create confusion. For instance, the Marine Environmental Protection Law (MEPL) is responsible for safeguarding certain ecological systems, the Water Pollution Prevention Law is responsible for controlling pollution activities in water, and the Solid Waste Law and Radioactive Pollution Prevention and Control Law is responsible for controlling certain types of wastes. By addressing only a limited number of pollutants, the existing laws are ineffective with regard to those pollutants that are not specifically addressed. There is also a lack of comprehensive legal basis for all types of pollutants in different media. As a result of this, pollutants which are not included under any law might be discharged without violating any laws. The lack of a comprehensive environmental law creates a lot of confusion and prevents effective environmental management of water resources or of any other environmental media.

(2) **Enforcement issues:** The horizontal institutional system for water management is distributed across nine authorities: the MWR, MEP, State Oceanic Administration, MHURC, MOA, MOT, State Forestry Administration and NDRC. As these nine authorities are from different sectors and have varied interests in water resources management, it results in fragmented water management[946], they lack a unified environmental supervision system. Issues also arise with regards to management of trans-provincial water pollution issues. For instance, the Environmental Protection Law (1989) states that local governments are responsible for local environmental issues in their jurisdictions and that the MEP will only play a supervisory role. However, in certain

[943] S. Ding and J. Knight, 'Why has China Grown so Fast? The Role of Structural Change' [2008] Department of Economics, University of Oxford Working Paper 415

[944] The effect and the underlying reasons of population growth and increase in industry as a percentage of GDP on China's pollution levels have been discussed before in model 1 results.

[945] The World Bank, 'Strengthening China's Environmental Protection Administrative System: Analysis and Recommendations' [2009] Discussion Papers 66535

[946] He (n 751) 40

environmental issues such as controlling pollution in the Huai River Basin,[947] there is a need for the national government to intervene at times and play a more significant part in coordinating and implementing environmental management plans. Since there is no allocation procedure for environmental management responsibilities between the central ministries and the local level administrations, it is difficult to understand which environmental issues lies under which governmental authority or agency.

(3) **Limited capacity of the MEP and the local EPBs:** Although the MEP is the main organization for overseeing environmental implementation and its supervision, it lacks adequate human resources. Though there are around 180,000 people working on environmental protection in different affiliated agencies and institutions at all levels of government, only 1.3 per cent of them are employed at MEP and its affiliated research organizations, 6.01 per cent are employed at the provincial level, 22.7 per cent at the municipal level, and 67.1 per cent at the county level[948]. Therefore, some 100,000 officials are employed at the local level, but most of them either have no relevant qualifications at all or are poorly qualified or trained. In China's 11th FYP[949], 15 billion RMB was invested to build up the human capacity of the MEP and the local EPBs. As a result, MEP now employs 330 staff and at its affiliated research organizations and institutions employ 1950 staff. Though this represents a significant improvement, but given China has one fifth of the world's population, it compares very poorly with its counterparts such as the USA[950].

Given that the existing enforcement of environmental regulations is already weak in China, with its growing population and industries it is obvious that the RQ will further weaken if China does not attempt to amend not only its RQ and GE and also its corruption problems.

[947] In the upper stream of Hai River Basin, water conflicts amongst three provinces over pollution resulted in social instability in that area.
[948] Ministry of Environmental Protection (MEP) China, 'Environmental Condition Bulletin' [2017]
[949] Is a series of social and economic initiatives set up by China as a part of it's planning processes.
[950] Mention in detail in Mode 1, under the proxy of government effectiveness.

5.6 Conclusion

China's unprecedented growth since the late 1970's has resulted in severe environmental degradation including water pollution. This study is an attempt to understand the underlying causes of China's water pollution in its river basins, and also how regulatory quality, government effectiveness, rule of law, free media, population and industrialization interact with water pollution abatement measures in China. For this purpose, two econometric models were formulated along with devising a regulatory quality index for water pollution.

The first model attempted to comprehend the existing relationship of river basins' RQ, RL and GE with river basin water pollution. The results revealed that only corruption (a proxy for rule of law) seems to have an effect on water pollution measures. China's environmental regulations suffer from not only many legislative gaps but there also exists an apparent lack of coordination between different laws and regulations. Apart from this, the issue of repetition of articles in the concerned laws results in inconsistencies in terms of basin procedures and fundamental principles. China's water legislation also suffers from problem of ambiguous legal provisions, in addition to facing challenges from various groups during the drafting process. As China's judiciary is highly decentralized, its courts are not independent and therefore it is difficult for the judiciary to take a stand on environmental issues. In addition to China facing a weak legislative basis for enforcing river basin regulations, it faces a weak institutional structure for water pollution abatement. Firstly, China's government invests an almost negligible amount in environmental management. Give the country's growth rate of 80 to 120 per cent every five years, this has resulted in severe environmental degradation. Secondly, even environmental management in China is highly decentralized and, as a result, multiple agencies are involved, not only at the vertical institutional structure but horizontally as well. This results in competition amongst different government bodies for the limited available resources and influence. In addition, though the MEP is responsible for monitoring water pollution in areas not supervised by other ministries, but it does not have the authority to compel other ministries to adhere to its recommendations. This weakens the MEP's bureaucratic position in terms of environmental pollution. Furthermore, the MEP not only faces a serious shortage of staff but it also does not have jurisdictions over local EPBs. To make matters worse, as the local EPBs are under the local governments, and the latter prioritises economic growth over environmental protection, in addition to providing funding to the local EPB's, the

former are more responsive towards the needs of local government. Government ineffectiveness and weak regulation of China's river basins are further exacerbated by corruption. Additionally, the country's restrictions on its media have resulted in a regressive environment for its media houses. This ensures that coverage of politically sensitive issues such as environmental pollution is restricted. This also ensures no demand for government accountability by the citizens, which might lead to an improvement in the environmental regulatory quality, government effectiveness, along with reducing the country's corruption levels.

The second model in this study was formulated to understand the role of river basin pollution's RQ in decision-making of institutions. The results indicate that corruption heavily influences China's regulatory quality for the river basin commissions. In addition, because of the existence of other natural resource endowments such as gas, oil and minerals, the regulatory quality of the RBCs has declined. In this case as well, free media does not seem to affect regulatory quality at all.

Not only does China face corruption in the enforcement of environmental regulations, there also exist very few cases which dispute the interpretation of statute law. This is a result of the lack of separation of powers and corruption at every level in the judiciary. Due to this, the CPC has continuous influence in almost all aspects of the legislative process and the courts system, including initiating the process for drafting environmental statutes and selection of the justices. In addition, citizens also face numerous obstacles in private enforcement of environmental statutes, as a result of corruption in case-filing divisions, and the judges' unwillingness to hear environmental cases which might affect social stability. Inadequate salaries for judges, insufficient funding for courts, inadequate legal training of judges, a lack of judicial independence and local protectionism also contribute to severe corruption in judicial institutions. As a result, corruption reduces the stringency of China's water pollution regulatory quality. In addition, China has huge coal reserves which are partly responsible for the country's industrialization and manufacturing sector growth. Weak environmental regulation in China's mining sector has resulted in serious environmental impacts on water resources, mainly because large amounts of water are required across the various processes of mining and processing. In this situation, as there is an overlapping of ministries for river basin management and for controlling the environmental consequences of mining, it results in conflict between managing the environmental impacts of both. Therefore, a rise in natural resources rent has also resulted in a decline of regulatory quality of river basin

management for reasons mentioned previously. In addition, as mines are important sources of local financial revenues and employment, local protectionism comes into play when enforcing environmental regulations for water pollution caused by mining at the local level, which further lowers the stringency of RQ. The effects of corruption and a rise in natural resources rent on the environment could have been offset if free media had any impact in improving the RBC's regulatory quality by increasing the government's accountability to its citizens. However, given China's severe legal restrictions on media houses, it has failed to affect RQ, in any manner.

5.7 Policy Implications

Given the situation of water resources management in China, there is first of all a need to establish a comprehensive river basin law. Although, the Taihu Lake Basin Management Regulation (TBMR) demonstrates a significant development in terms of river basin legislation by progressing from a fragmented management in Water Law towards an integrated management, there is still a long way to go. Secondly, in the existing Water Law, the MWR is responsible for designating administrative water management responsibility to the RBC's. However, because of ambiguous language and a lack of clear specifications regarding the powers and responsibilities of the RBCs, its role is limited to organising and formulating river basin plans. They also have inadequate powers in terms of water resources planning at the basin level and managing water resources maintenance. It cannot be denied that though the RBCs do have procedural powers[951], which are essential for them to negotiate conflicting interests, they also require substantive powers to be able to operate in the interest of the whole basin. Therefore, along with developing river basin laws, the RBCs also need to be provided with substantive powers.

Furthermore, China's environmental legislation needs to deal with non-coordination between laws and regulations as regulations required by a corresponding law are not adopted or entered into force in a timely manner. Therefore, regulations need to be formulated quickly after the introduction of laws, so as to reduce the waiting period and increase the efficiency of the corresponding laws. China's water legislation also needs to deal with the issue of ambiguity. As stated earlier, the RBC's duties are not defined clearly by the Water Law and this has resulted in the RBC's role being limited to only offering scientific guidance to the river basins. Further, as

[951] such as the role of offering scientific guidance in river basin planning, overseeing the implementation of laws and regulations, and managing conflicting interests

the ambiguity of environmental laws also limits the ability of the environmental courts to uphold general or vague laws in different situations, there is a need to ensure clearly drafted environmental laws in China so as to ensure the laws are not intentionally exploited by the institutions, actors or stakeholders. China's environmental courts not only face difficulties in terms of vague laws, but also no new environmental courts are being set up because of low caseloads. Another major issue is the lack of an independent judiciary which could prevent the Party's intervention in decision-making. Therefore, there is an urgent need to establish an independent judiciary in China. In terms of improving governmental effectiveness in China, there is a need to increase China's spending on environmental management. Given that the country is growing at a rate of 80 to 120 per cent every five years, allocating only 1.3 per cent of its GDP for environmental management does not seem enough. Also, China's water management system is divided amongst multiple agencies, not only vertically (MEP, provincial EPB's, municipal EPB's and county EPBs), but also horizontally (State Council cooperates with other authorities along with the MEP and MWR). This fragmented system has resulted in a lack of cooperation amongst various agencies as well as competition amongst themselves for the limited resources available. The dual leadership system of the MEP and MWR for water resources management has also affected the effectiveness of the local EPBs.

Lastly, China's corruption levels also affect the management of environmental resources significantly. There is a need to increase the transparency of not only the institutional structure for river basin management, but also of the law drafting process for environmental statutes and of the work of the judiciary. Given that China is not a democratic country, bringing about these changes could be difficult, but NGOs could be the way forward for increasing transparency in environmental management. Chinese NGO's might not only increase public participation, but can also develop a positive government attitude towards dealing with environmental issues through raising environmental awareness amongst Chinese citizens. As China's environmental NGO sector has seen a rapid growth in the last 10 years, with student groups increasingly participating in these grass-roots bodies, relaxing government policies for NGOs could be the way forward for China's fight against environmental degradation.

Background for Chapter 6

This chapter conducts a comparative analysis of India and China. Despite being at a similar stage of economic development, both countries have different, yet very similar, approaches to river pollution management. This chapter charts the similarities and differences between India and China based on the econometric analysis conducted in Chapters 4 and 5. It also attempts to understand what lessons both countries could learn from each other with regards to environmental management.

Chapter 6: Regulatory quality in pollution control: A comparative case study of India and China.

6.1 Introduction and Background

China and India are the fastest growing large economies, occupying a special place in the imagination of the OECD and as well as other global observers. Despite the two countries' low per-capita income, their sheer size combined with rapid economic growth imply that they contribute significantly to world output[952]. China ranks as the second largest economy in terms of GDP in purchasing power parity (PPP) after US, and India is the fourth largest economy by PPP[953].

In the 1960s and 70s, Asian countries such as South Korea, Singapore and Japan achieved a high rate of annual growth of GDP per capita. During this period, China and India were closed economies and therefore were less engaged with the world economy in terms of foreign trade and investment. China's economic reforms were initiated in 1978, which resulted in an average annual growth rate of 9.7 per cent. A decade later, India pursued a similar path and it experienced an average GDP expansion of 5.8 per cent per year since the economy opened up in 1991[954]. Despite the gap in the growth performance of both the countries, India has caught up with China in recent years.

Though both countries achieved a similar rate of growth, their economic growth experiences are quite different. For instance, China's economic growth was driven by explosive growth in its industrial sector, which was a result of the country lowering its trade barriers and in turn attracting foreign direct investment inflows. India's growth, on the other hand, was driven by the rapid expansion of service industries[955].

Currently, the two nations together are home to more than one-third of the global population and contribute 19.2 per cent of world GDP; China contributing 11.5 per cent and India 7.7 per cent.

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[952] R. Herd and S. Dougherty, 'Growth Prospects in China and India Compared' (2007) 4(1) The European Journal of Comparative Economics 65

[953] K. Hubacek et al., 'Changing lifestyles and consumption patterns in developing countries: A scenario analysis for China and India' (2007) 39(9) Futures 1084

[954] R. K Pachauri, 'The future of India's economic growth: the natural resources and energy dimension' (2004) 36(6-7) Futures 696

[955] B. Bosworth and S.M Collins, 'Accounting for Growth: Comparing China and India' (2008) 22(1) Journal of Economic Perspectives 45

However, at the same time, China and India are also contributing around 18.1 per cent of global carbon emissions[956].

6.1.1 **Pollution in India and China**

High growth in both countries has resulted in severe environmental damage, such as deteriorating air quality, widespread acid rain and deforestation. These issues not only affect the living spaces and health of the citizens but are also very costly to deal with. A Chinese government report demonstrates that China's environmental costs account for 3 per cent of its GDP[957]. India's environmental costs, on the other hand, amount to 10 per cent of its GDP[958].

Despite having a low per capita income and low per capita consumption of energy and natural resources compared to the developed countries, there has been a rapid increase in consumption in these two countries. Demand for modern conveniences such as air conditioners, automobiles, electric appliances and refrigerators has been steadily rising. Along with this, an increasing population and growing demand ensures a rise in greenhouse gas (GHG) emissions. One of the consequences for this is rising air pollution. It has been estimated that by 2010, India and China alone would account for over half of total world GHG[959].

This has resulted in lowering the ambient air quality in both countries. The annual average suspended particulate matter (PM_{10})[960] in both Indian and Chinese cities is fairly high. In fact, many cities have surpassed the critical air standards set by the World Health Organisation (WHO)[961]. Six of the world's largest cities are in India and China.

In both countries air and water pollution are severe issues. Further, with rising water demand for industrial and agricultural purposes, India and China could face severe water shortages[962].

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[956] Hubacek et. al (n 953) 1087

[957] State Environmental Protection Administration of China (SEPA) and the National Bureau of Statistics of China (NBS), 'China Green National Accounting Study Report 2004' (8th September, 2016) < http://www.gov.cn/english/2006-09/11/content_384596.htm >

[958] R. K. Pachauri (n 954) 703

[959] Institute for Global Environmental Strategies (IGES), 'An Analytic Framework for a Comparative Study of Environmental Governance in Asia' [1998] 01 < https://pub.iges.or.jp/pub/analytic-framework-comparative-study >

[960] PM_{10} is used as measure for air quality. It is used to describe particles of soot (carbon, metal or inorganic salts. < http://apps.sepa.org.uk/spripa/pages/substanceinformation.aspx?pid=124 >

[961] Y. Wu, 'Comparing Pollution by Asian Giants: China Vs. India' [2009] EAI Background Brief Number 434

[962] IGES (n 959) 3

6.1.2 **Water and river pollution**

Water and river pollution are a rising concern in both countries. The rivers of both countries risk being contaminated by organic pollutants. The main sources of river pollutants include industrial effluents, domestic sewage and run-off from agricultural activities[963].

In China, although, on an average, 92 per cent of industrial wastewater discharge complies with the official standards, but for some regions like Tibet, Qinghai and Xinjiang, it is as low as 29 per cent, 50 per cent and 65 per cent respectively[964]. In 2016, up to 40 per cent of China's rivers were seriously polluted[965]. In fact, more than 20 per cent of these rivers had crossed the pollution levels, where the water quality was rated too toxic to even come into contact with. On top of that, China's Ministry of Supervision reports approximately 1700 water pollution accidents annually[966].

Major pollution of China's rivers can be traced back to the early 1970s. Since then, river water quality has deteriorated year by year. In the 1980s, a survey of 878 rivers revealed 82 per cent were polluted and more than 5 per cent of total river length lacked aquatic life and was made unusable for agricultural activities by pollution[967].

China's water pollution is also leading to the appearance of so-called 'cancer villages', as mentioned in Chapter 5. These villages are usually located near industrial complexes and rely heavily on rivers for drinking and bathing. Although industrial pollution cannot be confirmed as the absolute cause, there exists a direct link between cancer villages, polluted rivers and industrial complexes[968].

India's rivers are facing a similar issue. According to India's CPCB, 63 per cent of urban sewage flows into rivers in untreated condition. Further, a water quality assessment indicated that there are 302 polluted river stretches on 275 rivers which lie along the 35 metropolitan cities and 615 urban centers[969]. Large stretches of various rivers such as the Yamuna, Coocum, Methi and Ullas

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[963] Wu (n 961) 4
[964] National Bureau of Statistics, 'China Statistical Yearbook 2008' [2008]
[965] Y. Jian, 'China's river pollution 'a threat to people's lives' (Shanghai Daily, February 17, 2012)
[966] E.C Economy, 'China's Water Pollution Crisis' (The Diplomat, 22 January 2013)
[967] W. Jusi, 'Water Pollution and Water Shortage Problems in China' (1989) 26(3) Journal of Applied Ecology 851
[968] < http://www.greenpeace.org/eastasia/campaigns/toxics/problems/water-pollution/ >
[969] A. Devi, '63% of sewage flows into rivers untreated every day: Central Pollution Control Board' (The Times of India, 27 September 2016)

rivers have been declared as ecologically dead zones with oxygen levels too low to support aquatic life.

6.1.3 **Rationale behind comparing the two countries**

Given that both India and China have experienced similar economic growth and, consequently, the accompanying environmental degradation, it will be interesting to compare the impact of various factors affecting river pollution in both countries. This comparative analysis is based particularly on identifying how river pollution is affected by the countries' regulatory quality, rule of law, government effectiveness and a free media. This chapter is intended to aid in ascertaining how to avoid the mistakes made by the two Asian giants in balancing and integrating environmental protection with economic growth, along with providing lessons regarding how these factors may both advance and inhibit effective environmental protection. In this way, each country's environmental policy decisions could be more informed.

6.2 Comparative analysis

6.2.1 **Methodology**

Two econometric models were run for each country's river management (legal and institutional) (in Chapter 4 and 5). Model 1 was run to understand how water pollution is affected by regulatory quality, rule of law, government effectiveness and free media along with a few other variables[970]. However, this comparative study only concentrates on the above mentioned four variables.

The second model was run to identify the factors that affect the countries' regulatory quality. A summary of the factors affecting RQ would be provided for both the countries in the next section.

Comparison of regulatory quality's effectiveness[971]

India

The models that we ran for understanding how water pollution is affected by RQ show that the latter affects water pollution at a negligible rate. This is not surprising given India's fragmented

[970] The justification for choosing the different variable can be found in the methodology section
[971] How 'regulatory quality' has been defined in this study is mentioned in detail in Chapter 2.

water pollution abatement legislation. India's water law is a fairly complex area of law, as it includes numerous legal instruments both at the Federal and state level, along with other laws which are recognized as fitting in with other areas of law[972]. Unlike other countries, India lacks a national water law. There exist various laws at the state level and a few at the national level, but there is no overarching umbrella legislation for regulating freshwater in all its dimensions. As a result, the country's water law is characterized by substantive gaps[973].

Furthermore, it is worth noting that, though India's water law, including the statutes adopted since the 1970s, do not mention water conservation and protection, one of the earliest and most important environmental instruments is the Water (Prevention and Control of Pollution) Act (1974)[974]. A detailed review of this Act indicates the presence of a viable regulatory strategy in India for tackling water pollution. However, in reality, the Act is neither effective nor enforceable. In addition, the administrative organization set up by the Act is poorly staffed[975]. Lastly, this Act is based on criminal justice instead of civil law, which implies that firms do not have any incentive to comply with pollution control regulations. This also ensures that proving criminal liability is a complex procedure, apart from providing unpredictable outcomes for environmental litigation[976]. Other laws, such as, the Wildlife (Protection) Act, Forest Conservation Act, Electricity Act and the Environment (Protection) Act also have certain provisions which could be used for prevention of pollution and protection of rivers but these have not been used even in the most deserving cases.

India currently lacks a river basin law/act. A few river basin organisations were set up under the Damodar River Valley (DVC) Act, but they were set up for the purpose of utilizing the river through large dam projects, instead of river pollution abatement. It was intended that these RBOs would later advocate river basin development. However, so far, none of the river basins have taken up the role of river basin management.

It is believed that the reason RQ was found to be marginally significant in affecting water pollution abatement in India is because of rising legal activism in the country. Environmental reforms, especially in relation to river pollution, have been brought more by the courts and less by executive

[972] Cullet and Koonan (n 363) 1
[973] Ibid 2
[974] Ibid (n 972) 5
[975] Abraham and Rosencranz (n 403) 107
[976] Bowonder and Arvind (n 420) 183

or legislative actions. India's environmental activism has contributed to public interest litigation (PIL)[977] which has evolved over the years[978]. Justices have exercised 'suo moto' powers in more than one instance[979] to directly intervene in the functioning of private projects and have exercised judicial powers in legislative and executive fields. In fact, there are various instances[980] where the Supreme Court, High Courts and the National Green Tribunal were obligated to address river pollution issues due to inadequate implementation of the relevant provisions of statutory environmental law.

Furthermore, model 2 results reveal that RQ is significantly affected by Corruption. This goes on to demonstrate one of the underlying reasons for the ineffectiveness of RQ at the executive level.

China

The results obtained in China's case indicate that the effect of RQ is insignificant in the context of river pollution abatement. The result is not surprising as China's environmental legislation faces serious issues in terms of dealing with not only the legislative gaps, but also finding specific solutions to environmental issues in the legal provisions[981].The country's fundamental law dealing with water resources management (the Water Law), is also its first water law. It was issued in 1988 and later amended in 2002, which also made it China's first law to define river basin management in detail (such as defining the basin and regional boundaries and laying down the details regarding river basin management system). It also allocated the MWR with the primary responsibility for water management[982]. However, China's national water law is critiqued for its low capability in terms of providing good water governance and water pollution abatement. One of the underlying reasons for this is the 'dual management' model existing in the country for water pollution control and utilization[983]. Apart from the Water Law, certain administrative regulations for some specific

[977] For a detailed information regarding PIL and it's development and role in environmental cases in India, refer to the India chapter.
[978] K.D. Alley (n 237) 793
[979] R.K. Jaiswal v. State of Uttar Pradesh (n 467) ;News Item "Hindustan Times" And quiet flows the Maily (A.Q.F.M.) Yamuna v/s Central Pollution Control Board and Another Ias Nos. 5-10 In Writ Petition (C) No. 725 of 1994; Comdr. Sureshwar D. Sinha And Ors. vs Union Of India (Uoi) And Ors. , 8 SCC 368 10 May, 2000
[980] Indian Council for Enviro-Legal Action v Union of India (n 490) ; Vellore Citizens Welfare Forum v Union of India (n 412)
[981] Wang (n 840) 3
[982] Shen (n 687) 484
[983] Wang (n 764) 89

rivers have also been implemented[984]. However, when compared to environmental laws and regulations at the national level, progress in terms of legislation at the river basin level has been slower[985]. In addition, there also exists comprehensive river basin regulation at the sub-basin level.

The issue of fragmented legislation for river pollution abatement is further exacerbated by the fact that only general principles and a framework are provided for water resources management. It lacks instruments and procedures for implementation[986]. The flawed separation of responsibilities along with ambiguous language have also contributed towards this deficiency.[987]

Contrary to India where the judiciary has intervened in cases of poor implementation of statutory environmental law, the judiciary in China has failed to improve the RQ of river pollution abatement measures because of ambiguous laws. The underlying causes for this could be that, historically in China, law was used as a means of oppression by highly qualified judges favouring the political ideologies of the country. Though in 1978 the country's legal system was developed as per the 'western country's' model, even now past cases do not serve as binding precedent unlike in common law countries[988]. In addition, China's highest judicial authority - the Supreme People's Court - only has a supervisory role and does not have any real power over the local courts. The local courts are in fact under the control of the local governments who are supportive of local enterprises or industries[989].

As a result, RQ in China is ineffective in river water pollution abatement.

Our second model results reveal that, in case of China, RQ is significantly affected by factors such as corruption and natural resources rent.

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[984] For further details, refer to China chapter.
[985] People's Republic of China Changjiang Water Resources Commission, Water Legislation Plan in China's River Basin, Order No. 293 (7 June 2004)
[986] J. Zhou, G. Peng and C. Zhen, 'Trading water in thirsty China' (2008) China dialogue <http://www.chinadialogue.net/article/show/single/en/2144-Trading-water-inthirsty-China> accessed on 2 October 2017
[987] X. Yang and M. Muller (n 767)
[988] J. A. Cohen and J. A. Lange (n 819) 350
[989] T. Plafker (n 852)

Comparison of rule of law's effectiveness

Corruption was taken as a proxy for rule of law in Model 1 for both the countries.

India

In India, corruption plays a significant role in increasing river water pollution levels. It is expected that a higher rate of corruption in India's environmental management indicates financial mismanagement of resources, including diversion and incorrect reporting of funding. This is further evidenced by the fact that India's Environment Minister recently held corruption as one of the main factors for the rising levels of pollution in the country[990].

China

The results for China also indicate that a rise in corruption increases water pollution levels in the rivers. Like in India, the underlying causes of China's corruption in the environmental management sector can also be identified as lack of respect for the rule of law, poor enforcement and low transparency. In the last decade there have been several cases in China which involved mishandling of the funds allocated for water pollution management[991]. In addition, pollution fines imposed on industries are usually not paid - funds which could have been invested in water pollution abatement[992].

Given that corruption significantly affects river water pollution in both countries, it is very interesting to look at whether both countries' governmental effectiveness plays a role in river pollution abatement.

[990] A. Khandekar (n 586)
[991] Vos (n 862)
[992] Ibid 22

Comparison of government effectiveness

India

In India's case, 'expenditure by the NRCP' was taken as the proxy for GE. The results indicate that GE does not have any effect on river pollution abatement. This is not surprising, given that India's institutional framework for water management is highly fragmented like its legislative structure. Though water is a state subject in India, the Federal government is also provided with powerful leverage in water pollution abatement. Although the core of the national water administration includes the MoWR, it also includes other federal ministries such as the Ministry of Agriculture, MoEF, Ministry of Shipping, Ministry of Drinking Water, Supply and Sanitation, Ministry of Urban Development, Ministry of Tourism, and Ministry of Health and Family Development. Furthermore, each of these agencies have their own corresponding interests, preferences and mandates in dealing with river pollution[993]. In addition, CPCB - the Central Pollution Control Board - does not lie under the jurisdiction of the MoWR, but under the MoEF instead. There do exist mechanisms in the form of the National Water Resource Council and National Development Council to promote State-Federal coordination in the water sector[994]. However, as operational responsibilities, planning skills and technical capabilities in water management remain dispersed across various layers of government, the country's water institutions are not only sectorally disjointed and fragmented but also regionally uncoordinated[995].

In addition, the SPCBs and CPCB are autonomous of each other. This ensures that though CPCB's and SPCB's actions are coordinated at the output stage, they lack functional correlation at the input stage. This dichotomy of control also ensures that no single agency can be made accountable for nationwide river pollution abatement[996]. In addition, other reasons for low GE in India's river

[993] Wang et al. (n 504) 128
[994] Government of India, Ministry of Human Resource Development(MHRD), 'Law relating to water pollution' < http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/law/06._environmental_law/05._water_pollution/et/5725_et_05_et.pdf >
[995] Saleth and Dinar (n 495) 122
[996] Ministry of Environment and Forests (MoEF), 'Water Pollution in India' (2014-15) Public Accounts Committee, Eighth Report 52

pollution abatement can also be attributed to NRCP's inability to keep pace with sewage generation in India and the disproportionate financing of sites[997].

China

In case of China too, GE seems to have no effect on river water quality. The major underlying cause for this, like that of India, is the highly fragmented institutional structure of the water management framework, along with a lack of coordination amongst the organizations involved.

China's institutional setting is a dual environmental management system where water-related environment management and its corresponding responsibilities are handled by two different agencies, MWR and MEP. Unlike India, China has RBCs which are set up under the state's authority (as with India, China's water resources are state-owned). But the river basin approach is a very complicated multi-tier administrative system which includes various levels of water authorities and governmental bodies[998]. Further, the RBCs are not provided with adequate powers, especially over the control of pollution at source, in addition to not having authority over economic and administrative issues[999]. As a result, the RBCs in China have failed due to an ineffective institutional structure[1000].

The country's present institutional settings can be categorized into 'vertical' and 'horizontal' institutional settings (similar to India), whereby the vertical setting refers to the fact that responsibilities are distributed amongst different levels of governmental and water authorities at the central, regional and local levels. This ensures inadequate coordination within environmental protection agencies, provincial water resources bureaus and other agencies involved. In fact, inter-jurisdictional rivalries also contribute to lack of coordination. The 'horizontal' institutional setting on the other hand, results in fragmented water management[1001]. Further, due to lack of clarity regarding the boundaries of institutional jurisdictions, it results in conflicts and overlapping responsibilities. In addition, this multi-agency sharing of water resources implies that all agencies

[997] Suresh et. al. (n 630)
[998] X. He (n 751)
[999] J. Xie et. al., 'Addressing China's Water Scarcity Recommendations for Selected Water Resource Management Issues' [2009] The World Bank
[1000] Ibid 107
[1001] He (n 998) 40

are only partly responsible for water pollution abatement, while no single agency is liable for managing the entire country's water resources, similar to India's case.

Further, the fragmented water resources management structure is weakened by lack of investment in water pollution abatement[1002] , poor supervision and shortage of staff[1003]. Lastly, the fact that the MEP does not have jurisdiction over the local EPBs (similar to India, they only play a supervisory role), ensures that the local EPBs are controlled by their local governments who prioritise their respective economies over environmental governance.[1004]

Comparison of Free Media's effectiveness

The 'voice and accountability'[1005] measure was taken as a proxy for free media for both the countries.

India

The results indicate that FM affects river pollution negatively. This could be interpreted as indicating that India's media has encouraged environmental activism[1006] which in turn has forced the government to undertake river pollution abatement efforts. Firstly, the reason FM seems to affect pollution abatement efforts in India is probably because the majority of the media is privately owned. Furthermore, the shareholders of the independent media houses are either individuals or corporate bodies[1007] who are usually not censored by the government. Therefore, India's media can freely influence people and encourage environmental activism.

Environmental degradation and pollution in India have given rise to many different forms of organized environmental movements.[1008] India's first environmental activism movement can be traced back to 1974 which also led to the rise of nationwide environmental movements in the 1980s and 90s with protests against deforestation, growing pollution and construction of dams[1009].

[1002] Ma (n 867)
[1003] Xie (n 999) 37
[1004] OECD (n 876) 18
[1005] Details of this measure is provided in the methodology section
[1006] refer to: Zhang and Skoric (n 634) 380
[1007] Team (n 636)
[1008] Gadgil and Guha (n 637) 371
[1009] Narain (n 639)

Activism regarding river pollution has been focused on three major discourses: (1) preservation of floodplains against building developments; (2) questions regarding minimum water flow in the river; and (3) pollution abatement and ecological restoration[1010].

China

In China's case on the other hand, FM failed to show any relationship with water pollution abatement. This is not surprising as most of China's media houses are state-controlled, unlike in India. Those which are nominally independent are controlled indirectly through financial incentives, legal restrictions and surveillance[1011]. Chinese media has, therefore, not been able to influence environmental activism or environmental engagement[1012] and, as a result, has not been able to influence pollution abatement efforts.

China's party papers [papers which are affiliated to the CCP] cover only the State's efforts and progress made in terms of environmental pollution abatement, instead of focusing on deterioration of environmental resources. The non-party papers, on the other hand, exercise self-censorship concerning environmental issues because of its political sensitivity[1013]. At the local level, newspapers not only tend to have an even lower coverage of environmental issues when compared to the national level, but also attempt to direct local journalists away from questionable activities as 'local protectionism' takes precedence over environmental issues[1014].

China's CCP has one of the most restrictive media systems of the world, where the Federal government censors all forms of media so as to maintain a monopoly over its power and information[1015]. Similarly, environmental pollution news are also closely monitored as it is a politically sensitive subject. There have been various instances where environmental journalists were either banned from the country or their works were censored[1016]. As a result, FM fails to improve water pollution abatement efforts of the country.

[1010] Follmann (n 524) 1; Details regarding this could be found in the Indi
a chapter
[1011] Griffiths (n 882)
[1012] refer to: N. Zhang and M.M Skoric (n 634) 380
[1013] Palmer (n 885)
[1014] Rong (n 884)
[1015] Nhan (n 886) 36; for more details: refer to the China chapter
[1016] For details: Refer to China chapter

6.3 Conclusion

India and China are both developing economies which have attained a very high rate of economic growth during the past few decades. However, economic development in both the countries came at the cost of severe environmental degradation. This study has attempted to undertake a comparative analysis which looks at how various measures of environmental governance affect river pollution in both countries.

The results indicate that, even though China has a comparatively better legislative framework than India for river pollution abatement, it still fails to improve river water quality because of substantive legislative gaps. India, on the other hand, despite having poorer water legislation specifically aimed at river pollution, has still been able to lower pollution levels because of a better judiciary. The country's judiciary has often stepped in to compensate for the Executive's inefficiencies in water pollution management. Further, this study has looked at the factors which potentially affect regulatory quality in India and China for river pollution, and the econometric findings indicate that, in the former, only corruption affects RQ, whereas in case of the latter, RQ is affected significantly by not only corruption, but also by NRR and FM.

As far as GE is concerned, results for both countries demonstrate that the variable is insignificant in affecting river pollution. The results are not surprising as both India and China share very similar institutional structures with respect to water management. Both countries have a generic dual-management structure, whereby there exists a vertical structure which has institutions taking care of pollution abatement at the Federal, State and local/provincial level, as well as a horizontal structure whereby different Federal ministries are allocated different water management sectors according to their corresponding interests. This has ensured that both countries have a very fragmented institutional structure.

As expected, corruption significantly affects both India and China's river pollution levels and is one of the additional underlying reasons behind the ineffectiveness of RQ and GE in the context of water pollution.

Finally, this study has attempted to look at whether FM has promoted environmental activism in both countries. The results again indicate that a free media seems to have had an impact on river pollution in India but not in China. The underlying reason for this is that China's media is highly

state-controlled and even the independent media houses are controlled by the state indirectly through financial incentives and self-censorship, unlike India where the majority of the media houses are owned by individuals or business corporations.

6.4 Policy Implications

Both China and India need to address the legislative gaps in water pollution abatement legislation. Further, China also needs to provide greater autonomy to its judiciary so that the Executive is unable to interfere in environmental cases. There is also a growing need for India to establish river basin commissions or laws which facilitate river basin management. Both countries also need to set up better institutional frameworks which ensure no overlapping of responsibilities. Both countries' pollution control boards need to be provided with greater autonomy over state or provincial pollution control boards so as to ensure less corruption, less interference by the local economic actors, and more effective pollution abatement measures. In addition, media is supposed to play a very critical role in increasing environmental awareness via environmental activism. In India's case, FM seems to have an effect on river pollution abatement through this linkage. However, in China's case, it does not show any effect whatsoever. As a result, it is important to ensure that media houses in any country are not forced to follow any party ideology, as otherwise it does not provide the citizens with enough information to make the best possible decisions about their communities.

Although China and India are making substantial efforts towards river pollution abatement, they still have a long way to go and both countries should probably start by formulating better water laws.

Conclusion: drawing lessons and the way forward

This study attempts to understand how formal regulation affects river pollution and also seeks to identify which other factors play a significant role in improving or diminishing the effectiveness of regulation.

In an effort to get a better understanding of the above mentioned relationships, India and China have been taken as case studies. An interdisciplinary methodology commonly referred to as 'economic analysis of law' has been used for the purpose of this comparative study. The main lessons drawn from this piece of work can be divided into two main categories, in accordance with the two models formulated in this study.

The first model attempts to understand the following question: 'what are the prime determinants of river pollution?' The main variables considered in this model are rule of law, government effectiveness, regulatory quality and free media. The results obtained are as follows:

1. ***Rule of law (RL)***

Corruption was considered as a proxy for understanding the effect of rule of law on water pollution abatement in both the countries. In India's case, corruption contributes significantly towards increasing river pollution. The issue of corruption in India's environmental management system has been addressed by the Minister of Environment on various occasions. Similarly, in China's case corruption also contributes to an increase in river pollution. There have been various corruption cases in China which bring to light the issue of mishandling of the funds allocated for water pollution management. The underlying reasons for corruption in both the countries can be attributed to low levels of transparency, lack of stringent anti-corruption measures and poor enforcement.

2. ***Government effectiveness (GE)***

For India, 'expenditure by the NRCP' has been considered as the proxy for GE. The results indicate that GE does not have any effect on river pollution levels. The fundamental reason for this may be the fact that, similar to the country's legislative structure, its institutional framework for water management is also fragmented. Despite water being a state subject, the Federal government is also provided with various powers in terms of water pollution abatement. This contributes to fragmentation of water administration as each of the national agencies responsible for water

management at the federal level have their own corresponding preferences, interests and mandates in dealing with river pollution. In addition, these institutions are not only sectorally disjointed but also regionally uncoordinated.

In China's case also, GE does not seem to affect river pollution. Similar to India, China's institutional structure for water management is also highly fragmented as a result of the existing 'dual' environmental management system. This may be the reason why GE seems to be ineffective in China. Unlike India, China does have river basin commissions (RBCs), however they are set up in a complicated multi-tier administrative system. Furthermore, the RBCs are not provided with adequate powers in terms of authority over economic and administrative issues.

Both countries, therefore, deal with multiple institutional water management framework which ensures ineffective implementation of river basin programs.

3. ***Free Media (FM)***

'Voice and accountability' has been taken as the proxy for free media for both countries.

In India's case, FM has brought about improvements in river pollution abatement. The country's media seems to be able freely to influence the public and thereby encourages environmental activism. The reason FM seems to affect pollution abatement efforts is primarily because a majority of the media in India is not state owned but privately owned. As a result they are not easily influenced by the government. Further, most shareholders of India's media houses are either corporate bodies or individuals who are not usually censored by the government.

Contrary to this, FM failed to affect river pollution abatement in China. This is because China's media houses are state controlled and even the few independent ones are indirectly controlled by the state via legal restrictions, financial incentives and surveillance. As a result, the Chinese media has not been able to encourage environmental activism or environmental engagement in the country.

4. ***Regulatory quality (RQ)***

In India's case, RQ's effect on water pollution is negligible. This finding reflects the shortcoming of the country's fragmented water pollution abatement legislation. There is no overarching umbrella legislation for regulating freshwater in all its dimensions and different laws exist at the central and at the state level (as water is a state subject in India). Further, India lacks a national

water law or river basin law/act. Although river basin organisations (RBO) were set up, it was only for developmental purposes (such as, constructing dams). These RBO's have not yet taken up the role of river basin management. It is assumed that the only reason RQ seems to affect river pollution marginally is because of India's rising environmental legal activism. This has also contributed towards evolving public interest litigation (PIL) over the years. The country's environmental reforms have been brought about more by the courts and less by the legislative and executive actions.

In the case of China, RQ does not seem to affect river pollution abatement at all. The underlying reason for this may be the serious issues that the country's environmental legislation faces, in terms of legislative gaps. China's first water law is also the fundamental water law which deals with water resources management. Unlike India, this law defines river basin management in detail. However, this law is criticised in terms of providing good water governance because of the 'dual management' model existing in the country for water pollution control and utilization. Despite having river basin laws, legislation in terms of river basins is ignored when compared to environmental laws and regulations at the national level. Contrary to India where the judiciary intervenes in cases of poor implementation of statutory environmental law, China's judiciary has failed to do so. The fundamental reason for this could be that, being an authoritarian country, China's highest judicial authority – the Supreme People's Court - only has a supervisory role and has no powers over the local courts. In addition, China has always used its judges as a means to favour political ideologies.

After identifying the factors that influence river pollution abatement efforts in both countries, it was deemed necessary to understand why the RQ in both the countries seems to be almost totally ineffective. As a result, the second model was formulated to answer the question: '*which factors affect regulatory quality*?' In other words, the model attempts to understand which factors play a crucial role in influencing RQ of river action plans. The results obtained are as follows:

In India's case, one of the most significant factors affecting RQ is corruption. The fragmented water management structure is, in fact, one of the primary reasons for bureaucratic corruption in India. On the other hand, NGOs do not seem to affect RQ at all[1017]. This is surprising given that NGOs are expected to play a crucial role in river pollution abatement by creating awareness on

[1017] Except in the case of the Ganges (or the GAP). For a detailed discussion, refer to Chapter 3.

environmental issues and thereby encouraging the reinforcement of the environmental protection lobby in the local community. However, in India's case, they seem to have developed an ambiguous position in people's perception. Lately, NGOs have come under scrutiny in India with regards to receiving foreign funding for campaigns to protect environmental rights. In addition to facing a lack of public support and a hostile government, they are also severely constrained with a lack of trained personnel in the field of environmental protection, difficulties in mobility and a shortage of research facilities. The results also indicate that natural resources rent (NRR) does not affect RQ. In theory, extraction of natural resources prompts deterioration of RQ through triggering bureaucratic battles amongst different interest groups for control over these natural resources and natural resource policies adopted throughout the value chain. However, in India's case, this does not hold valid as there has been a negligible growth in India's mining and quarrying activities during the time period considered by this study. This is probably why NRR failed to affect river pollution and, consequently, RQ as well. FM also does not seem to have any effect on RQ. However, in the first model, we found that FM affects river pollution abatement efforts in India. So this points out that even though FM's role in prompting the executive has not worked, it has probably affected river pollution abatement through another channel, such as procedural innovations by the legislature empowering the public in terms of PIL (which is encouraged via media coverage). Lastly, population seems to affect RQ significantly and negatively. This implies that, with everything else being constant, an increase in population leads to weakening of regulatory quality in India. This only makes the issue of river pollution in India even more critical. With an ineffective regulatory quality and an increasing population, there is an urgent need for action.

In China's case also, corruption seems to affect RQ. Unlike in India, both the executive branch of the government and the judiciary are plagued by corruption issues in China. The corruption in the country's judiciary could be attributed to lack of separation of powers, inadequate salaries of judges, inadequate legal training of judges and local protectionism. Natural resources rent also seems to effect RQ negatively, in that an increase in NRR leads to a decrease in RQ. In theory, extraction of natural resources results in deterioration of RQ because of the reasons mentioned above. In China's case, this theory applies as the country's economic growth is fuelled by electricity generated from the coal reserves. However, as mining has very serious environmental impacts on water quality, river pollution has increased despite the country adopting numerous

regulations for internalising the environmental costs imposed by mining activities. This underlying reason for this is an inefficient regulatory and institutional structure in China. The results also suggest that China's media does not seem to affect RQ, unlike in India. The underlying probable cause for this is that the country has media censorship and, as a result, the media is unable to hold the government accountable for deteriorating environmental quality and hence is unable to affect the stringency of water regulatory quality in any way.

The results obtained from the two models indicate that both India and China have not only weak formal regulatory quality in terms of river pollution abatement, but also a weak institutional structure. In addition, both countries have very high levels of poverty and, therefore, environmental protection is the last priority of the people. As a result, there is almost negligible public pressure on the governmental institutions. Further, this issue is exacerbated with a high level of corruption in both countries.

The way ahead

Both India and China have fragmented water pollution legislation. Therefore, both countries need to address the legislative gaps in river pollution abatement legislation. In addition, India needs to introduce river basin laws to ensure that the river action plans have an appropriate legislative basis instead of basing them on the fragmented Environmental Protection Act (1986) which has not been used for river pollution even in the most deserving cases. China also needs to provide greater autonomy to its Judiciary so as to ensure that, where the Executive fails to implement environmental statutory law, the Judiciary can act as a watchdog. Moreover, both countries need to provide greater authority to the central/federal pollution control boards over the local or state level pollution control boards so as to ensure less corruption, less interference by local economic actors and more effective pollution abatement measures.

As corruption seems to be a significant factor affecting the effectiveness of formal regulatory quality and the institutional structure for river pollution abatement, there is an increasing need to ensure proper implementation of existing anti-corruption legislation in both India and China. The rule of law as regards corruption enforced by an independent judiciary will probably be more

effective in India than in China. However, given that the Indian courts are clogged,[1018] resulting in significant delays, there exist considerable opportunities for corruption[1019]. On the other hand, the Chinese authoritarian system allows Party officials to get away with corruption due to a non-transparent system. Though China has attempted to use extreme punishment (sometimes even execution) for those found guilty of corruption, its deterrent effect has been limited. India, on the other hand, has more institutional checks in the form of a vigilant media[1020], an independent judiciary, the independent Comptroller and Auditor General of India[1021] and the Right to Information Act. However, '*corruption is implicated more into the Indian institutions and practices*[1022]', when compared to China. One of the underlying reasons for this is that China is politically more centralized than India which ensures that lines of authority in the latter are less streamlined and less well-defined[1023].

Therefore, given the differences in their systems of governance, both countries face different challenges in terms of controlling corruption. This study highlights that, if formal regulatory quality needs to be effective, the first step should be towards ensuring more institutionalised checks and balances on corruption in addition to putting more accountability pressures in place.

Lastly, in both countries, there is a lack of public involvement in river clean up action plans. Both have very high poverty levels and, as mentioned earlier, environmental protection is probably not the first priority of the majority of the population. In such circumstances, firstly public awareness about the long term implications of river pollution should be promoted. Campaigns should be launched which take up the task of educating people about river pollution, not only in the cities, but also in villages and towns. Secondly, river action plans should encourage public involvement in river clean-up by providing incentives for keeping the rivers clean in the form of money or tax concessions. Given the vast geographical size of both countries, disaggregated institutions make it

[1018] The reason why even RQ fail to affect river pollution significantly in India , despite the judiciary's intervention as mentioned earlier
[1019] P.K Bardhan, 'Comparative corruption in China and India' (2014) 7(1) Comparative corruption in China and India 8
[1020] again a factor which also influences RQ
[1021] It is an authority which audits all expenditures and receipts of the government of India and state governments, along with the bodies and authorities financed by the government.
[1022] Bardhan (n 1019) 10
[1023] Ibid 10

very difficult to ensure river clean-up at the local level. Therefore, the best way forward would be to ensure that people are being involved in this process.

As developing countries, both India and China face a severe dilemma in terms of prioritising economic development or environmental protection. However, as economic development would not be possible without natural resources in the first place, it is important to ensure that these resources do not degrade to a point where it would become impossible to use them. Therefore, it is crucial for both countries to ensure lower river pollution levels for attaining higher economic development through better regulation and better governance structures.

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Appendix

Table A.1: Water Quality Criteria in India

Designated best use	Class of water	Criteria
Drinking water source without conventional treatment but after disinfection	A	Total Coliforms organism MPN/100 ml shall be 50 or less pH between 6.5 and 8.5 Dissolved oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20^{o}C 2mg/l or less
Outdoor bathing(Organised)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20^{o}C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100 ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20^{o}C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electricity conductivity at 25^{o}C micro mhos/cm Max.2250 Sodium absorption ratio Max.26
	Below E	Not meeting A, B, C, D, E criteria

Source: CPCB website (http://www.cpcb.nic.in/Water_Quality_Criteria.php)

Figure A.1: Organizational structure of PMG (source: Ministry of Environment and Forests (MoEF))

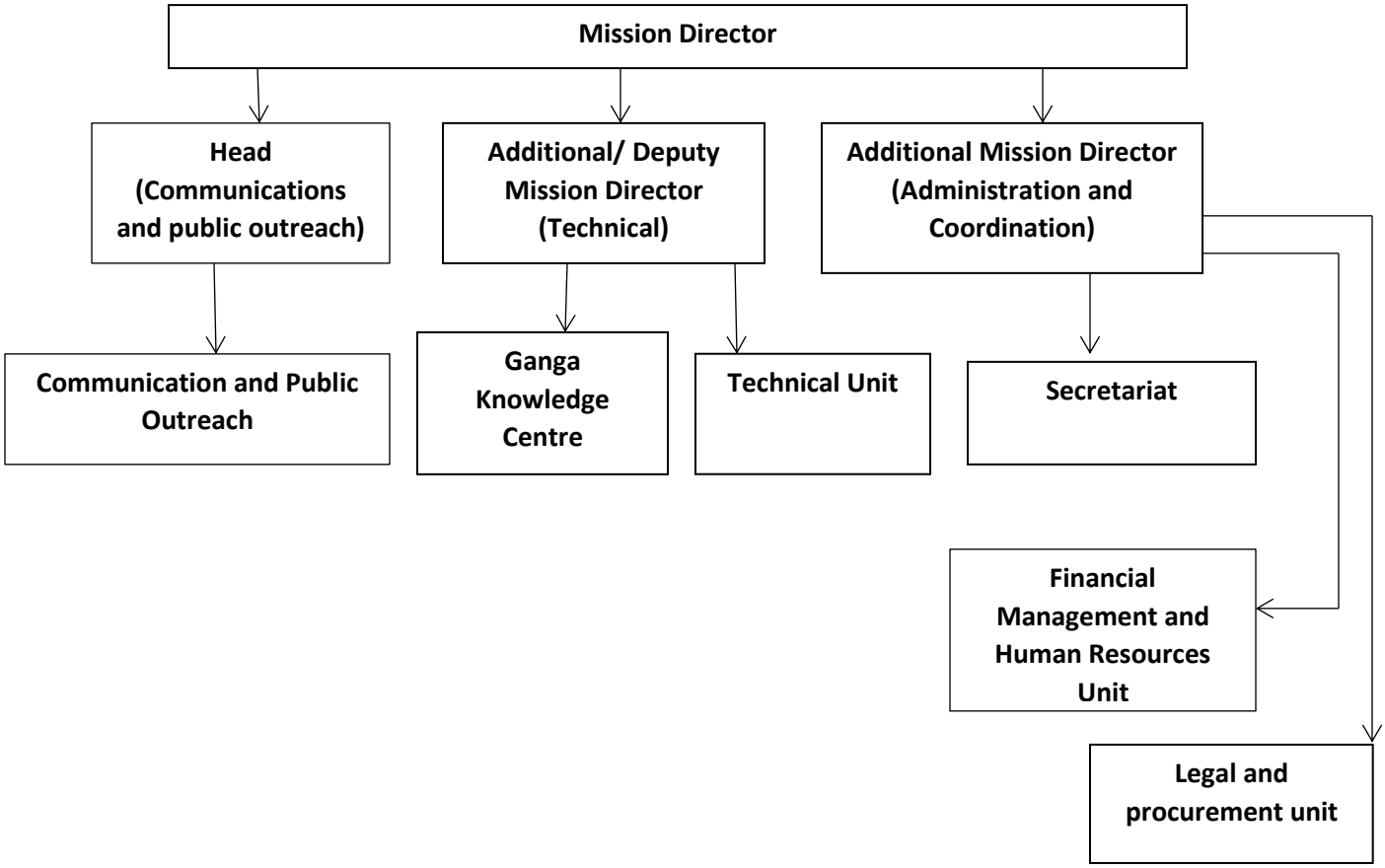


Figure A.2: Organizational structure of SPMG (source: Ministry of Environment and Forests (MoEF))

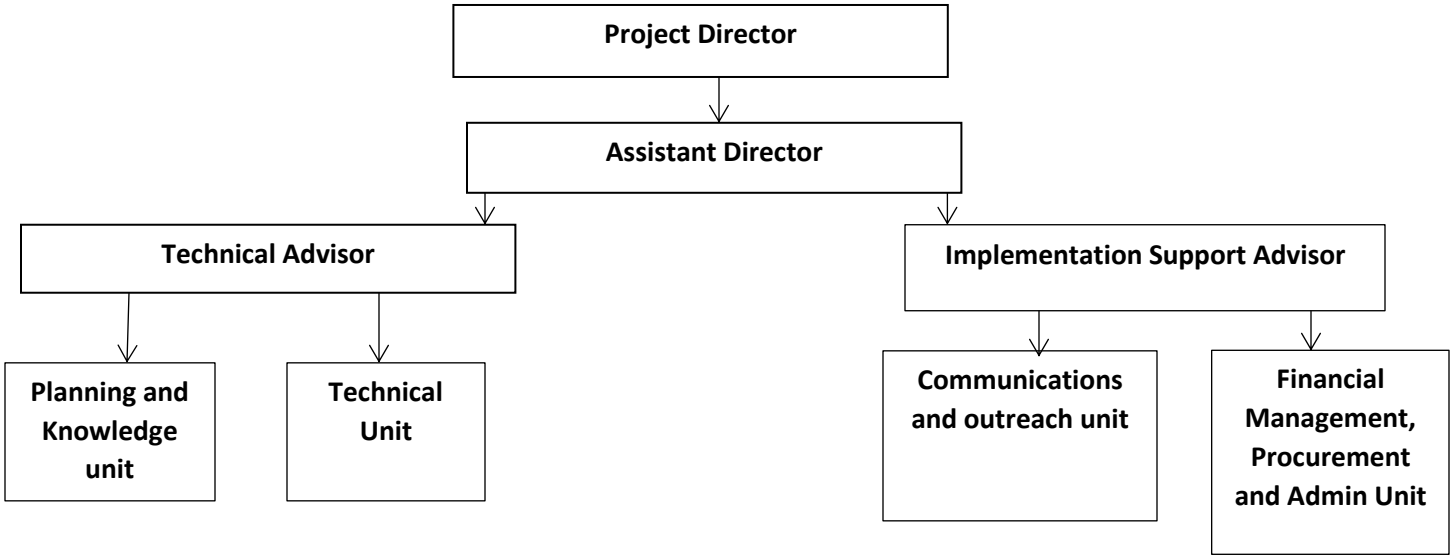
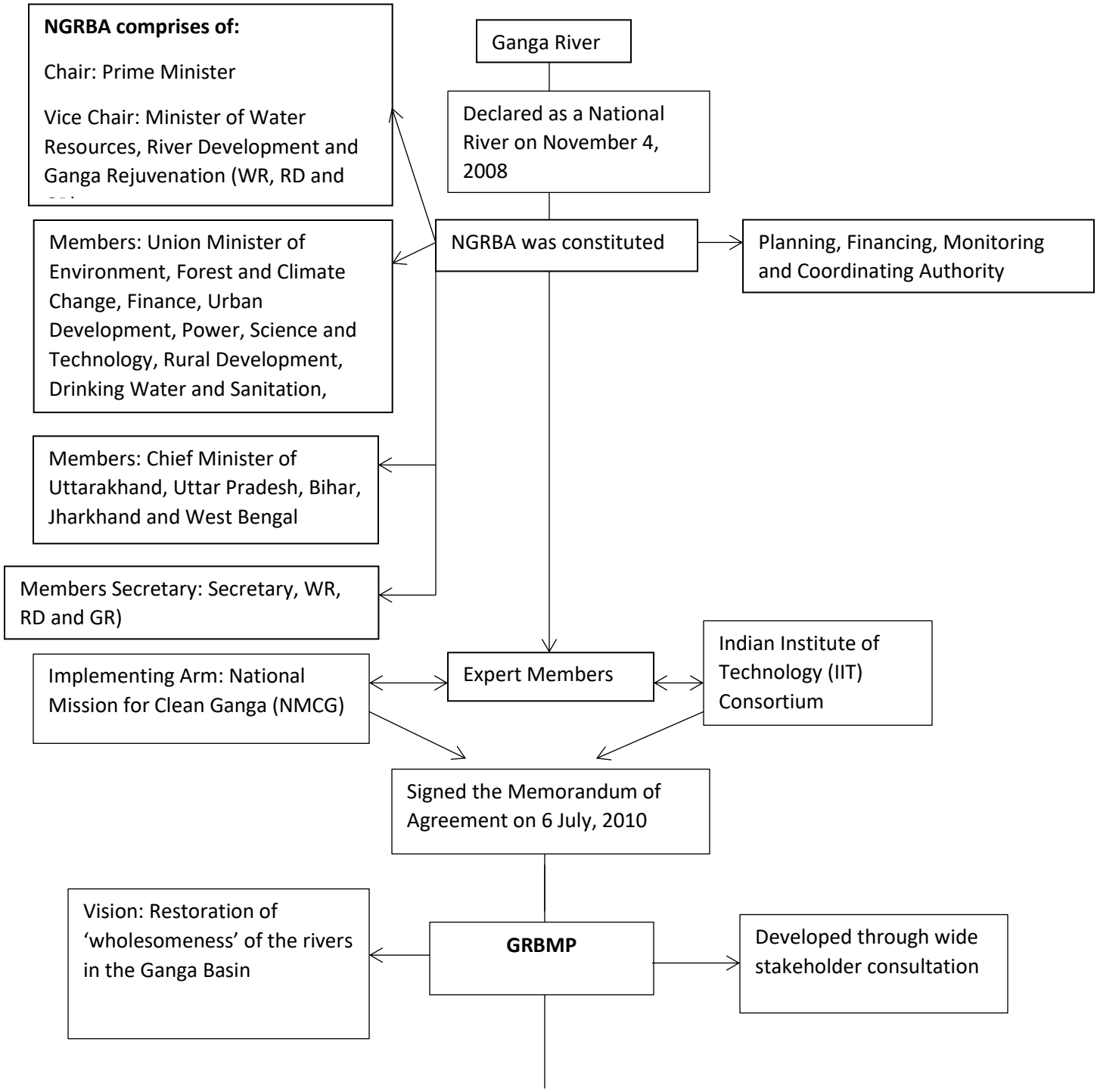
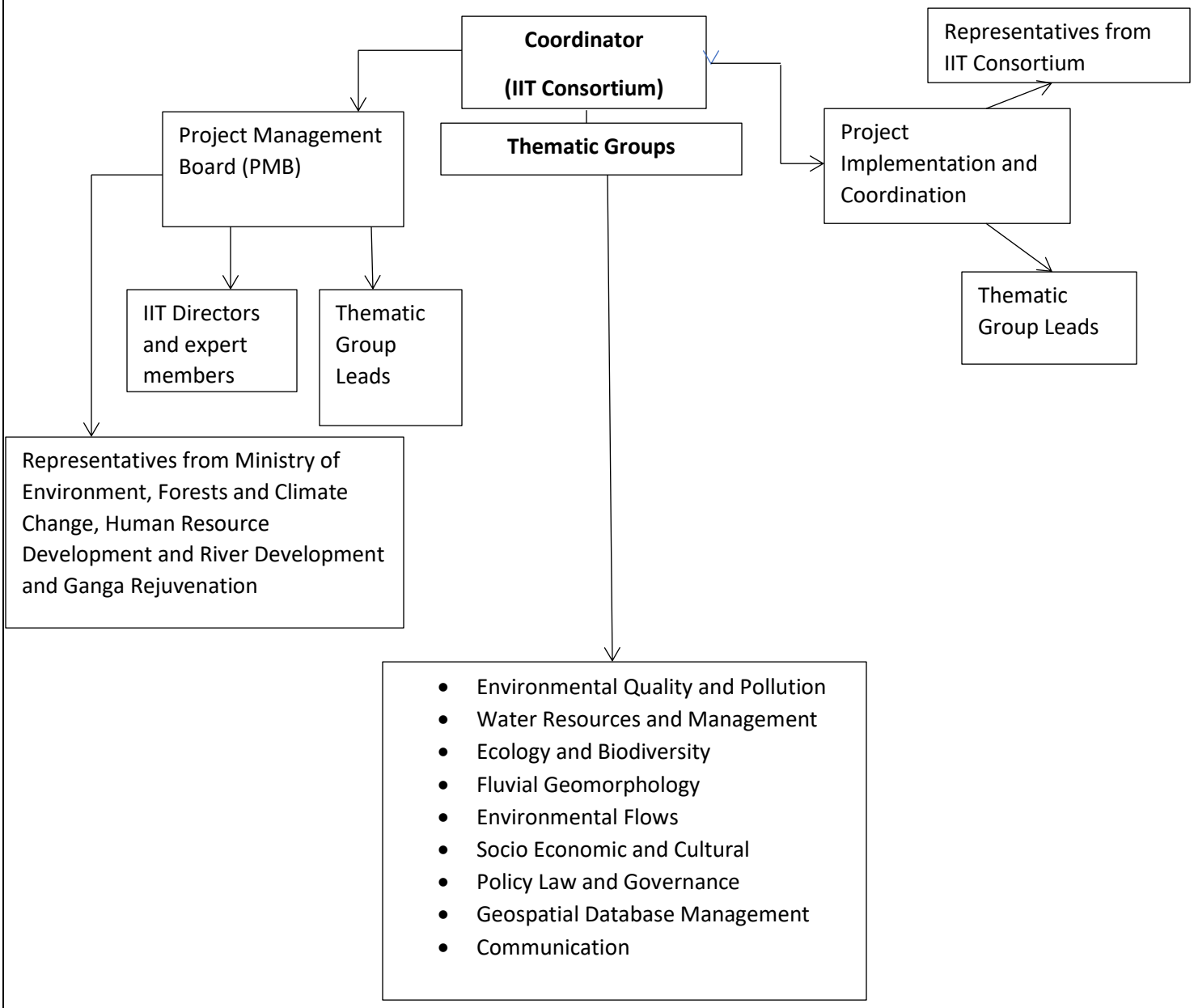


Figure A.3: Organizational Structure for preparing GRBMP (Source: IIT Consortium report[1024])



(continued on next page)

[1024] Consortium of seven Indian Institute of Technology's(IIT's),*'Ganga River Basin Management Plan- 2015'* (2015)


Coordinator
(IIT Consortium)
Representatives from IIT Consortium
Project Management Board (PMB)
Thematic Groups
Project Implementation and Coordination
IIT Directors and expert members
Thematic Group Leads
Thematic Group Leads
Representatives from Ministry of Environment, Forests and Climate Change, Human Resource Development and River Development and Ganga Rejuvenation
Environmental Quality and Pollution
Water Resources and Management
Ecology and Biodiversity
Fluvial Geomorphology
Environmental Flows
Socio Economic and Cultural
Policy Law and Governance
Geospatial Database Management
Communication