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Ganga Action Plan(GAP): The Challenge of ‘Regulatory Quality’

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Ganga Action Plan(GAP): The Challenge of 'Regulatory Quality'

Sharanya Basu Roy¹

Abstract: The largest river basin of India, the Ganges (locally referred as Ganga) is one of the most important river systems in the world. It is home to almost one tenth of the world's population. Billions of litres of sewage, industrial waste, thousands of animal and human corpses are also released into the river every day. Consequently, the Ganga Action Plan (GAP) was launched in 1985 for pollution abatement as a Federal and state sponsored scheme and till date, three phases have been implemented. Even after establishing numerous institutional arrangements under the GAP and investing billions of dollars there has been no major improvement in the Ganges river water quality, in fact it has further deteriorated. Clearly governmental intervention through pollution control policies, specifically regulation has failed miserably. Therefore, an attempt has been made to analyse empirically, the legal and institutional framework of the GAP using the transdisciplinary method '*economic analysis of law*'. The results reveal that the chief underlying reason for ineffective GAP regulations is lack of a well-defined legal basis

Introduction

The Ganges is the fourth largest river basin² in the world and is home to half a billion people³ which is projected to increase to over one billion by the year 2030⁴. 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 region is also home to more than 200 million people living below the poverty line⁵.

Apart from this river's economic and social importance, river Ganges holds religious significance in India. Regarded sacred by the Hindus, ritual bathing in the Ganges is an important aspect of this religion and ashes of the cremated are often spread over the waters⁶.

Unfortunately, the Ganges is also amongst the world's most polluted rivers. Nearly 1.3 billion litres of sewage per day, runoff from 6 million tons of fertilisers, 9000 tons of pesticides utilised in agriculture within the river basin, 260 million litres of industrial and solid waste, including thousands of animal carcasses and human corpses are released into the river every day. This eventually led to an erosion of

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² covering an area of 861,404 square kilometers

³ It supports 29 Tier-1 cities, 23 Tier- 2³ cities and 48 towns in India (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)

⁴ 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

⁵ 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

⁶ Ibid 4

the river water quality. In fact, by the 1970s, over 600 kilometers of the river had deteriorated. As Ganges water is used directly for drinking, religious bathing and other household purposes by people living along the river, it also poses a considerable public health threat⁷.

Post-Independence Environmental quality

After India's independence in 1947 the federal policies concentrated solely towards heavy industrialization and later in the 1960s the focus shifted to agricultural policies. But during this entire period, the lack of policies and regulations for environmental quality encouraged ecologically unfavourable industrial and agricultural practices.

It was in 1974, that the Water (Prevention and Control of pollution) Act ⁸ was introduced to set up pollution control boards at the Federal and state level to prevent and control water pollution. It was joined by the Air (Prevention and Control of Pollution) Act in 1981. Later in 1986, the comprehensive Environment (Protection) Act was enacted⁹. This Act is an 'umbrella' legislation intended to provide framework for coordinating all the federal government activities under the previous environmental laws such as, the Water and the Air Act.

As water is a state subject in India, ideally state legislative assemblies should adopt a legislative framework for water management. But, despite national water policies being adopted on three different occasions (the first one dating back to 1987) by the Ministry of Water Resources, it did not result in water management legislative framework being adopted by the states. Instead, in practice the process has remained entirely driven by the Executive¹⁰. Although this provides more flexibility in adapting to new circumstances, it also bypasses the various safeguards that the '*constitutionally established process for the adoption of legislation provides*'¹¹.

In the 1980s the water quality deteriorated further with a policy shift towards promoting privatization. This led to the Ministry of Environment and Forests' (MoEF) establishment to assist the Department of Environment (DOE)¹². Despite MoEF's efficient monitoring system, lack of enforcement capabilities at

⁷ Markandya and Murty (n 4) 62

⁸ in pursuance of clause (1) of Article 252⁸ of the Indian Constitution [Article 252(1) gives the general power to the States to make Laws for matters regarding which the Parliament has no power to make laws except as provided in the Articles 249 and 250 which 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]

⁹ Under Article 253

¹⁰ If parliamentarians belong to the majority in the Parliament, then the Legislature is usually controlled by the Executive

¹¹ Philippe 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)

¹² The Department of Environment was established in 1981 to evaluate the environmental aspects of development projects, monitor air and water quality, promote environmental research and coordinate activities between the federal, state and local governments. But the DOE was criticized for its small financial and political base. As a result in 1985 the MoEF was established which had the same functions as the DOE. The DOE then served as an advisory

the Central (Federal) and state levels and ineffective coordination amongst Ministries at the planning stage of the projects deterred satisfactory control of environmental pollution (Economic Survey of India, 1998-99)¹³.

Ganga Action Plan (GAP)

The GAP was formulated in 1985 on the basis of a survey conducted by the Central Pollution Control Board (CPCB)¹⁴ for gauging the extent of Ganges water pollution. The objective of this massive river program (an approximate investment of 300 million US dollars) was to control pollution in the Ganges and its tributaries. GAP was introduced with the objective to restore the entire river water's quality to 'Class B' or the 'Bathing Class'¹⁵ (Table1 in appendix). For this purpose, the CPCB requires the industries to treat wastewater before discharging into the river. But the corresponding effluent standards set up by the CPCB has been adopted from the ISI (Indian Standards Institution, now known as Bureau of Indian Standards) which are completely arbitrary as they were framed without any scientific rationale¹⁶.

GAP was launched in phases namely, Phase I, Phase II and Namami Gange (referred to as Phase III here). The initial objective of this river action plan included establishing sewage treatment plants at major urban centers, refurbishing existing sewage pumping and treatment stations and installing wastewater sub-pumping stations. In 2009 when Ganges was declared as the 'National River', the GAP was relaunched with the objective to implement a river basin approach instead¹⁷.

GAP Phase I

1.1 Legal Framework

The GAP's implementation wing, CGA was set up under the DOE. It's responsibilities included improving the river water quality of the Ganga and its tributaries to acceptable standards through mobilizing efforts of State Governments, local bodies, voluntary agencies and other organizations¹⁸.

body which had few enforcement powers (S. Managi and P.R. Jena, 'Environmental productivity and Kuznets curve in India' (2008) 65(2) Ecological Economics 432)

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

¹⁴ The CPCB is a statutory organization under the MoEF providing technical services under the Environment (Protection) Act 1986. It was established in 1974 under the Water (Prevention and Control of pollution) Act. CPCB has also been delegated with the functions and power under the Air (Prevention and Control of Pollution) Act 1981

¹⁵ 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

¹⁶ For further details refers to: D.S Bhargava, 'Why the Ganga (Ganges) Could Not be Cleaned' (1992) 19(2) Environmental Conservation 170

¹⁷ 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.

¹⁸ The Gazette of India(16 February, 1985)

A few months later into GAP's implementation, M.C Mehta, an activist advocate, social worker and a renowned Supreme Court lawyer filed a petition¹⁹ against the public authorities responsible for the GAP²⁰. It claimed that despite the strides made in the legal code with respect to GAP, the government authorities failed to take effective steps to prevent Ganges river pollution. The Court ordered the Central (Federal) Government, Uttar Pradesh Pollution Control Board (UPCB) and the District Magistrate, Kanpur to restrain leather tanneries and Kanpur's municipal corporation from dumping industrial and domestic effluents in river Ganga. The Court bifurcated the petition into two parts. The first one dealt with Kanpur tanneries and the second one with the Municipal Corporation. These are the most significant water pollution litigation in the history of Indian environmental law. Eighty-nine respondents were named in the petition; which apart from the seventy-five tanneries of the Jajmau district (Kanpur) also included the Union of India, Chair of the CPCB, Chair of the UPCB and the ISI²¹.

This case was treated as a representative action by the Court. Therefore, when this petition came up for preliminary hearing, notice was given to all the industrialists, municipal corporations and the town municipal councils having jurisdiction over which the Ganga flows by publishing a summary of the petition in the newspapers in circulation in Northern India. The defendants were also instructed to appear before the Court and to explain the reasons for not issuing those directions as requested by the petitioner and for allowing trade effluents and sewage into river Ganga without treating them appropriately before discharging into the river. Following this, a large number of industrialists and local bodies (Kanpur Nagar Mahapalika) filed counter-affidavits explaining steps taken by them for treating the effluents/sewage before discharging into the river²².

The Supreme Court (SC) directed tanneries (thirty, in number) which failed to the minimum steps required for primary treatment of industrial effluents to shut down as the pollution of river Ganges outweighs the inconvenience that may be faced by the management and labour employed in these polluting tanneries. The Kanpur Nagar Mahapalika (local government) was instructed to relocate the dairies outside the cities, which released an enormous amount of waste into the river. Further, the local bodies were also ordered to build sufficient amount of urinals to prevent people from defecating in the open land near the river. In addition, the Central Government was instructed to introduce weekly classes and sensitize children on the importance of the protection and improvement of the natural environment across all educational institutions²³.

It is worth noticing that this case was filed under Article 32, in the absence of the CGA legislation. This clearly points towards a weak legal basis of the GAP from the very beginning.

¹⁹ Filed a petition under Article 32.

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 '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

²⁰ M.C. Mehta vs Union Of India & Ors [1988] AIR 1115

²¹ A.K Singhal, 'Some Legal Cases on Ganga River Pollution' (2012) 4(2) Researcher 61

²² Auburn University, *The Enviro-Litigators: Environmental Law and Activism in India* (2015)

²³ M.C Mehta v Union of India (n 20)

1.2 Institutional Structure

The CGA was under the chairmanship of the Prime Minister and the Government of India was represented by the Ministers of Finance, Planning and Urban Development, Water Resources and Environment and Forests. The three states through which river Ganga flows were represented by their respective Chief Ministers²⁴. The CGA's implementing agency was the Central Steering Committee which had the Secretary of the MoEF as the Chairman and other secretaries of the relevant central ministries as its members. The CGA's executing agencies were the respective State Public Health Engineering Departments who had many experiences of implementing similar schemes. Implementation of the programs under the GAP included preparing city based schemes and conducting extensive review of progress every five years²⁵.

As water is a state property in India, the state is responsible for the protection of its water resources. However, since the Ganges is an inter-state river the Central Government also has a concurrent responsibility towards its maintenance. This resulted in a dispute between the states and the Centre (Federal) regarding sharing of the GAP's cost. Therefore, to ensure the state's coordination in GAP Phase I's implementation, the Central government decided to bear the entire implementation cost except the maintenance cost²⁶. GAP Phase I was launched with an estimated budget of 37 million US Dollars (at the current exchange rate).

1.3 Outcomes/Difficulties

There was a clear lack of planning in the first phase of GAP. For instance, schemes were prepared without an appropriate survey of the locations, including the routes along which the intercepting sewer would be laid. In addition, an actual outflow of the estimated sewage was estimated incorrectly which resulted in installing more sophisticated systems than required. This further resulted in implementation delays and cost escalations. Also, the plan did not concentrate on treatment and resource recovery system. For instance, there was no emphasis on maintenance and proper operation of the assets and requirement of trained personnel for this purpose. In addition, maintenance required annual recurring expenditure, but there were no provisions made for this in the annual budget²⁷.

GAP Phase II

GAP Phase II was launched in stages between 1993 and 1996. Apart from including other cities and towns along the Ganges (which were not included earlier in GAP I), pollution abatement programmes for its tributaries (like Yamuna, Gomati and Damodar) which discharged directly into the river were also integrated in the second phase of GAP. Later in 1995, under the National River Conservation Plan (NRCP) river action plans for other major rivers (for instance, Godavri, Krishna, Mahanadi, Mandakini etc.) were

²⁴ 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.

²⁵ Nilay 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)

²⁶ Ibid 399

²⁷ Ibid 399

also launched. In 1996, GAP Phase II and NRCP were merged²⁸ as a centrally sponsored single scheme. Under the NRCP, the CGA was renamed as National River Conservation Authority (NRCA) which covered all programs supported by the National River Conservation Directorate (NRCD)²⁹ under the MoEF.

2.1 Legal Framework

Though GAP Phase II was launched after making modifications in GAP Phase I's blueprint, it was unable to improve the water quality of the Indian rivers. This is evidenced by the fact that in 1998, Gopeshwar Nath Chaturvedi, a social activist filed a petition³⁰ against the Government of India³¹, the State Government of Uttar Pradesh and municipal bodies (local government) of Mathura and Vrindavan for failing to clean up river Yamuna under GAP Phase II. It is an ongoing case, where he claimed that despite the Uttar Pradesh Jal Nigam (local water body) investing millions of rupees (64 million USD at the current exchange rates) in Mathura and Vrindavan³² it has failed to clean up the river. In fact, the directions issued by the Supreme Court in the Mehta cases³³ regarding setting up sewage treatment plants by the local government were not followed out even after more than ten years. With regards to this ongoing case the High Court of Allahabad instructed³⁴ the MoEF to present a detailed account of the implementation of the GAP and which departments are liable for its failure, as till then no Department or Authority was able to validate it³⁵.

This indicates that the GAP not only had a loose and vague legal framework (as even after GAP phase II's implementation, Chaturvedi filed a case under Article 226³⁶ in the absence of NRCA legislation) but it also lacked clarity about the roles of the various stakeholders involved in the implementation of GAP and its institutional structure³⁷.

2.2 Institutional Structure

The Chairman of GAP Phase II's Steering Committee was the Secretary of the MoEF. Other members of the Committee included the chief secretaries of the states through which river Ganga flows, secretaries

²⁸ Ministry of Environment and Forests(MoEF), *Regeneration and Development* (2003)

²⁹ NRCD is the implementing agency for Centrally sponsored schemes of NRCP and National Plan for Conservation of Aquatic ecosystem(NPCA)

³⁰ Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others (No. 1644 of 1998)

³¹ under Article 32

³² 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.

³³ M.C Mehta v Union of India (n 20)

³⁴ Order dated 6 May 1998

³⁵ Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others [1998] WRIT 1644

³⁶ Article 226 of the Indian Constitution allows an aggrieved person to move the High 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 'writs'. The jurisdiction of the High Court when compared to the Supreme Court with regards to writ petition is wider and provides greater constitutional rights.

³⁷ Indian Institutes of Technology, *SWOT Analysis of Ganga Action Plan* (2011)

of the concerned Central (Federal) ministries, Chairman of CPCB, Directorate General Health services, Directorate General Indian Council of Medical Research(ICMR) and other experts³⁸.

At the state level, the state governments and its agencies were assigned with the responsibility to prepare and execute projects related to the treatment of municipal wastes. The Urban Development Department in the state of Uttar Pradesh was the nodal department for this purpose. Under its supervision, the other state government agencies were assigned with the preparation and execution of individual schemes. An inter-departmental committee was formulated as well, convened by the secretary of the inter-departmental committee³⁹.

GAP Phase II's monitoring mechanism included a multi-tier monitoring system. At the state level, it included a monthly progress review by the implementing agency apart from regular monitoring by a team of engineers. At the Federal (Central) level frequent site visits were conducted by the NRCD and quarterly progress reviews were done by the Steering and the Monitoring Committees⁴⁰.

Despite the GAP having an elaborate institutional structure, its leadership and staff lacked commitment and vision towards cleaning river Ganges. Although monitoring and reviewing of the river action plan were conducted regularly, the problems identified were never addressed and even if they were, the decisions taken then were never enforced. Also, officials responsible for implementing the GAP at the lowest tier were not kept well informed regarding the next course of action to be taken⁴¹.

2.3 Outcomes/Difficulties

GAP Phase II has been criticised for lack of planning and implementation. For instance, cities/towns facing a shortage of electricity supply relied on increased supply of electricity for operating the sewage treatment plants⁴². In addition, the selection of towns and cities were inconsistent as the funds were allocated on the basis of imprecise estimate of sewage load⁴³.

GAP Phase II also encountered administrative incompatibilities. As decision making powers were under the district magistrates and commissioners and cleaning the sewers were under the jurisdiction of the municipal authorities, it led to conflict of interest between the two. Further, the state governments were reluctant to cooperate with other states or the Central government if they had different political parties in power⁴⁴. Despite multiple agencies being entangled with GAP, there was no single

³⁸ Rakesh 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

³⁹ Ibid 5

⁴⁰ Ibid 6

⁴¹ Ibid 4

⁴² Venkatesh Upadhyay, 'Ganga at Varanasi: Lessons from Environmental Abuse' (2009) 44(37) Economic and Political Weekly 64

⁴³ Priyam Das and Kenneth R. Tamminga, 'The Ganges and the GAP: An Assessment of Efforts to Clean a Sacred River' (2012) 4(8) Sustainability 1647

⁴⁴ Ibid 65

coordinating body with corresponding powers to give directions⁴⁵. Another major shortcoming was that the local government institutions were not consulted during the GAP's formulation, to assess their readiness for taking upon 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 monitoring⁴⁶.

Although GAP on paper professed to be a 'people's program', participation was supported mainly for political expediency misusing the religious sentiments of the Hindus. 'People's participation' was only limited to infrequent 'ghat'⁴⁷ clean ups. Though the local governments/ Non-Governmental Organizations (NGO's) were expected to promote public participation but they did not receive any financial support from the government for the same⁴⁸.

Namami Gange/Phase III

The Mission Clean Ganga was an initiative launched by the National Ganga River Basin Authority (NGRBA)⁴⁹ from 2009 to 2014. With the change of party in the Central (Federal) Government in 2014, 'Namami Gange', an integrated conservation mission replaced Mission Clean Ganga. It is launched with a changed approach for wastewater management, solid waste management, industrial pollution and river front development.

3.1 Legal Framework

The NGRBA was constituted⁵⁰ in 2009. Apart from this, the MoEF and the CPCB/ State Pollution Control Boards (SPCBs) have also been entrusted with the responsibility to administer the legislation under the Environment Act⁵¹.

The jurisdiction of the authority was extended to states through which River Ganga and its tributaries flow. In addition, the State Governments of Uttarakhand, Uttar Pradesh (UP), Bihar, Jharkhand and West Bengal (WB) were also authorized to constitute a State Ganga River Conservation Authority (SGRCA)

⁴⁵ Praveen Singh, 'Bridging the Ganga Action Plan: Monitoring failure at Kanpur' (2006) 41(7) Economic and Political Weekly 590

⁴⁶ Das and Tamminga (n 43) 1648

⁴⁷ River front steps leading to the banks of river Ganges

⁴⁸ Das and Tamminga (n 43) 1666

⁴⁹ The NGRBA started the Mission Clean Ganga when it was established in 2009 as a nodal agency for the Ministry of Water Resources, River Development and Ganga Rejuvenation (when the Central Government changed in 2014, the GAP's responsibility was transferred from the MoEF to the Ministry of Water). The NGRBA's functions included inter-sector coordination for planning under the GAP and effective abatement of pollution of the river Ganges.

⁵⁰ In exercise of the powers conferred by section 3(1) of the Environment (Protection) Act 1986⁵⁰ to the Central (Federal) Government. 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.

⁵¹ National Ganga River Basin Authority Ministry of Environment and Forests(MoEF), *Volume II Environmental and Social Management Framework (ESMF)* (2010)

under the Chairmanship of the Chief Ministers. Consequently, the Central Government (Federal)⁵² set up the SGRCAs⁵³.

As in several other countries, India's constitutional articles on environment were adopted in response to commitments entered into international conferences/conventions. The first provision for environment 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 International Conference on Human Environment in 1972⁵⁴.

The Environment (Protection) Act 1986

The Environment (Protection) Act 1986 was formulated⁵⁵ 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 towards protection of the environment⁵⁶. Objects of legislation includes 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 accidents threatening the environment. This Act clearly extends to control water pollution as section 2(a) defines the environment as including water and interrelationships existing between water and human beings, plants, animals and other living beings⁵⁷.

This Act provides concentration of power in the hands of the Central Government^{58,59}. For instance, 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 might be exercised by the Central Government or through its agencies and occasionally in its promotion towards development

⁵² In exercise of the powers conferred by 3(3) of the Environment (Protection) Act, 1986. 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.

⁵³ 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.

⁵⁴ Kelly D. Alley, 'Legal Activism and Pollution Prevention' [2009] Georgetown International Environmental Law Review 1

⁵⁵ 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.

⁵⁶ S.R Wate,'An Overview of Policies Impacting Water Quality and Governance in India' (2012) 28(2) International Journal of Water Resources Development 265

⁵⁷ Kumar 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)

⁵⁸ Section 3(1) of the Environment Protection Act states explicitly, '*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*'

⁵⁹ Shodhganga, 'Environmental Protection and Ecological Development- Constitutional Imperatives and Legislative Frameworks' (2011)

this power also might be exploited by overlooking critical environmental considerations when approving projects⁶⁰.

Though the rule-making powers under this Act are exhaustive and they might reach wide and varied dimensions⁶¹ but it has not been invoked even in the most deserving cases. It has turned out to be at best a paper meant to alleviate the feeling of the environmental hazards⁶².

3.2 Institutional Structure

The NGRBA chaired by the Prime Minister, is the governing body of Namami Gange. Its members comprise of Government of India ministers and Chief Ministers of the five basin states (Uttarakhand, UP, Jharkhand, Bihar and WB). Its implementation wing is the National Mission for Clean Ganga (NMCG)⁶³, chaired by the Minister, MoEF⁶⁴. The NGRBA has five wings for efficient discharge of its duties, namely, Information and Communication wing, Environmental Monitoring and Impact Assessment wing, Investigation wing, Research and Development Wing and the Policy, Planning and Advocacy Wing⁶⁵.

At the state level, the SGRCAs are responsible for program implementation through its implementation wing, State Program Management Group (SPMG)⁶⁶. At the national level, the Program Management Group (PMG) is responsible for ensuring effective implementation of the overall NGRBA program⁶⁷

Unlike GAP Phase I and II in the third phase, provision has been made for post-implementation management of the assets created. This includes submitting a Detailed Project Report (DPR) containing a plan for operation and maintenance of assets created under the NGRBA program⁶⁸.

One of the important functions of the NGRBA includes preparing and implementing the Ganga River Basin Environment Management Plan (GRBEMP). In 2010, the responsibility for preparing the GRBEMP was given to the consortium of the seven Indian Institute of Technology⁶⁹ (IIT's) by the MoEF. This Plan identified seven important missions for a focused intervention as follows: Mission Aviral Dhara (Continuous flow), Mission Nirmal Dhara (Unpolluted flow), Mission Ecological Restoration, Mission

⁶⁰ Peggy Rodgers Kalas, 'Environmental Justice in India' (2000) 97(1) Asia-Pacific Journal on Human Rights and the Law 97

⁶¹ It allows the Central Government to make rules in respect of all or any of the matters referred to in Section 3 of this Act, which also includes specific matters. For instance, maximum allowable concentration limits of various environmental pollutants, prohibition and restrictions on handling of hazardous substances and restrictions with respect to location of industries (n 59)

⁶² Philippe 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)

⁶³ a registered society under the Societies Registration Act 1860

⁶⁴ National Mission for Clean Ganga website <http://envfor.nic.in/sites/default/files/nmcg-ad-05062014.pdf> accessed 8th March 2016

⁶⁵ Indian Institute of Technology, 'Implementation of Ganga River Basin Management Plan: Recommendations on Legal and Institutional Aspects' (2013)

⁶⁶ The state of Jharkhand does not have an implementation wing as a relatively small stretch of Ganga passes through this state. Instead it is provided with a dedicated cell within the Urban Development Department.

⁶⁷ Ministry of Environment and Forests(MoEF), 'NGRBA Programme Framework' (2011)

⁶⁸ Ibid 10

⁶⁹ IIT Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee

Geological safeguarding, Mission Disaster Management, Mission Sustainable agriculture and Mission Environmental Knowledge Building and sensitization. Based on these findings, action plans are being formulated under NRGB to counter harmful anthropogenic activities and promote helpful activities⁷⁰.

Though multiple institutions/agencies were set up for cleaning the Ganges, but overlapping and conflicting jurisdictions of government agencies could be traced to the underlying cause of institutional failure of the Mission Clean Ganga. This led to many disputes regarding decision-making and implementation of GAP, as discussed later⁷¹.

4. Literature Review

Government intervention is necessary in the resolution of pollution problems. Lack of government restraints in terms of pollution, permits individuals and firms to pollute as much as they want, because market imperfections allows them to not internalise the cost imposed upon others through their polluting activities⁷². To correct for these market imperfections, the government can intervene only through its agencies namely the executive, administrative, legislative and judicial bodies⁷³. Therefore, one of its major tools to control pollution includes the regulatory mechanism.

In the global context there exists quite a number of case studies⁷⁴ which tries to examine the effect of formal regulatory quality on river pollution.

⁷⁰ Consortium of seven Indian Institute of Technology's(IIT's), '*Ganga River Basin Environment Management Plan*'(2013)

⁷¹ Indian Institute of Technology, '*Implementation of Ganga River Basin Management Plan: Recommendations on Legal and Institutional Aspects*' (2013)

⁷² 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 (by levying fines on that individual, imposing automobile or energy taxes) to prevent market failure.

⁷³ James E. Krier, 'The Pollution Problem and Legal Institutions: A conceptual Overview' [1970-71] 18 UCLA L. Rev. 429

⁷⁴ Case studies on China includes: 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 ; 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) < http://pub.iges.or.jp/modules/envirolib/upload/2775/attach/policy%20review_water%20pollution%20control_chi_na.pdf > accessed on 17 June 2016.

A comparative case study of the regulatory framework of the water sector between UK and China can be found in: Organisation for Economic Co-operation and Development(OECD), '*OECD Reviews of Regulatory Reform in China*' (ISBN 978-92-64-05939-9, 2009)

Case study on US which examines water pollution and its control from the twentieth century: Jouni Paavola, 'Interstate Water Pollution Problems and Elusive Federal Water Pollution Policy in the United States, 1900-1948' (2006) 12(4) Environment and History 435

In the Indian context, very few studies have been conducted to comprehend the influence of regulatory quality on river pollution. One of the papers conducted an econometric analysis to identify the effect of informal regulation of pollution on ten important Indian rivers using poll percentage as a proxy for informal regulation (informal pressure on industrial firms). The results revealed that informal regulation has a significant favourable effect on water pollution in India⁷⁵.

Another study assessed India's environmental regulations using a difference-in-differences approach⁷⁶. A city level dataset for air pollution, water pollution, environmental regulations and infant mortality was constructed for a systematic evaluation of the environmental regulations. The study demonstrates that air pollution regulations in India are more effective than water pollution regulations. Substantial decline 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 settings⁷⁷.

Further, one of the papers analyses the impact of a particular piece of judicially mandated environmental legislation in the city of Kanpur, situated on the banks of the river Ganga (or Ganges) using a reduced form model. The legislative piece evaluated in this study was an order of India's Supreme Court (SC) from 1987 which instructed the Kanpur tanneries to treat sewage before discharging into the rivers. The results obtained demonstrate that the SC order issued has been effective in reducing the Ganges water pollution substantially along with a decline in infant neo natal mortality⁷⁸.

One of the studies also attempted to analyse theoretically the prevailing legal and institutional measures that affect the state of Indian rivers. Some of the relevant Acts and their relevant provisions evaluated includes the Interstate River Water Disputes Act 1956, River Boards Act 1956 and State Irrigation and Drainage Acts. This study concludes that the regulatory and institutional framework is inadequate for resolution of water conflicts for interstate rivers⁷⁹.

Comparative analysis of water pollution and its regulatory quality in Japan, United States, United Kingdom, Netherlands, France and Sweden: Jean-Phillippe Barde, Gardner M. Brown Jr. and Pierre Frédéric Teniere Buchot, 'Water Pollution Control Policies Are Getting Results' (1979) 8(4) *Ambio* 152

⁷⁵ Biswanath Goldar and Nandini Banerjee, 'Impact of informal regulation of pollution on water quality in rivers in India' (2004) 73(2) *Journal of Environmental Management* 117

⁷⁶ 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.

⁷⁷ Michael Greenstone and Rema 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

⁷⁸ Quy-Toan Do, Shareen Joshi and Samuel 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

⁷⁹ Himanshu 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

A few studies have also evaluated the formal regulatory quality of the GAP theoretically, criticising it on the following grounds:

1. Failure of implementation, monitoring and lack of planning⁸⁰
2. Lack of support from the Government⁸¹
3. Exploiting the religious sentiments of the Hindus⁸²

Though a lot of papers have tried to analyse empirically the formal regulatory quality of India for 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 previous studies on GAP take 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 extends the literature in this direction by analysing the formal regulatory quality of the GAP using an econometric approach.

5. Methodology and data description

The methodology adopted in this study includes doctrinal legal research⁸³ and economic analysis of law. The latter would comprise using quantitative or econometric methods to analyse the regulatory quality of the GAP. The models employed in this study are ad hoc models where the variables have been selected after a thorough review of the existing literature. The concept of regulatory quality (RQ), rule of law (RL) and government effectiveness (GE) is based on the annual Worldwide Governance Indicators (WGI) report developed by the World Bank since 1996 for over 200 countries. Though the WGI is a composite governance indicator which reports on six broad measures of governance including RQ, RL and GE, for the purpose of this study only the environmental governance component of the measures has been developed⁸⁴.

5.1 Theoretical model

Economic Analysis of Law (EAL)

The 'marrying' of Law and Economics is not new, it dates back to the early 1960s when Ronald Coase's article on social cost⁸⁵ and Guido Calabresi's article on torts⁸⁶ was published. Though economic methods in legal analysis were used well before the 1960's, but the earlier applications of EAL were limited to the

⁸⁰ Praveen Singh (n 45) ; Priyam Das and Kenneth R. Tamminga (n 43) ; Ashok Das and Priyam 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); Upadhyay (n 42)

⁸¹ Upadhyay (n 42)

⁸² Ibid 66 and Das and Tamminga (n 43)

⁸³ For a detailed study refer to: Richard A. Posner, 'The Present Situation in Legal Scholarship' (1981) 90 *The Yale Law Journal* 1113; Ashish Kumar Singhal and Ikramuddin Malik, 'Doctrinal and socio-legal methods of research: merits and demerits' (2012) 2(7) *Educational Research Journal* < <http://resjournals.com/journals/educational-research-journal/EDU%202012/EDU%202012%20JULY/Singhal%20and%20Malik.pdf>> accessed on 1 February 2016

⁸⁴ Worldwide Governance Indicators(WGI), World Bank

⁸⁵ R.H. Coase, 'The problem of social cost' (1960) 3 *The Journal of Law and Economics* 1

⁸⁶ Guido Calabresi, 'Some Thoughts on Risk distribution and the Law of Torts' (1961) 70(4) *The Yale Law Journal* 499

areas of law where economics was centrally important in understanding the concepts (competition law, common law, public utilities). It was in 1960's that Coase⁸⁷ and Calabresi⁸⁸ made the initial attempts to employ economic analysis in areas of Law where Economics had never been utilised to acquire quantitative and qualitative insights into the operation of the legal system. Since then this methodology has been extended and applied to virtually all fields of Law, including family law, environmental law, legal procedure, human rights, conflict of laws, judicial behavior and so on⁸⁹. EAL contributes to legal analysis by emphasising the unintended or undesirable consequences of the existing or proposed laws⁹⁰. It is quite well established from the EAL literature that quantitative study of the legal system can be fruitful⁹¹.

Within EAL, there are two approaches, normative and positive analysis. This research would concentrate on the latter. Positive analysis employs mathematical models and empirical tools to postulate the existing relationship between various variables along with explanations and predictions of the effect of changes in the variable on others. This aids in determining the effect of legal rules on the various phenomena that the law is required to deal with. For instance, positive economic analysis of law can deal with and quantify how crime is influenced by different methods of punishments, enforcement efforts, effect of alternative liability rules on the rate of accidents etc.⁹²

Although economic analysis when applied to Environmental Law has its limitations but it also offers a robust theoretical framework for systemizing questions of the concerned Law and policy⁹³.

5.2 Analytical Method

Econometric methods, particularly regression has been used to analyse the formal regulatory quality of the GAP. Econometrics is a branch of Economics which facilitates sifting through complex data to identify and extract simple relationships. Conducting a quantitative analysis, sheds light on issues that either cannot be or usually are not answered by qualitative methods and in addition, permits re-

⁸⁷ Coase (n 85)

⁸⁸ Calabresi (n 86)

⁸⁹ John E. Velntzas, Kyriaki K. Savvidou and Georgia K. Broni, 'Economic Analysis of Environmental Law: Pollutions Control and Nuisance Law' (International Conference on Applied Economics, 2009) < <http://kastoria.teikoz.gr/icoae2/wordpress/wp-content/uploads/articles/2011/10/066-2009.pdf> > accessed on 26 June 2016

⁹⁰ Richard A. Posner, 'Values and Consequences: An introduction to Economic Analysis of Law' (2000) John M.Olin Law and Economics Working paper Number 53 2D < <http://www.law.uchicago.edu/publications>> accessed 30th December 2015

⁹¹ Richard A. Posner, 'The Economic Approach to Law' (1974-1975) 53 Tex. L. Rev. 757

⁹² Eli Salzberger, 'The Economic Analysis of Law - The Dominant Methodology for Legal Research?!' (University of Haifa Faculty of Law Legal Studies Research Paper No. 1044382, 2007) < http://weblaw.haifa.ac.il/he/Journals/din_udvarim/pabN/d/%D7%A2%D7%9C%D7%99%20%D7%96%D7%9C%D7%A6%D7%91%D7%A8%D7%92%D7%A8%20-%20The%20Economic%20Analysis%20of%20Law%20-%20The%20Dominant%20Methodology%20fo.pdf > accessed on 28 June 2016

⁹³ James Krier and Richard B. Stewart, 'Using Economic Analysis in Teaching Environmental Law: The Example of Common Law Rules' (1980) 1 UCLA Journal of Environmental Law and Policy 13

examination of the questions addressed earlier by qualitative methods. In short, quantitative analysis proposes a valuable addition to qualitative techniques in assessing environmental regulations⁹⁴.

This study involves analyzing the regulatory quality of GAP at the level of Indian states with the aid of two Econometric models, as discussed below. Both the models have been estimated using panel model analysis over the time period, 2006 to 2014 for the four Indian states namely, Uttarakhand, UP, Bihar and WB through which the Ganges flows.

5.3 First Model

Model Description

The first model of this study tries to determine the impact of regulatory quality, rule of law and government effectiveness of the GAP on Ganges river pollution. In this model at time 't' and in state 'i', Ganges water pollution (waterpoll) is expressed as a function of regulatory quality (RQ), government effectiveness (GE), rule of law (RL), per capita Net State Domestic Product (PCNSDP), industrialisation(Indst) and population(Pop). The model is expressed as follows:

$$\text{waterpoll}_{it} = \beta_0 + \beta_1 \text{RQ}_{it} + \beta_2 \text{GE}_{it} + \beta_3 \text{RL}_{it} + \beta_4 \text{PCNSDP}_{it} + \beta_5 \text{Indst}_{it} + \beta_6 \text{Pop}_{it} + u_{it}$$

where u is the error term

The aim of the model formulated is to establish a correlation between the concept of 'regulatory quality' and the results in terms of pollution abatement. The coefficients of the β 's helps quantify the exact relationship between the dependent variable (waterpoll) and the independent variables (RQ, GE, RL, PCNSDP, Indst, Pop)

Variable Description

'Regulation' has been defined as statutory law by Cento Veljanovski⁹⁵. Regulatory quality (RQ) on the other hand, is defined by the World Bank as the ability of the government to formulate and implement effective policies and regulations for the protection of the environment⁹⁶. Therefore, for the purpose of this study RQ is defined as the ability of the government (State/Central) to formulate and implement effective environmental statutory law for GAP. RQ is included in the model as most of the studies analysing the GAP theoretically, have concluded that failure of implementation is a major cause of concern^{97,98}. Similarly, studies on China where water pollution is a rising concern have also indicated that despite the existence of a comprehensive system of environmental law, lack of implementation is an underlying reason for the inefficient regulatory quality⁹⁹. To capture RQ for the GAP, stringency of

⁹⁴ Ronald B. Mitchell, 'A Quantitative Approach to Evaluating International Environmental Regimes' in Arild Underal and Oran R. Young(eds.), *Regime Consequences: Methodological Challenges and Research Strategies* (Springer 2004)

⁹⁵ Cento Veljanovski, 'The Economics of Law' [2006] Institute of Economics Affair Hobart Paper No. 157

⁹⁶ Worldwide Governance Indicators (WGI), World Bank

⁹⁷ Singh (n 45)

⁹⁸ Das and Tamminga (n 43)

⁹⁹ Qi and Zhou (n 74)

environmental statutory law was initially considered as a proxy¹⁰⁰. But later due to data limitations, number of Civil or Criminal judgements for environmental cases resolved per year (CivC+CrimC) by the Supreme Court of India and the National Green Tribunal (NGT) has been taken as a proxy.

Government Effectiveness (GE) gauges the credibility of the government's commitment to environmental policies. More often than not, the mere existence of institutional solutions does not always translate to desirable environmental outcomes especially in the presence of lack of institutional capacity¹⁰¹. To capture GE, the financial capacity 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.

Rule of Law (RL) measures the quality of environmental policing. Along with the existence of a comprehensive environmental law framework, continuous supervision and severe punishment and prosecution is required for an effective water management framework¹⁰². In the case of the GAP, initially the number of inspectors and the level of fine levied on industries were considered as a proxy for the RL variable. But later, due to data unavailability, the number of trainings conducted every year for inspectors at the state level for maintaining the Ganges water quality (No.T) under the Ganga Action Plan (GAP) is taken as a proxy for RL.

Industrialisation (Indst) is measured as the proportion of the absolute size of the manufacturing sector (registered and unregistered sectors) to Net State Domestic Product (NSDP).

Population (Pop) is measured by the number of people living in a state during a given period of time. Population data was inconsistent, as census in India is conducted decennially therefore, the dataset was extrapolated from the projected population of the Indian states.

Per capita Net State Domestic Product (PCNSDP) has been used to capture the volume of economic activity of the states. NSDP is the measure of all the goods and services produced within the boundaries of the state during a given period of time. Therefore, PCNSDP is the ratio of NSDP at constant prices for the base year 2004-05 to the corresponding population of the state.

The dependent variable (DV) in this model, Ganges water pollution (waterpoll) is gauged by 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, manure, sewage, etc. is present in a water supply 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. BOD is a

¹⁰⁰ At times due to data unavailability, proxy variables are considered. A proxy or 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.

¹⁰¹ Jouni Paavola (n 74)

¹⁰² Wang Xi and Xu Zhengxian (n 74)

measure of the oxygen used by microorganisms to decompose this waste. Therefore, a higher BOD is indicative of higher water/ river pollution (For the data sources of the variables, refer to Table 2 in the Appendix)

Therefore, the estimating equation for the first model after including the proxies can be expressed as follows, where log has been taken for IETP, PCNSDP and Pop:

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

where u is the error term

5.4 Second Model

Model Description

The second model is formulated to comprehend the impact of the GAP's regulatory quality on the decision making of the institutions/public. In this model, regulatory quality (RQ) is taken as the dependant variable (DV). The independent variables (IVs) include environmental expenditure by the local government (LGEE), water pollution of the Ganges (waterpoll), number of Non-Governmental Organisations (NGO's) (NNGO) and Population (Pop). The model is expressed as follows:

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

where u is the error term

Variable description

The dependent variable (DV), regulatory quality (RQ) in the second model has been defined the same as in the first model and therefore its proxy is the same as in the previous model. Among the independent variables (IVs), the proxy for Ganges water pollution (waterpoll) is also the same as in the previous model. Population (Pop) has also been considered in this model as an IV.

Local environmental expenditure is a key aspect of a state's environmental policy, regulatory framework and institutional framework, as development and implementation of most policies require public expenditures of some kind. Increased local environmental expenditure contributes to better environmental management at the state level along with supplementing other policy tools, such as legislation and regulation¹⁰³. Therefore, local government environmental expenditure (LGEE) has been included in this model. The investment made by the states under the NRCP for GAP has been considered as a proxy for this variable.

Another IV considered is the number of Non-Governmental Organisations (NGO). NGO's or civil society organisations recently have started playing an important role in environmental management especially in the developing world in the following ways: (1) through conducting public awareness programs as the

¹⁰³ The World Bank, 'Public Environmental Expenditure Reviews (PEERS) Experience and Emerging Practice' (7, 2003)

public is more likely to believe the NGOs 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 (4) apart from these organisations generally lacking a larger political agenda towards protecting the environment, they also take on responsibilities which would otherwise need to be undertaken by the over-strained and under-funded environmental protection agencies¹⁰⁴. For this study, the number of NGO's working at the state level has been included (For the data sources of the variables, refer to Table 2 in the Appendix).

Therefore, the estimating equation for the second model (including the proxies) is as follows, where log has been taken for Pop, LGEE and NNGO:

$$(CivC + CrimC)_{it} = \beta_0 + \beta_1 \ln NNGO_{it} + \beta_2 BOD_{it} + \beta_3 \ln LGEE_{it} + \beta_4 \ln Pop_{it} + u_{it}$$

where u is the error term

6. Results and Discussions

6.1 Model 1 results

Originally the equation is examined to determine whether Random Effects Model (REM) or Fixed Effects Model (FEM) should be used by conducting the Hausman Test. 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. FGLS method allows estimation in the presence of first order autocorrelation, heteroscedasticity or cross-sectional correlation across panels¹⁰⁵.

The REM and FGLS results for the first model are as follows:

Panel Model Estimation Results (Model 1, 2006-2014)

Independent Variables (IVs)	REM (Model 1)	FGLS Model (Model 1)
$CivC + CrimC_{it}$	-0.103	-0.10
No. T_{it}	0.00	0.00
$\ln IETP_{it}$	0.157	0.15
$\ln PCNSDP_{it}$	-0.018	-0.01
$\ln Pop_{it}$	0.772***	0.77***
$Indst_{it}$	16.871***	16.871***
	Hausman Test H_0 : REM preferred P-value = 0.5775 Multicollinearity Test	

¹⁰⁴ Jonathan Schwartz, 'Environmental NGO's in China: Roles and Limits' (2004) 77(1) Pacific Affairs 28

¹⁰⁵ Sayantan Ghosh Dastidar, 'Essays on Public Education Expenditure, Trade Openness and Economic Growth of India' (Doctor of Philosophy, University of Dundee, 2015)

	<p>Mean VIF = 2.18</p> <p>Ramsey RESET Test H_0 : Model has no omitted variables P-value = 0.6889</p> <p>Breusch Pagan Test H_0 : Constant Variance P-value = 0.260</p> <p>Woolridge Test for autocorrelation H_0 : No first order autocorrelation P-value = 0.0975</p>	
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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. This implies that growth in population leads to an increase in Ganges water pollution. In this study, the model predicted that a one percent increase in population would lead to 0.008 per cent increase in the Ganga water pollution levels. Some other studies also attempted to estimate the relationship between population growth and pollution levels using mathematical models¹⁰⁶ or theoretically¹⁰⁷ and concluded the same. The growing population in India contributes towards a rise in the demand of per capita availability of water (domestic water usage), consequently leading to an increase in the per capita wastewater generation. In such a scenario, current and future fresh water demand could be met if efficient wastewater management system exists. But in major cities of India although an estimated 38,254 million litres of sewage (MLD) is generated per year from domestic usages, the sewage treatment capacity is only 11,786 MLD thereby leaving gap of more than 20,000 MLD in sewage treatment capacity. In fact, even the existing wastewater treatment facilities 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 personnel¹⁰⁸. Therefore, with a growing population in India the water pollution levels in the Ganges are rising and would continue to rise if the sewage treatment facilities are not improved.

Along with population, the results verified that industrialisation also contributes significantly to Ganges water pollution. According to this model, every unit increase in industrialisation leads to 16.871 units increase in the Ganges water pollution levels. Many studies have acknowledged the existing relation

¹⁰⁶ 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

¹⁰⁷ Dewaram A. Nagdeve, 'Population Growth and Environmental Degradation in India' (Population Association of America 2007 Annual Meeting, New York, March 2007)

¹⁰⁸ 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

between the two¹⁰⁹ and have also attempted to analyse the environmental costs imposed by industrialisation in India¹¹⁰. Despite a fast paced growth of industrialisation in India, only 60 per cent of industrial wastewater is treated before releasing into the water bodies. In addition, according to UNESCO the industrial water use productivity of India is the lowest and is only 1/30th of that of Japan and Republic of Korea¹¹¹. Currently with India being the most attractive destination in the world for investments in manufacturing and pollution intensive industries owing to its large domestic consumer base along with cheap labour, this trend represents a serious challenge. The country is already losing 10 per cent of its GDP due to environmental degradation and with an absence of effective pollution abatement program in place India's ecosystems seem to be in threat¹¹².

The results also imply that the existing regulatory quality does not seem to affect the Ganges water quality significantly. Firstly, though the Indian judicial system is efficient in passing effective judgements with regards to prevention of Ganga water pollution¹¹³ but with the given amount of cases working their way through the system most of the environmental cases are still ongoing or pending. For instance, the Chaturvedi vs. State of Uttar Pradesh¹¹⁴ was filed in 1998 against the state government for failing to clean up the Yamuna river but it is still an ongoing case. Moreover, up until 2013 there were more than 31 million open cases in the Supreme Court (SC) of India¹¹⁵. Though in 2010, the National Green Tribunal (NGT) was established to aid the SC in resolving environmental disputes but despite being efficient it is facing its own set of problems. In spite of disposing 82 per cent of the pending cases¹¹⁶ by 2014, in 2015 the SC's Green Bench dumped 300 more cases on the NGT, some of them pending since the last 14 years¹¹⁷. The NGT apart from facing staff shortage¹¹⁸ also faces opposition from the MoEF and other Central government bodies. In 2013, for instance the MoEF complained against the NGT before the SC claiming that though the Tribunal does not have the powers to act 'suo moto'¹¹⁹ in environmental cases it has been doing so beyond its remit. The SC supported the NGT declaring that '*the [environment and forests] department is taking all-out efforts to ensure that the NGT does not function effectively so*

¹⁰⁹ Shailender Singh, Pooja Jain and Abhay Kumar, 'Impact of Industrialisation on Environmental Pollution' (2009) 135(9) *The Indian Forester*

¹¹⁰ Rajarshi Majumdar (2009), 'Environmental Costs of Industrialisation: A Study of Durgapur Region in West Bengal' [2010] *Rabindra Bharati University Journal of Economics*

¹¹¹ Kaur et.al (n 108) 2

¹¹² T. Rajaram and Ashutosh Das, 'Water pollution by industrial effluents in India: Discharge scenarios and case for participatory ecosystem specific local regulation' (2008) 40 *Futures* 56

¹¹³ For reference, n 23

¹¹⁴ *Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others* (n 35)

¹¹⁵ Tom Lasseter, 'India's Stagnant Courts Resist Reform' *Bloomberg BusinessWeek* (England, January 8 2015)

¹¹⁶ Press trust of India

¹¹⁷ Utkarsh Anand, 'Projects stuck, Supreme Court transfers 300 cases to NGT, govt bodies' *The Indian Express* (New Delhi, 21 October 2015)

¹¹⁸ Explained in detail in model 2 results

¹¹⁹ This term is generally used in Indian legal parlance. If a court takes 'suo moto' action, it means starting a legal process on its own.

that the court may be compelled to pass an order for restoration of jurisdiction of the High Courts and other courts in matters which are presently dealt with by NGT¹²⁰.

Secondly, there are no provisions made for following up the directions issued with regards to environmental cases. This is evidenced by the fact that in Chaturvedi v State of Uttar Pradesh¹²¹, one of the filed claims against the state government were that the directions passed earlier by the SC in the Mehta cases¹²² were not followed out by the State or the Central government even after a span of more than ten years and further no action was taken against them regarding this¹²³.

Thirdly, the legal basis of the GAP is characterised by overlapping responsibilities across multiple agencies with limited written guidance. Also due to the legislation not clearly providing a dedicated funding authority, it often leads to disputes regarding financing the project across all levels of government. In addition, there is an absence of widespread public support for implementation of water pollution regulations in India¹²⁴.

It is worth to be noted that government effectiveness (IETP) and rule of law (No.T) of the GAP do not seem to affect the water quality significantly. This could possibly be due to the fact that institutional solutions and investment does not always translate into effective river action plans. Lack of political will¹²⁵, absence of cooperation amongst the state and central governments¹²⁶ and inefficient institutional capacity in terms of availability of trained personnel could be a contributing reason. In short, existence of institutional arrangements is a necessary but not a sufficient condition¹²⁷ for successful water pollution abatement programs.

6.2 Model 2 Estimation Results

In the second model, initially the Hausmann test was conducted to determine whether REM or FEM should be used. The test ruled in favour of REM. But as first-order correlation was detected in REM, the model was re-estimated using FGLS.

Panel Model Estimation Results (Model 2, 2006-2014)

Independent Variables (IVs)	REM (Model 2)	FGLS Model (Model 2)
$\ln Pop_{it}$	-0.698***	-0.600***
$\ln LGEE_{it}$	0.1865	0.134
$\ln NNGO_{it}$	0.704***	0.413**
BOD_{it}	-0.121	-0.123
	Hausman Test	

¹²⁰ Nitin Sethi, 'NGT does not have powers to act suo motu: government' *The Hindu* (New Delhi, September 11, 2013)

¹²¹ Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others (n 35)

¹²² M.C. Mehta vs Union Of India & Ors [1988] AIR 1115 (n 20)

¹²³ Gopeshwar Nath Chaturvedi vs. State of Uttar Pradesh and others (n 35)

¹²⁴ Greenstone and Henna (n 77)

¹²⁵ Paavola (n 74)

¹²⁶ Qi and Zhou (n 74)

¹²⁷ Paavola (n 74) 436

	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	
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Note: Dependent Variable is $CivC + CrimC_{it}$. 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 (Pop) affects the regulatory quality (RQ) significantly and negatively. This implies that with everything else constant a one percent increase in population leads to 0.006 per cent weakening of the regulatory quality in India. Population growth, along with the resulting lower per capita resource availability puts pressure on the existing natural resources thereby 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 Ganges water quality. The NGT though effective in resolving environmental disputes already faces a shortage of resources to have a strict environmental vigilance across India. In addition, with the increasing population resulting in rising water pollution levels the resource crunch of the NGT has worsened further. Two years into NGT's functioning, six judges had quit citing 'shortage of resources' as the reason. Several of the judiciary members were not provided accommodation by the government in the city of the NGT's operation. In fact, initially for the first two years the court was run out of a guesthouse till before the intervention of the SC. Also, the cases filed in the NGT's of other cities than New Delhi (the Indian capital) were also run out of makeshift offices¹²⁸. In 2014 the southern bench of the NGT which handled cases of four states apart from facing staff shortage, also had to operate from a building which lacked even basic facilities such as, adequate chambers for advocates, common visitor's halls, library, storage for important documents and sufficient washrooms^{129,130}. Sadly, the staff shortage of the Indian judiciary is not limited to the NGT, India has only eighteen judges for every one million people as against thirty-five to forty in

¹²⁸ Nitin Sethi, 'Green tribunal in red as two more judges quit' *The Times of India* (New Delhi, 6 July 2012)

¹²⁹ *The Hindu*, " Not enough space at Green Tribunal office" (9 November 2014)

¹³⁰ Gargi Verma, " National Green Tribunal's Pune bench faces staff crunch" *The Golden Sparrow* (13 May 2016)

other developing nations and around fifty in the developed nations¹³¹. Even if this shortage of judges is accounted for, there would not be enough courtrooms to accommodate them all (there exists a shortage of 3,989 court rooms across the country)¹³². Judicial infrastructure has clearly not kept pace with the rate of litigation in India. Along with this, the current rate of population and the consequent declining levels of environmental quality is further weakening the existing environmental regulatory quality.

The local government environmental expenditure (LGEE) on the other hand, does not translate into an improvement in the regulatory quality (RQ) of the GAP. This further implies that the mere existence of institutions and investments 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. The underlying reasons for failure of implementation are far beyond existence of inefficient institutions¹³³.

The second model results also indicate that existence of environmental NGO's (NNGO) has led to an improvement in the regulatory quality of the GAP. In India NGO's have played a critical role in social, health and environmental issues. Public participation in environmental management has recently been encouraged by the legislation, providing greater powers to the NGO's and other civil society organisations to contribute significantly towards environmental protection. Quite a few studies of river action plans have demonstrated that public awareness campaigns in the long term can go a long way towards promoting pollution abatement¹³⁴. In fact, in India one of the campaigns 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, in Varanasi (UP) only three sewage plants were constructed which were inadequate for treating the city's waste. But due to erratic electricity supply these plants were unable to function continuously. Further, during the rainy season when water levels rose in the Ganges it submerged the sewage plants and they could not be operated. To resolve this, in the mid 1990's the SMF approached the University of California, Berkeley for a partnership to look for an alternative solution for this issue, as the University had developed an affordable 'advanced integrated wastewater pond system'(AIWPS) which treated sewage naturally without using electricity at all. In 1997, the SMF proposed the Varanasi city government to set up the AIWPS, who in turn claimed¹³⁵ funds from the GAP for the same. But the state and the federal governments refused to comply with the city government's request which resulted in Varanasi's leaders

¹³¹ PTI, 'India has 18 judges per ten lakh people: Law Ministry' *The Indian Express* (New Delhi, 4 August 2016)

¹³² Maneesh Chibber, "Do we need more judges? CJI Thakur's plea to the government raises key questions" *The Indian Express* (1 May 2016)

¹³³ Explained in detail in the conclusion

¹³⁴ Qi and Zhuo (n 74)

¹³⁵ As per the 74th Amendment. 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*'

filing a PIL for alleged breach of the 74th Amendment. For eleven years, this case was pending. During this time, the SMF gained international support from the likes of USAID, Asia Foundation and US-AEP, for this issue and also promoted it domestically. Finally, in 2008 the Federal government formally agreed to support the AIWPS system in Varanasi¹³⁶.

Conclusion

India's ill-fated GAP was launched thirty years ago, but the Ganges water quality has deteriorated further. This study was conducted to analyse the existing formal environmental regulatory quality of the GAP using two models. The first model attempted to comprehend the existing relationship of GAP's regulatory quality, rule of law and government effectiveness on the Ganges river pollution. The results revealed that neither of these seem to have made any significant contribution towards improving the river water quality. With around 22 million cases pending in the Indian courts and six million of those lasting longer than five years, one cannot really expect GAP's formal regulatory quality to have deterred Ganges water pollution. In addition, there is a lack of government support in terms of finances to the Judiciary which adds on to the weakening regulatory quality. In 2016, for instance, only 0.2 per cent of the government budget was allocated to the Ministry of Law and Justice, one of the lowest proportions in the world¹³⁷. Further, the mere existence of institutions and investment through them does not necessarily translate into successful river action plans is substantiated by the fact that even government effectiveness and rule of law of the GAP do not seem to have any impact on the Ganges river water quality.

The second model in this study was formulated to understand the role of GAP's regulatory quality in decision making of institutions or public at large. The NGO's or civil society organisations seem to affect the regulatory quality of the GAP significantly and positively. Of late, in India the NGO's have contributed considerably towards environmental management through conducting public awareness programs, promoting the issues internationally to gain more funding, working at the ground level to get a better understanding of the obstacles faced by GAP and also find viable solutions. Though in this model as well, the local government environmental expenditure does not seem to affect the regulatory quality in any way.

Through both the results, it could be concluded that the existing institutions under the GAP do not seem to be working efficiently due to implementation failure. But the underlying causes for implementation failure are not limited to inefficient institutions. Along with an indistinct legislative basis for the GAP, absence of heavy penalties/fines for not meeting targets on time, non-existent system for a follow up of the directions issued by the environmental courts, lack of legal powers of the environmental courts, lack of personnel training at the ground level for the GAP, inefficient monitoring systems, involvement of multiple agencies for the same work and planning the GAP without a thorough

¹³⁶ Jennifer S. Schiff, 'Silencing the Opposition: The State v. Civil Society in India's Ganges River Basin' [2014] International Studies Perspectives 229

¹³⁷ Vidhi Doshi, 'India's long wait for justice: 27m court cases trapped in legal logjam' *The Guardian* (India, 5 May 2016)

field investigation contributes towards it. Also the effluent standards of the wastewater discharged into the river is completely arbitrary and framed without any scientific rationale.

Policy implications

The legal basis of the GAP is weak and provides limited guidance characterised by overlapping responsibilities across multiple agencies. Therefore, the need of the hour is to formulate a well-defined legal basis for GAP which clearly outlines the responsibilities of each agency involved, along with indicating the Ministries responsible for the implementation of the GAP. In case of failure of implementation of the GAP, the legislative basis should also include strict penalties/fines to be imposed on the Ministries or the government bodies responsible for it. Further to ensure effective regulatory quality results in lowering the Ganga water pollution, along with giving greater legal powers to the NGT¹³⁸ there is also an urgent need to make provisions for following up of the directions issued by the Judiciary, as more often than not the state governments/ Central government/pollution control boards fails to comply with them.

This study also found that NGO's seem to have a greater impact in reducing Ganga water pollution. In the existing GAP though NGO's have been included on paper but they have not been allocated funds nor were they included while formulation of the GAP. Given the Ganga water quality is reducing at an unprecedented rate, in a country like India with wide geographical, demographical and income differences it is extremely important to understand that the hurdles faced by different regions cannot have the same solutions. For instance, the SMF functioning in the state of UP identified that cities like Kanpur were facing shortage of electricity and were therefore unable to operate the sewage treatment plants. The SMF along with the local municipality also helped the city come up with a viable solution for this. To understand the problems at the ground level, the NGO's are the best option available as they usually do not have any bigger political motives. Therefore, there is a need to grant considerable amount of economic and legal power to NGO's and regional water authorities as well. Also, as the Ganges river is a religious river for the Hindus the GAP needs to be implemented without hurting the sentiments of the people. There is a greater need to conduct more public awareness programs especially in the rural areas to educate people regarding the dire consequences faced by their 'beloved river'. And as people are more likely to believe the NGO's than the government, involving them at the ground level is the only viable option available.

¹³⁸ The NGT's success rate in terms of solving environmental disputes is really high (in a span of four years has disposed of 82 per cent of the cases) but because it does not have the powers to act 'suo moto'(term mostly used in India when a higher authority takes an action on an important issue without consulting any minister/ministries and that decision holds) in environmental cases the Ministries do not pay any attention to its orders.

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Appendix

Table 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°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°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°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°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)

Table 2: Data sources for Model 1

Variable	Data Sources
CivC + CrimC _{it} (RQ)	(2006-2010) Supreme Court of India (2010-2014) National Green Tribunal's(NGT)
No. T _{it} (RL)	Ministry of Drinking water and sanitation
IETP _{it} (GE)	NGRBA, NMCG, CPCB, National Institute for Public Finance and Policy, Swachh Bharat Mission and Ministry of Drinking Water and Sanitation
PCNSDP _{it}	Reserve Bank of India(RBI)
Pop _{it}	Census of India
Indst _{it}	Reserve Bank of India(RBI)
BOD _{it} (waterpoll)	CPCB, MoEF and ENVIS CPCB

Table 3: Data sources for Model 2

Variable	Data Sources
CivC + CrimC _{it} (RQ)	(2006-2010) Supreme Court of India (2010-2014) National Green Tribunal's(NGT)
BOD _{it} (waterpoll)	CPCB, MoEF and ENVIS CPCB
Pop _{it}	Census of India
LGEE _{it}	MoEF , Ministry of Drinking Water and Sanitation
NNGO _{it}	National Institution for Transforming India (NITI Aayog), Government of India

