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Challenges of water governance in the context of water quality problem: Comparative study of India, Indonesia and Germany

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Abstract

This paper discusses water governance in India, Indonesia and Germany especially in the context of surface water pollution. Each country undertook various initiatives from time to time. Germany provides important lessons for India and Indonesia. However, command–control and techno-centric approach hitherto followed for water governance have limitations. The challenge is to evolve water governance that is participatory and stresses on source sustainability. It is suggested that such studies covering developed and developing countries are important for drawing lessons leading to decision making at the national and global levels.

Key words: *Water governance, pollution control rules and regulations, India, Indonesia and Germany.*

1.0 Introduction

Human induced water quality degradation through nutrient enrichment and contaminant pollution is one of the problems encountered by both developed and developing countries. While the rich nations offset the pollution related water stress through huge investment in water technology without remedying the underlying causes, the developing nations continue to remain vulnerable (Vorosmarty et al., 2010). Water governance for increasing pollution abetment measures and water reuse is felt necessary in all water management related deliberations across the world in recent years. Along with technology transfer, which dominated most of the water management dialogues between developed and developing countries there is growing emphasis on understanding of the nature of policy interventions in the developed countries that has helped them to ameliorate situation, and draw lessons for developing countries, for which comparative studies covering both developed and developing countries assume great significance.

In this study, we consider three countries, namely, India, Indonesia and Germany for a comparative analysis. These three countries are characteristically different in biophysical setup, levels of economic development and demographic characteristics; however, all three countries are water rich with certain hydrological specificity. While Germany is a country falling in the high income group with per capita income (PPP) of US $43,919, both India and Indonesia are considered as middle income group countries with per capita income (PPP) of US $5494 and 9788 respectively. It is largely established that the state of water governance and economic development of a country are

positively related (Briscoe, 2009). Germany faced water quality problem during 1950s and 1960s, however it has successfully overcome the situation and presently it is one of the countries served by very high quality water. Conversely, both India and Indonesia are passing through a phase of water quality degradation. Surface water bodies and aquifer waters are highly affected in both these countries. This study proposes to discuss prevailing water governance in these countries and to draw lessons.

2.0 Water governance in India

2.1 Constitution of Central Pollution Control Board

Traditionally water governance in India was for irrigation purposes and in case of urban centres it was for drinking water supply. Deterioration of water quality emerged as a matter of concern at the policy planning level in early seventies. The Indian parliament passed the Water (prevention and control of pollution) Act, in 1974. Central Pollution Control Board (CPCB) was constituted under the Act No 6 of this Water Act and was entrusted with the job of controlling water quality. This Act No 6 was also instrumental in setting up State Pollution Control Boards at the State level. Subsequently there were Water Rules, and Water Rules for Transactions of business in 1975, the Water Cess act, 1977 and Water Cess rules, 1978. The Pollution Control Acts, Rules and Notifications were issued there under. Environment protection rules 1986 rule 3 set the standards for discharges from the industries (CPCB, 2010).

2.2 Gradation of rivers

Water quality monitoring of the rivers started with the all India level programme of Central Pollution Control Board (CPCB), Government of India. The monitoring is done for Global Environmental Monitoring System (GEMS) and monitoring of India National Aquatic Resource System. The data are reported in water quality statistical year book (Bhardwaj, 2005). Based on total coliform, pH, DO and BOD all rivers are classified under five categories from A (Drinking water source without conventional treatment but after disinfection), B (Outdoor bathing), C (Drinking water source with conventional treatment followed by disinfection), D (Propagation of wild life and fisheries) and E (Irrigation, industrial cooling and controlled waste disposal). The CPCB data analysis from 1995 to 2011 indicated that organic and bacterial contamination continued to be critical in the water bodies. This is mainly due to discharge of domestic sewage, mostly in the untreated form from the urban pockets in the country and lack of compliance with regulations by the industries, particularly small and medium-sized enterprises (SMEs) (OECD, 2006). The pollution control laws in India have neither kept pace with constitutional directives nor have they operationalised the scope for action. Policy and laws have been existing without any coordination between the two, affecting the enforcement of regulations.

2.3 Water policy

The First National Water Policy (NWP) was adopted in 1987, which was revised in 2002 and 2012. Global transitions in water governance, including promotion of

Integrated Water Resources Management (IWRM), river basin approaches and inclusion of participation are also reflected in the India government's policy (UNICEF, 2013). In general terms, there is a clear policy shift from a supply-driven to a demand-driven approach, characterised by decentralisation and user participation. The country's comprehensive National Water Policy (NWP) addresses water as a state subject which is a finite and vulnerable resource and focuses on the importance of a river basin governance approach involving various stakeholders.

2.4 Cleaning of Rivers

Clean Ganga project taken up during 1980s. National Ganga River Basin Authority (NGRBA) has been established to spearhead the activities. The principal aim is to i) prepare a river basin management plan and ii) Regulation of activities aimed at prevention, control and abatement of pollution in Ganga to maintain its water quality and to take measures relevant to river ecology and management in the Ganga basin States. Restoration of Yamuna river is another programme being initiated involving Central and State Governments. Thames River Restoration Trust (TRRT) of UK is extending help to restore Yamuna river. Besides, there are several other attempts undertaken by Government Departments and NGOs. Restoration of Nagpur rivers was taken up by Nagpur Municipal Corporation in 2013 (Puranik and Kulkarni, 2014) after preparation of a detailed restoration plan at the instance of the Nagpur Municipal Corporation (Anon., 2012). Chennai River Restoration Trust under Government of Tamil Nadu has initiated ecorestoration of Adyar Creek, Adyar creek estuary and Cooum river. Detailed project report (DPR) for restoration of Cooum river is underway. The Sabarmati river front project, executed by the Ahmedabad Municipal Corporation in 1997, concentrated on beautification of river front. Similar initiatives are reported from different States. In Kerala there are projects involving local self governments and people at large to improve water quality. International cooperation is also envisaged at different level, but the approach is piecemeal and yet to produce desired results. Apart from meeting water demands of population, realising importance of ecosystem approaches, need for ecological restoration, maintaining environmental flow and similar broader issues are visible in policy shifts although nutrient management is yet to figure in water quality management. Most of the policies and guidelines appear to fault at implementation level. In spite of CPCB's stipulation on effluent discharge and of policy adaptation water quality is degraded in all the rivers in the country.

2.5 Challenges

Water governance in India generally followed command and control (CAC) approach that sets emission or effluent standards to curb industrial pollution. The success in abating and controlling pollution has been limited due to poor monitoring and enforcement of environmental laws by the PCBs which in turn is due to slow response of courts in enforcing actions sought by state PCBs, financial constraint of the Boards, low penalties for non-compliance, widespread corruption and preponderance of small-scale units that lack any technical, financial and managerial capabilities to treat their effluents.

Water law in India is not uniform across the States and somewhat inadequate to deal with today's complex water situation characterized by scarcity and depletion of this renewable but limited resource, and increased demand (TERI, 2014). There is a need for paradigm shift in water governance comprising science based water policy and a Central Water Framework Law that will provide scope for enhanced technical support and involvement of all stake holders. Multi-level and poly centric water governance may help to address many of the technical and institutional issues like empowerment for service delivery, efficient management and source sustainability and strike a balance between 'bottom –up' and 'top-down' approach as all water issues cannot be captured at a single level.

3.0 Water Governance in Indonesia

Bearing the colonial legacy Indonesia had a command and control governance system addressing the problems of few urban centric stakeholders. Land use change, agricultural development, industrialisation and population growth have not only placed increasing pressure and competing demand on available water resources but also caused water quality deterioration, thereby reducing the resource base itself.

3.1 Laws and regulations

Beginning with the Article 33 of 1945 Constitution and subsequent laws like Agrarian Law No. 5 of 1960, Law no 11 of 1974 on water resources and Government regulations no 22 and 23 of 1982 on water resources management and irrigation and drainage formed the basic national rules and regulation for governing water resource management (Sarwan et al, 2004). The Government Regulation No. 22 of 1982 stressed on river basin management. Based on a 1989 and 1990 Decrees 5590 river basins in Indonesia were grouped into 90 river basin management units (*Wilayah Sungai*) of which 72 river basins are managed by the regional Governments, 15 river basins are managed directly by the Minister of Public Works, and public corporations manage the rest three basins, namely, the Brantas river basin, the Bengawan Solo river basin and the Citarum river basin (ibid). Some other river basins in Java, Sulawesi, and Sumatra have already begun developing public river basin management institutions.

Since 2004 there had been a change and Indonesia witnessed a paradigm shift in water resource management to address the issues of economic, social and environmental concern. There had been several rules and regulations promulgamated from time to time for environmental management and to prevent water pollution (Kurniawan 2014, Wibowa, 2010). Issue of water pollution control was addressed since adaptation of Act no 23 of 1979 on Environmental Management. The Government Regulation No. 82 of 2001 on Water Quality Management and Water Pollution Control established the framework for implementation of water pollution control, including aspects of prevention, protection and recovery. The Act No. 18 of 2003 dealt with Solid Waste Management. The Law no 26 of 2007 was for spatial planning, in which water quality management was a component. The Act No. 32 of 2009 on Environmental Protection and Management and Article 54 (2) envisaged

recovery of environmental function of water through: (a) discontinuation of source of pollution and cleaning of pollutant; (b) remediation; (c) rehabilitation; (d) restoration; and/or (e) other measures in accordance with scientific and technological developments. MOE Decree for Effluent Standard of various sources tried to set concentration and the maximum load permit system for point sources (Kumiawan, 2014)

3.2 PROPER AND PROKASIH

PROPER (Programme for Pollution Evaluation and Performance Rating) and PROKASIH (Program Kali Bersih-Clean River Program) were two important initiatives to control water pollution (Wheeler and Afsah, 2005). PROPER is a disclosure scheme meant for the Corporate Houses listed in stock exchange deal with foreign product and have significant impact on environment. It is primarily a point source management for water, air and hazardous material. The Clean River Programme (PROKASIH) is an integrated water pollution control programme that reduces the burden of water pollution at the source. It is executed in cooperation between the provincial regional governments and the regency/municipality regional governments. Besides there was intensive monitoring and inspection schemes for compliance, improvement and reduction of emission from the institutions that are not covered under PROPER and PROKASIH programmes. These programmes yet to produce desired results as number of organizations adhering to the prescribed regulations are below the critical mass (Wibowo, undated).

3.3 Integrated Water Resource Management Initiative

These regulatory measures had not yielded desired results as was evident from the report that the river Citarum, which was one of the high priority rivers for pollution abetment continued to be in a precarious situation. Toxic industrial chemicals flowed through this river freely, turning the river into a waste dump site. The rehabilitation project taken up for the Citarum river since 2007with a loan from Asian Development Bank following the frame of Integrated Water Resource Management (IWRM) was not so effective as GWP (Global Water Partnership) toolbox concepts for IWRM did not get transferred into the ground reality in many areas and even the bigger problems of enforcing water quality standards and compliances in the upper basin and the issue of compensating the displaced people had not been adequately addressed (Cavelle, 2013). The lower reaches of most rivers are already polluted beyond the capacity of existing treatment plants. The technical feasibility will be to upgrade the plant to handle more polluted water but this will be an expensive solution and would address the problem till pollution level exceeds the treatment capacity. The only sustainable solution is to address the issue at source, i.e to address the growing challenge of urban and industrial pollution (Fulazzaky, 2014). Nutrient flow from agricultural field and livestock is also a matter of concern and Indonesian Government initiated programmes for site specific fertilizer recommendation for lowland rice in 2007. There were certain progress but it could not reduce the occurrence of nitrogen loss through surface run off, leaching and soil erosion (Widowati et. al, 2011).

3.4 Challenges

Lack of good governance has been identified as one of the causes underling deterioration of water quality in rivers and other public water resources due to pollution from domestic, commercial, industrial and agricultural sources (Global Water Partnership Southeast Asia, 2013). Overlapping functions among WRM institutions, unresolved conflicts in water use, lack of accurate WRM data and information, and lack of financing for WRM investment and infrastructure development are listed as indications of governance failure. Participation, capacity building, institutional framework and management instrument are important for effective implementation of the future IWRM. Both technical and non technical solutions are necessary to control human induced changes in water system.

4.0 Water Governance in Germany

Germany is a water rich country. Quality of drinking water is excellent and sufficient. Waste water treatment in Germany is also of high level and almost 100% waste water is treated to the highest level of EU purification standard. This achievement was possible through concerted efforts and definite policy decisions.

4.1 Federal Water Acts

The Federal Water Act (WHG), 1957 and Waste Water Charge Act (AbwAG), 1976 constituted the essential elements of water management and water pollution control in Germany. All subsequent laws like Waste water ordinance, Ordinance on ground water, Ordinance on long distance pipeline, Federal soil protection Act, Act of Fertilising etc evolved based on these Acts. The Federal government is also involved where international river basins are concerned. The states are responsible for establishing pricing policy within the framework set by the Federal Water Act (BFG, 2002).

4.2 Working Group on Water (LAWA)- an evolving institution

Germany generally followed two tier system in water management: Federal level and State level and in most Federal States water resource management was carried out in three levels: Supreme water authority-Ministry with water Resource Department; Upper water authority-Regional government responsible for water resource management and planning; Lower water authority-Rural districts or cities not belonging to a county as well as water resources authorities (BFG, 2002). The State (Lander) Working Group on Water (LAWA) established in 1956 coordinated water management, policy and legislation. Water and Land Management Associations (WLA) were the lowest management units evolved over the years as felt need from the bottom. The first Water Association Act was promulgated in 1937. Subsequently there were modifications due to historical reasons. New Water Association Act (WVG) was adopted in 1991 after unification. This federal Act provided the guidelines for the 16 states which were allowed to adopt WVG within defined limits according to different regional needs and tradition (ibid). The water and soil association act of 1991 is a legal framework for establishing land and water management consortia. Germany has 12,000 to 18,000 such institutions (Patel, 2009). Local self Governments are important components of water governance in Germany.

4.3 Water protection policy

The long term goals of German water protection policy were: to maintain and restore good ecological and chemical quality of water bodies, to ensure an adequate supply of drinking and process water, both in terms of quality and quantity, to secure for the long term all other uses of water. The water protection policy was based on precautionary principle, the polluters pay principle and cooperation of all water users and stake holders in water protection (www.bmub.bund.de). The water policy formed part of the environmental code to harmonise fragmented environmental legislation in Germany.

4.4 European Union Water Framework Directive (EUWFD)

The EU Water Framework Directive (WFD) provided as overarching frame for water management in whole of Europe. It set the goal of describing the characteristics of the river basins by 2004, to develop and start implementing river basin management plan by 2009 and to reach good status of surface and ground water by 2015. The programmes under WFD are integrated water resources development and management-integrated management of land resources, water resource assessment, protection of water resources, water quality and aquatic ecosystems- integrated watershed management; Drinking water supply and sanitation, Water and sustainable urban development, water for sustainable food production and rural development, impacts of climate change on water resources.

The Federal water act was updated to implement the EU Water Framework Directive adopted in 2000 and with Federal water act amendment of 2002 Germany completed transposition of European Water Framework Directive into federal framework legislation. Under new water legislation water management covered whole river basin districts and hydrological units, in place of State or country boundaries hitherto considered as decision making factors. The reforms finally concluded in 2006 vested new powers to the federal level in the field of water legislation to deal the issues more comprehensively. The Federal Water Act laid out the principal national framework and the State authorities and institutions decided the fresh water related issues. The instruments used for protection of water resources were: effluent disposal plan; effluent load plans; surface water and groundwater protection regulations; and the designation of flood-prone areas.

4.5 Nutrient governance

As farming was responsible for 50% of total nitrogen discharge into surface water there was a felt need to control nitrate from agriculture and livestock sectors. The Nitrates Directive of WFD (1991) aimed to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. The New fertilizer ordinance (2006) called for ban on fertilizer application, distance to water courses by 3m or exact application equipment, further restrictions on slope, limitation to fertilizer application considering N need and availability, establishment of fertiliser plan and limit of 170kg/h of N from livestock manure. The suggested Governance strategy for

nutrient management in Germany stressed on integration, analysis of N use and N flux at different levels, and according priority to increasing nitrogen efficiency (Godlinski et al., 2010). These initiatives were effective. Between 2004 and 2007 nitrate concentration in surface water remained stable or fell in 70% of the monitored sites (European Commission, 2010). Several measures were introduced to reduce nitrogen surplus by controlling agricultural, industrial and mining operations, particularly during post unification period (since 1990) and it had yielded definite results, however these were not sufficient to achieve the WFD target.

4.6 Polluters pay principle

Germany has successfully separated water administration and operation of water services with necessary self-governance and financial autonomy at the lower tiers. The system of water management associations proves to be effective at various levels. Polluters pay policy has provided financial independence for point source pollution management. Municipal integration of services and operational autonomy has also been achieved and there is effective and efficient use of water resources for drinking water supply applying high level of expert knowledge and technical competence which is recognized internationally. Due to installation of local waste water treatment plant and expansion of industrial effluent treatment and through strict adherence to the regulations water quality in Germany had improved significantly over the last 30 years.

4.7 Challenges

Emission from the point sources was significantly controlled in Germany, however, emission from the defused sources which could not be measured directly pose serious challenges for monitoring and taking appropriate prevention measures. The general attempt to address the problems was to follow technocentric approach. It was noted by various authors that agriculture, which contributed > 50% of nitrogen loading would continue to challenge the policy makers as reduction of nutrient fluxes from the farm lands to meet the WFD stipulation would be an uphill task and therefore, protection of water resources would be a major concern. As people seldom used river water directly for household purposes the issue of water quality at sources did not draw much public attention, but the problems deserved attention for resource sustainability. Different decision making levels and discrepancies between national, federal and international policies also contributed in this matter. Integration in environmental policy was yet to be achieved. Although Germany had a long history of community based organization at the lowest level, the stake holders' participation in environmental management might not bring desired results if the political will at the higher level does not concur. Nevertheless a well crafted agreement is necessary for involving stakeholders in case opportunities open (Drakiewicz et al, 2015).

5.0 Comparison and Lessons

Water governance evolves according to the political, historical, legal, administrative, geographical and economic circumstances prevailing in a country (Araral and Yu, 2013). Over the years with growth and development there are changes in water management practices in all three countries

(Table 1). Levels of development and water governance show positive relations. Accordingly, challenges vary from one country to another although there are certain commonalities (Table 2). Comparative study brings out that there are several experiences to be shared and important lessons may be learnt to address challenges of water resource management. Provisioning of safe drinking water is the topmost priority in case of India and Indonesia whereas nutrient management is the most challenging issue for Germany, a country which has successfully managed point sources of pollution and attained the highest quality in drinking water in the world.

Table 1: Changing water management initiatives

India	Indonesia	Germany
1960: Post Independence initiatives 1970: Irrigation infrastructure 1980: National water policy, decentralization 1990: Watershed based development 2000: National water policy 2010: National water policy with changed priority IWRM	1960: Post independence initiatives, water law 1970: New order resolution, Dutch involvement in water management 1990: ADB and Japan involvement, Reform and decentralization 2000: New framework Water law, 2004 IWRM	Till 1960: Centralised system with expert knowledge 1970: Ecological concern, European water legislation 1980: Quality target set, European water laws 2000: European Water Framework Directive Water balance law, 2003, monitoring programme set up, management plans prepared IWRM

Table 2: Challenges of Water Governance in India, Indonesia and Germany

India	Indonesia	Germany
• Providing quality drinking water • Sectoral allocation of water • Incidence of water related disasters • Pollution of water bodies • Institutional mechanism • Implementation of water policy • Coordination/ Integration	• Providing quality drinking water • Sectoral allocation • Incidence of water related disasters • Pollution of water bodies • Slow adaptation to Institutions • Gap between reform and execution • Coordination/ Integration	• Reducing nutrients • Coordination and integration • Conflict resolution • Human resource • Problems of renaturalisation of river • Decentralisation

• Decentralisation • Innovations • Public participation • Source sustainability	• Democratisation and dcentralisation • Public participation • Source sustainability	• Public participation • Source sustainability

Hitherto all three countries followed command and control system and most of the initiatives were techno-centric operations. The challenge is to change this approach and evolve water governance that is participatory and stresses on source sustainability. There had been several changes in national and state level policies in all three countries.

Germany is one of the countries noted for high accomplishment in water management with strong application of science and technology and a 'belief in the human mastery of water resources' (Blackbourn, 2006 c.r Neef, 2008). There was tremendous economic progress and significant gain in human well being and livelihood opportunities. However, due to extractive use of natural resource environmental problems cropped up and water was one of the sectors to have been affected. Majority of water courses were structurally altered through in-stream intervention and flood plain modification and water quality in most of the water bodies had been severely impaired. Since 1960s there were thrust on checking water pollution at the sources and point sources are mostly controlled. Various rules and regulations concerning the protection of water sources, the treatment of effluents and the use of chemicals in agriculture, households and industries were promulgated under federal and state legislation. (Neef, 2008). The WFD guidelines provided an overarching framework including scope of public participation to achieve targets in environmental remediation within a reasonable time frame. There were positive gains in water quality improvements during last two decades but the challenge remained to improve water quality further to meet the target of WFD within the stipulated time and also to renaturalise the water courses, most of which have been grossly altered. In India there is yet any specific attempt to control nutrient flux and improve water quality of the inter-state rivers. In case of India and Indonesia, governance of point sources has not been fully accomplished and non point source pollution or fertilizer management is yet to be initiated.

People's participation is considered as one of the main elements in water governance. In India there are few States like Kerala which has successfully demonstrated the positive impact of people's participation and internalised the process of democratic decentralisation. There were civil society movements, save river campaigns, and people's initiatives to protect rivers and water bodies. Similar initiatives are noted in other States also. Although in the matter of overall water governance for water quality and source sustainability the scope of people's participation is yet to be explored properly. In case of Java, people's participation is in nascent state. In Germany,

effective public participation is limited, principally, due to disconnect of people with the river. As good quality water is supplied to people it is difficult to communicate importance of river water management and its linkage to source sustainability. The existing framework of public participation provides facilities for consultation, which is not sufficient to draw people in decision making and implementation.

6.0 Conclusion

This study analysed the water governance in India, Indonesia and Germany. Germany has advanced significantly in controlling nutrient related pollution, particularly in combating point source of pollution. Since 2001 there were new initiatives –improvements in accountability, private sector participation, integrated approach, introduction of water laws, policies and practices and emphasis on people's participation. The general trend is to upscale and also decentralize the water management issues and State's role as an actor in water management seems to be reducing. Proposal to introduce IWRM in all three countries and Germany's following of EUWFD framework indicate globalization and also Europeasation of water governance issue at the same time emphasis on decentralization and people's participation highlights the trend of transferring governance issue to the local level. While thrust on decentralization and local level governance are necessary for governing a decentralized resource like water, larger questions of institutionaistaion, capacity building and source sustainability remain challenging issues. The nutrient management is yet to figure in India and Indonesia where nutrient pollution in water is low to moderate and the necessary thrust is on drinking water. In case of Germany, nutrient management is the biggest challenge. The issue of drinking water has been well managed decades before.

Both India and Indonesia can learn from the German experience of point source management, however, the route followed by Germany may not be appropriate in both the cases as technology related investment in both these countries will be very high and given the dispersed nature of settlement pattern and investment required. Moreover the necessity of renaturalisation of rivers/ water bodies is well understood in Germany and there are several programmes under EUWED in this direction. Technological intervention as is being practiced in the developed countries has its own limitations. There is a need to limit threat at the source of pollution instead of costly remediation of symptoms in order to assure global water security. Polluters pay principle followed in Germany particularly payment for waste water is yet to find favour in India and Indonesia. The appropriate and timely governance to manage the catchment might yield significant results. This study underscores the necessity of similar comparative studies to develop knowledge base on human induced nutrient flux into surface water bodies and governance while situating the developing and developed countries in the context of recent global and regional development in water management initiatives.

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