Development and implications of climate impact, and role of science on Water Policy of India

Introduction

Inappropriate management of water resources leads to a range of anthropological and ecological issues. Destruction of aquatic systems, anthropogenic water contamination, and growing risk of inter-state and intra-state political confrontations highlight water as a commonly available yet precious commodity. With a huge population to feed and an acutely worsening water profile in the country, India sits on a ticking water bomb and urgently needs to align long-term water planning and management with principles of sustainability and equity. Climate change implications make the situation even starker and require Indian policymakers to leverage unconventional measures. Public participation is an important aspect that water policy and its solution framework need to pay attention to and closely work with. In this backdrop, water policy interacts with science for optimal solutions on hand and with people's perception on the other. To ensure appropriate alignment of policy and science, and to reconcile them with stakeholder's perceptions, which sometimes could be varying or conflicting, it is important to understand the underlying value system in the context of water policy and develop tools to demonstrate its impact.

With limited literature available on the review of India's Water Policy in the light of Climate change and scientific interventions, I have attempted to provide critique on the topic.

Situation of Water Profile

Traditionally, India has been water-rich with large freshwater reserves and cyclically spread rainfall replenishing water reserves. However, an increase in water-intensive farming and consumption habits, growth in population, increased urbanization, expanding industrial

bases, and the absence of a proper model of water replenishment has pushed it to the grim side of the water resource continuum.

Roughly 90% of water consumption is in agriculture which sustains approximately 60% of the population. From a demand-side standpoint, there is a trend of the net increase in urbanization which means a three-fold increase in per capita water requirement and a growing trend of planting water-intensive crops will put an additional burden on the water table and reserves. Also, rise in exports and domestic demand for the grains, change in consumption pattern, overexploitation of the groundwater, and increase in wastewater discharge make the situation alarming. From a supply-side standpoint, major river basins e.g. Ganges, Krishna, Kaveri, and the Godavari, which jointly fetch water to more than one billion people which are far more than in any other developing country, spend 90% of their water-stock on irrigation which makes the transaction cost of irrigation extremely high with opportunity cost included. Groundwater depletion is already impacting many of these river basins and scenario-based forecasts say that we might lose 50-75% across all four basins by 2050 (Grail Research, 2009).

Water Policy in India

Water policy, in India, works at two levels. National Water Policy (NWP) was commenced in 1987 and the state water policy framework is placed under its purview. NWP prioritizes water in terms of its physical need and social value such as drinking water gets foremost place followed by irrigation, hydropower, etc. (FAO, 2010). NWP recommends alternatives and optimal methods of water use i.e. groundwater recharge, desalination, rainwater harvesting, etc. with mandatory water pooling programs at the state levels. Participatory methods of beneficiaries are in practice to garner efficient use of water for irrigation purposes through the Water User's Association (WUA) (Taenzler et al., 2011). Considering acute and worsening water-related challenges, several initiatives have been taken by Indian policymakers (USAID, 2010) in renewing water sector infrastructure, supplementing additional channels to ensure water availability and use of advanced technology.

National Water Policy (2012), as recommended by the National Water Board of India, recognizes the contribution of research in addressing water sector issues in a scientific manner which includes design and planning, preparing annual water profiles, basin accounting, preparing hydrologic balances, benchmarking, and performance evaluation, etc.

Water Policy plans to set up a comprehensive plan to train and educate water planners and practitioners in the latest water technology. It also plans to set up an autonomous center for water policy to critically evaluate policy decisions and help evolve the policy directive (GoI, 2012). The policy supports restoration programs at national, state, and local levels by promoting water-efficient technologies to minimize waste such as membrane chemistry bringing the purification cost down by up to 50%; Nano technology-led filter being experimented by Indian Institute of Technology, Madras; seawater desalination, smart irrigation, etc. It also propagates increasing storage capacity to de-stress groundwater use, recharging the underground water, conservation of wetlands, etc. The private-Public partnership is encouraging and incentivizing the private sector to invest in the proper industrial waste disposal and build a water footprint to avoid water activism as in the case of Coca-Cola India (BBC, 2011).

POLITICS OF WATER SECURITY

India has witnessed an unfavorable transition from being a water-rich to a water-insecure country in just 50 years with average annual precipitation staying roughly static at approximately 1,100 mm (World Bank, 2011) with a change in the pattern though. Some of the statistics such as average annual per capita renewable freshwater has shrunk by approximately 65%. Compulsions of electoral politics in the form of subsidy-led populism, moribund development machinery of the state, inefficient water bureaucracy, and ignorant approach of society towards using the natural resources have made water a super-premium commodity. With rapid urbanization underway, Indian cities would need significantly more water which is potentially supplied by rural areas and this would further intensify the urban-rural divide in water and food insecurity. India has witnessed numerous water-borne conflicts between political entities and institutions with Uttar Pradesh-Delhi sparring on Ganga waters, violence on Bilaspur Dam on the issue of water, and Karnataka-Tamilnadu water conflict being the cases in point. Some of these conflicts emanate from extreme water-inequity where the poor might have to pay 8-20 times more compared to what the rich pay. It is difficult to state whether it is causation or a pure coincidence but the Water situation has gone from seasonally scarce to chronically absent since water governance ownership was moved from the community to techno-economic bureaucracy.

At the time of the launch of the Water Policy in 2002, the Indian Prime Minister stated that the policy needs to do the needful to ensure that the community is the custodian of water.

Soon after the policy in play, the Indian state of Chhattisgarh allowed water privatization as water is constitutionally a state asset. Critics of the current policy framework argue that while water policy is attempting to address water insufficiency at an overall level, it flared up water inequity. Some states such as Kerala have granted private businesses open access to groundwater to attract foreign direct investment without ensuring that appropriate governance frameworks are in place to protect the rights of the community and had to legislate to protect the local community's water rights

Politically speaking, water is a hugely contested space in the Indian context primarily because of severe shortage, a large part of the population is dependent on agriculture, which in turn, banks on water, and lack of central governance and ownership.

Role of Science in Water Policy so far

While science has played an increasing role in framing Indian water policy, its role is limited in its application to solve the critical challenges emerging from the political economy of water and scientific contexts (Lopez Gunn et al., 2011). Much on the lines of the EU and the USA, India seems to be facing similar challenges where water policy and governance frameworks propagate participatory decision making and technology-led transparency but the goals, as instituted in Dublin principles and Rio, are rarely met. It is argued that Indian policymakers continue to see science's role in providing only incremental solutions. While technology has played in bringing awareness amongst people about the looming water crisis and also in making policymakers aware of the consequences, politics of democracy remains lackadaisical in supporting changes in the way people value and perceive collective assets such as water and in correcting the way we deal with it.

Public Participation and Transparency in Water Policy so far

India has witnessed many social movements inspired by water insecurity or transnational sharing of water between the states e.g. Sardar Sarovar Project. Many of those movements were mobilized to address underlying water-related anomalies embedded in social ethics and policy. Narmada Bachao Andolan (Save Narmada River Movement) in India is an epic example of starting with the noble objective of addressing climate change, what science can achieve, and where policy can fail. Sardar Sarovar, in the western Indian state of Gujarat, is one of the highest man-made constructions at 138 meters with a potential of providing irrigation water to 1.8 million hectares with 1,450 megawatts hydropower installed capacity. Policy and

participation issues in the resettlement of displaced people threw the entire development out of gear and arguably planted suspicion in people's minds of collusion between policy and science. Additionally, Governance of controversy and administration of information has been extremely poor and it might mean that future water-related climate change projects face people's skepticism. Expression of anger, in the Narmada case, was also about the lack of participation, continued exclusion, retention of knowledge in a select group, and lack of transparency which could have been addressed by appropriate policy and application of science

Transparency is a core element of water governance which ensures fair allocation and incentivizes efficient use (WEF 2008). Governance and public policy go hand in hand, reinforcing each other with their impact accentuated through the use of science either favorably or otherwise. Transparency International (2008) reported that 20-30% of the program budget in building and maintaining water and sanitation infrastructure in the Kerala public sector (India) was lost to corruption and never reported. The use of the Geographic Information System is providing support in taking measures to galvanize people's opinions to check corruption and build a culture of accountability. In India, these efforts are mostly privately driven, limited in the scope of work and geographical reach, and not institutionalized.

Impact of climate change on water security and how policy framework is responding to that

India is witnessing a characteristic trend of shifting climatic patterns with a significant increase in mean surface temperature by 0.51% per 100 years during 1901-2007 (Kothawale et al.. 2010), accelerated warming particularly after 1971 with a 0.2 degrees increase per decade and a higher annual mean temperature projected for 2030 with up to 2 degrees increase (INCCA, 2010). vulnerable. Meehl et al. (2007) indicate a global sea-level rise of approx. 0.2-0.6 mt by 2100 which means that a section of the Indian east coast might be submerged if sea-level rise were to happen uniformly. Factors such as sea-level rise, surface warming, change in the profile of flora and fauna, reduced water supply due to glacial meltdown are some of the key climate challenges which make current water challenges formidable in the not-so-distant future in India. Key forecasts indicate an increase in temperature by up to 4 degrees Celsius by 2050s with potentially catastrophic impact on arid regions (GoI, 2004, 2009); a change in the pattern of rainfall with seasonal change of up to 10%; water shortage

and energy paucity by Himalayan glacier retreat (IDSA, 2009, GoI, 2008); an increase in frequency and magnitude of extreme weather incidents leading to freshwater contamination, submerging coastlines and so on.

Water management is the key in adapting to climate variability and change and in ensuring a resilient economy (Lopez-Gunn, 2009). Traditional practices i.e. terracing, fallow periods will need to be blended with cutting-edge research in the latest technologies to provide a locally-nuanced water management solution. Dent et al. (2007, 2008) suggest that innovative schemes such as green water credit to rural users for using the fresh water at source efficiently should be encouraged. India is currently running possibly the largest scheme of this kind (known as NREGA – National Rural Employment Guarantee Act) for the rural poor with its policy and infrastructure in place which could be cross-used for water credits too, thus lowering the time to implement and transaction cost. Such theme-based interventions with pay-off milestones could be instrumental in making rural communities aware of the broader climate issues, align their behavior and make them financially better off. Implications of rural participatory policies also address issues around climate justice and democratizing the knowledge. Public engagement helps in the quality assurance of the research process by providing much-needed feedback and becoming a frontline champion of bringing science-led change.

How science is mobilized to help water insecurity: A critique

National Action Plan for Climate Change (NAPCC), a policy-making body, focuses on laying a platform of economic growth coordinated with environmental responsibilities. NAPCC's key principles of protecting the vulnerable by sustainable climate management strategy, ecological re-set by balancing GHG emission, build linkages with civil society and private partnerships, and encouraging the exchange of research capabilities and technology require deploying appropriate technology for adaptation and mitigation of key climate change events adversely impacting the water profile. National Action Plan intends to use scientific methods to understand climate change, adaptation, and mitigation, and resource conservation. NAPCC, in combination with India's National Water Policy, targets to develop a framework for efficient water usage and achieve a target of 20% by use of scientific research and technology and changing regulatory entitlements. Technologies, in use, are conventional water recycling as well as low-temperature desalination technology which is particularly useful for coastal

cities. States play a particularly important role in formulating basin-level localized water policy to account for the changes in rainfall, the impact of climate change, and the scope of mitigation activities i.e. rainwater harvesting, storage, etc.

The government of India's Department of Science and Technology (DST) has initiated a nationwide program to encourage science and technology to intervene and bring in radical transformation. Their objectives include incentivizing the development of cost-effective and easy-to-operate technologies which benefit point of use (individual) and point of custody (community); conscious enhancement of low-power hybrid technology use; technically enabled water contamination disposal and use of new-age technology e.g. Nano-technology for step-through change. DST emphasizes involving research and development units, academicians, and industry to bring in know-how and market mechanisms as well as involving the communities and NGOs to participate to ensure user interests protected. While it appears to be a good initiative by the government, we find glaring gaps on a closer analysis highlighting the lack of governance and transparency. DST's Water Technology Initiatives (WTI) program victimizes the science because of suboptimal application and lacking outcome. I have another concern around narrowing the scope of science to specific applications which are determined by the DST in the sponsor's capacity. DST, inadvertently, is focusing on 'manageriality' dimension of science in a prescriptive fashion rather than asking the Science what it can do for a given problem. While I find the initiative heading in the right direction but it lacks the scale and subordination of science by prescription of policy are concerning factors. If we browse through all the WTI programs funded by DST, not many have gone to NGOs or other civil societies which raises questions as to what and whose objectives WTI caters to.

As Water means more than just a useful means of living in India and people associate cultural value with it, scientific evidence-based formula to resolve the water conflicts is oftentimes not adequate. Dialogue is not about what is the scientific possibility but more about science enabling the socially binding definition of truth (Beck, 1992). Stakeholders, with vested interests, challenge scientific autonomy to reach a predetermined outcome (Rosenstock, 2002) such as Professor Janakarajan's MSD (Multi-stakeholder discussion) initiative to resolve the Cauvery water sharing issue between states failed as both mainstream regional political parties of Tamilnadu did not participate in the resolution process. Water-related issues are

not faced with the scientisisation of politics yet as Indian society is yet to be exposed to extreme science leverage and participant's evidence-keenness.

On Science's objectivity plank, Lackey (2006) believes that the personal preference of some scientists might take them too close to policy options to remain objective. Scott et al. (2007) support Lackey's position and suggest that scientists who argue a research finding linking it closely with the policy matter risk not being seen as objective. IPCC's report of the Himalayan meltdown, causing a severe water crisis in parts of India, was seen to be supported by the National Research Council (US). Doomsday message framing by this report, primarily to make it more provocative and get attention, created huge insecurity in people's minds, a section of scientists and the Indian government had to take an opposite stand. At the end of the saga, I would argue science lost its credibility in the minds of people as laypeople don't know who to follow and tend to align with those who seem to be favoring their position.

In order to prepare for adaptation and mitigation, Policymakers need to have a reasonable view into the future and that's where they lean on science. While mixing personal preferences and agendas make the interactions complex, it cannot be denied that scientists have to balance between the relevant information for the policymakers with appropriate qualifications and highlight underlying uncertainty. While a large part of scientific and policy circles concur about the grave water situation in India, there are differences of opinions on how far measures like river-linking to provide water to water-hungry regions could help. The uncertainty of outcome has made the political interests run high which led to this ambitious project put on hold by the central government but an opposition-led state government has launched the scheme keeping the electoral populism in mind for 2014 elections (NDTV, 2014).

Closing Remarks

The Indian government has enacted several water policies and climate change guidelines. There are myriad institutions for governance and oversight. With all the plans, institutions, and governance frameworks, Indian water policy is getting patchy in managing the water crisis at hand. I think that Indian policymakers still approach the issue as an issue of scarcity of physical resources. Discursively and anthropologically, the meaning and relevance of water are well beyond it. It is about people's values, identity, local culture, the way they participate

in their networks and run utility functions. Water crisis can threaten not only people's livelihoods but potentially displace them losing their cultural identity. I would argue that science is playing a subordinated role to the policy agenda which is very concerning. With one of the largest river basins globally, being one of the largest countries in its resource base and economy, having a fairly developed institution base, India runs a severe risk of losing out the plot on the waterfront and that could be in our lifetime. There is still time to put the policy, physical and scientific assets together to turn the situation around.

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Note - All websites, as mentioned below, were visited between 15 April and 9 May 2014

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