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REGULATING THE INTERACTIONS BETWEEN CLIMATE CHANGE AND GROUNDWATER

LESSONS FROM INDIA

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Regulating the Interactions Between Climate Change and Groundwater: Lessons from India

Groundwater is often considered a largely local issue that is difficult to regulate. Further, groundwater regulation has often focused on use, rather than protection and conservation. There has thus been little integration of environmental concerns into groundwater regulation. Climate change calls for rethinking the regulatory framework for protecting and regulating groundwater. In India, the climate change regime has not given groundwater adequate prominence. Conversely, groundwater regulation remains largely detached from environmental challenges, including climate change. This needs to be addressed through regulation that links the two fields and is based on legal principles derived from the Constitution of India.

Keywords: water law, groundwater, climate change, India

Introduction

Traditionally, surface water has been the primary source of water for different uses in India. The use of groundwater was restricted, partly due to technological constraints. However, the situation has undergone a dramatic change in particular since the 1960s and the demand for, and use of, groundwater, either as a supplement or as an alternative to surface water, has exponentially increased (World Bank, 2010, p. 2). Some of the reasons relate to the nature of surface water resources such as their seasonality and unreliability. Others concern groundwater resources, such as their ability to act as a resilient buffer against cyclical natural climatic variability, their quality, availability of low-cost abstraction technology, and the availability of free or subsidized electricity.

India is now home to the largest number of groundwater users in the world (WWAP, 2012, p. 85). The problem is that the staggering increase in demand linked to a rapid rise in the number of groundwater extraction structures has led to a situation where use is often more than recharge. The overall stage of groundwater development, or annual consumption compared to recharge, of the country is 62 per cent. More specifically, 1071 over-exploited units,[1] 217 critical units, 697 semi-critical units, 4530 safe units and 92 saline units have been identified across the country in a study of 6607 assessment units (CGWB, 2014, p. ii). This state-of-affairs highlights the urgent need for groundwater regulation. However, while surface water has been a subject of statutory regulation for a long period of time (notably in the form of irrigation laws),[2] concerns over the quantity and quality of groundwater have received limited attention.

The challenges posed by climate change in the water sector merit urgent attention at the international, regional, national and local levels. Water resources in a country like India are particularly vulnerable to the adverse impacts of climate change, including severe drought in some areas of the country and severe flooding in other parts. Therefore, the negative consequences of anthropogenic climate change provide the justification for the development of a new paradigm of groundwater regulation. On the one hand, groundwater has the potential to play a critical role in alleviating the adverse impacts of climate change on water resources by meeting future demand for different uses. On the other hand, climate change can adversely affect the quantity and quality of the available groundwater.

As a preliminary step towards the development of such a new paradigm, this article evaluates the scope and limits of the existing domestic regulatory framework in addressing the link between groundwater and climate change in India. The rest of the article is structured as follows: The section following this introduction examines the interactions between global climate change and groundwater in the specific case of India. In the absence of a comprehensive framework governing climate change and groundwater, the next two sections seek to unpack the domestic law and policy responses – first, the consideration of climate change (or the environment more generally) in the framework for groundwater, and second, the extent to which concerns relating to groundwater have been accommodated in the framework concerning the environment (generally) and climate change (specifically). This is followed by an examination of the need for a comprehensive framework to ensure the integration of climate change and more broadly environmental concerns in groundwater regulation.

Interactions between Global Climate Change and Groundwater in India

There are pervasive links between climate change and groundwater that impact the water cycle from the local to the global level. On the one hand, climate change is largely addressed at the global level and the global water cycle is indeed directly linked to and impacted by climate change. On the other hand, groundwater is most often managed and regulated at the local level since in most cases it is accessed directly from the aquifer and used locally. Yet, climate change directly impacts groundwater as the rainfall that recharges most aquifers becomes increasingly uncertain.

Both climate change and groundwater are of central importance in India. Groundwater is the source of about 80 per cent of drinking water (Planning Commission of India, 2012a, p.145),[3] accounts for around 60 per cent of irrigation water use and is the only source of irrigation for the poorest farmers (Vijay Shankar, Kulkarni & Krishnan, 2011; Mukherji, Rawat & Shah, 2013). It is thus a lifeline for most people, and this makes it a key concern in terms of addressing the links between climate change and the water sector, both in terms of adaptation and mitigation (WWAP, 2012, p. 85).

There has been a tremendous increase in the use of groundwater for irrigation, rising from a net irrigated area of 6.00 million ha in 1951 to 37.87 million ha in 2007-2008 (Planning Commission of India, 2011). Reasons for these changes include the increasing availability and affordability of mechanised pumping and the unreliability of surface irrigation where it is available. In addition, since groundwater extraction, including over-abstraction, does not have the immediate visible consequences that drying rivers have, state governments have found it more politically convenient over time to subsidize the cost of groundwater extraction, such as through the provision of subsidised or free electricity.

Groundwater use may have positive or negative impacts on the local climate. One of the specific negative impacts is the contribution of groundwater extraction to India's greenhouse gas emissions (Shah, 2009). Rising exploitation of groundwater also leads to depletion of aquifers and increases the vulnerability of dependent ecosystems to the adverse impacts of climate change (Government of India, 2008, p. 32). At the same time, groundwater is far more resilient to the impacts of climate change than surface water (World Bank, 2010, p. 5). As a result, it can play an important role in climate change adaptation and disaster risk reduction by providing an additional or alternative source of water for different uses if managed sustainably (Villholth, 2009).

The links between (ground) water and climate change are apparent at various levels. Some of these links have been acknowledged in official documents for some time. Thus, the Government of India noted in 2004 that 'the projected climate change (…) will adversely affect the water balance in different parts of India and quality of ground water along the coastal plains' (MoEF, 2004). A number of possible impacts of climate change on groundwater resources have been identified. These include:

- Influence on groundwater recharge due to changes in components of water cycle such as evaporation, precipitation and evapo-transpiration;
- Increased intrusion of saltwater into coastal and island aquifers due to rising sea levels;
- Increase in frequency and severity of flood and drought events that may affect groundwater quality in alluvial aquifers; and
- Increase in rainfall intensity that may result in increase in flood events; higher surface run-off and soil erosion and possibly reduced recharge (MoEF, 2012, p. 114; Panwar & Chakrapani, 2013).

On the whole, however, the impacts of climate change on surface water resources have received far more attention than on groundwater. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change acknowledges that insufficient attention has been given to the relationship between groundwater and climate change (IPCC, 2014, p. 15). One reason is the physical and institutional invisibility of groundwater, the latter being due to land ownership being the determinant of access to groundwater. Hence its use has been overwhelmingly a private affair rather than being subject to government control (World Bank, 2010, p. 1).

There are several reasons to focus specifically on the groundwater-climate change link in law and policy. First, dependence on groundwater is likely to grow as a result of the increasing unreliability of availability of surface water. Addressing environmental challenges linked to water thus requires giving special attention to groundwater to ensure that the resource is exploited sustainably. Second, where the quality of surface water is impaired and where climate change may exacerbate this status, groundwater is central because it is often less susceptible to contamination and pollution. Third, the impacts of climate change on groundwater are likely to affect the realisation of the human right to water since groundwater is the primary source of drinking water and water for other basic human needs. Given that (ground) water is also a central element for the realisation of other human rights, in particular the right to food, to health and to a healthy environment, these rights also need to be taken into consideration when addressing the link between climate change and groundwater.

(Ground) Water Law and Climate Change: Towards Tackling Climate Change Implications

The legal framework governing groundwater in India is structured mostly around the common law right of landowners to access and control groundwater beneath their land (Cullet, 2014). The law recognises the right of landowners to extract groundwater without any regulatory oversight. Some states in India have adopted groundwater laws, most of which are closely based on the Model Bill to Regulate and Control the Development and Management of Groundwater, prepared by the Union Government in 2005. In most cases, this legislation applies to groundwater in general but the measures taken to regulate groundwater are quite limited in scope (Koonan, 2009, p. 182). Some

early mover states, such as Maharashtra and Karnataka, initially adopted legislation with a focus on drinking water but subsequently enacted broader groundwater legislation (Maharashtra Groundwater (Development and Management) Act, 2009 and Karnataka Groundwater (Regulation and Control of Development and Management) Act, 2011 respectively).

The sustainability and equity problems and shortcomings of this regime are well recorded (Srinivasan & Kulkarni, 2014). However, there is little analysis of the regime as it relates to the impacts of climate change. It is anticipated that groundwater overdraft may deepen in the future due to climate change. Given its comparatively low vulnerability to changing rainfall patterns, both in terms of quantity and quality, groundwater can make up for insufficient surface water supplies, at least for some years. However, this significant feature of groundwater is yet to inform the legal regime in India, which is more or less indifferent to climate change-induced challenges. Since almost all the existing state-level groundwater laws have been adopted in the last 15 years, lack of knowledge or awareness cannot be cited as a reason for this oversight. Lawmakers were apparently not apprised of the intricate linkage between groundwater and climate change. In fact, there is hardly any literature making the link, particularly from a legal point of view. Further, most of the states followed the convenient route of adopting the Model Groundwater Bill, 2005 discussed in the next section, which in turn was based on another model document drafted in 1970 when there was hardly any concern about the environment, let alone climate change. As a result, the existing legal regime is insensitive to, and unprepared to deal with, climate change-related challenges and implications.

The next section analyses how, and to what extent, the existing legal regime for groundwater in India addresses climate change-related challenges. It also discusses a way forward by analysing the potential of the proposed model groundwater law drafted by the Government of India to overcome the shortcomings from the point of view of climate change.

Land-based Groundwater Rights, Unsustainable Use and Equity Implications

One of the impacts of climate change is water related stress both in terms of quality and quantity resulting, for instance, from changing precipitation patterns. Water allocation is a major challenge during a crisis and such a situation demands a proper mechanism to ensure equitable allocation and use of the available sources. This is particularly relevant in the context of groundwater in India because it is the major source of drinking water and therefore a key source for the realisation of the fundamental human right to water whose core content includes at least domestic uses and arguably some livelihood uses too. Thus, climate change challenges demand a legal framework based on the principle of equity and the human right to water to regulate allocation and use of groundwater.

The existing legal regime for groundwater does not accommodate the principle of social equity that calls for ensuring that no person is deprived of sufficient access to groundwater because of other persons' uses and the human right to water. This is mainly because it is based on the common law notion that groundwater is a part and parcel of the land lying above the resource. Groundwater law in India follows this common law logic and gives uncontrolled power to landowners to use groundwater extracted from their land (Srinivasan & Kulkarni, 2014). Even though a number of states have enacted separate groundwater laws since the turn of the century, these laws

are invariably based on the model legislation first prepared by the Union Government in 1970 and recast in slightly updated forms several times until 2005. This model legislation is based on the recognition that there is looming physical scarcity brought about by the large-scale introduction of mechanised pumping. Measures proposed thus centre around regulating or prohibiting new groundwater extraction in areas that have been identified as being over-exploited. This does not affect pre-existing rights and access to groundwater, even where this may have contributed to falling water tables.

The exclusive right of landowners, as recognised by the existing groundwater law is in contravention of established legal principles such as the public trust doctrine, the human right to water and sustainable development because these principles do not approve a system of private appropriation of groundwater on the basis of land rights (Vani, 2009, p. 448). It is a visible contradiction in the Indian legal system that while these principles are well recognised, one of the critical sources of freshwater continues to be available only to landowners.

One of the central problems is that the existing legal regime excludes the landless and allows individuals and companies with land and money to exploit groundwater to the detriment of others. The impact of the existing law on the human right to water is critical because groundwater is the major source of freshwater for drinking and other domestic purposes in rural areas and often an important source of water in urban areas. In fact, the large-scale over-exploitation of groundwater, which has been facilitated by the common law rule, has already triggered a number of conflicts relating to groundwater use and allocation in India. For example, local communities in a few states are protesting against water-based industries such as Coca Cola and Pepsi for depleting and contaminating their groundwater sources due to over-exploitation (Koonan, 2010; Bijoy, 2006; Bhaduri, 2014).

The state groundwater laws address groundwater exploitation from a physical scarcity point of view at a broad level and they shy away from abolishing the land-based groundwater right. These laws do not mandate that groundwater should be allocated so as to realise equity and human rights. By implication, the state groundwater laws only protect the rights of landowners from infringement by other landowners. They do not ensure access to the landless and other vulnerable people. The problem with this approach is that it seeks to address an issue, which has its roots in local, national and international factors, without changing the focus of regulation that remains at the level of individual landowners. In other words, the current legal regime remains based around an atomised understanding of groundwater that considers its regulation exclusively at the level of individual plots of lands. This does not provide the basis for aquifer-wide measures and even less for introducing a climate change dimension to groundwater regulation.

Overall, the existing legal regime that allocates groundwater exclusively to landowners is unsustainable in a context where groundwater sources are fast depleting and are increasingly being contaminated. Such an approach will exacerbate inequity and the violation of the human right to water in a scenario of increased water vulnerability due to different reasons including climate change. The land-based groundwater right, therefore, needs to be abolished and replaced by a new legal framework that is sensitive to climate change-related challenges.

Inadequate Focus on Protection and the Need for an Aquifer Based Approach

Groundwater is central to climate change adaptation strategies because it is a more resilient freshwater source than surface water, and therefore it must be protected and conserved. However, the existing legal regime for groundwater in India lacks a strong emphasis on resource protection, which adds to its insensitivity to climate change-related challenges. The regime needs to focus more on protection in order to be able to deal with the crisis. The present approach, from a protection point of view, is piecemeal in nature as it mainly focuses on controlling groundwater extraction by landowners in places where over-extraction is already taking place without addressing issues related to recharge of the aquifer. Similarly, while rainwater harvesting can be a significant conservation measure, it is conceived in the existing laws in narrow terms. Thus, groundwater laws focus mostly on roof-top rainwater harvesting in urban areas. Rainwater harvesting has been made compulsory for certain large buildings in some legal instruments, such as the Bihar Groundwater (Regulation and Control of Development and Management) Act, 2006 (s 18) and the Bangalore Water Supply and Sewerage Act, 1964 (s 72A). Yet, rainwater harvesting must also take place in rural areas where individuals, communities and the government have taken a multitude of initiatives over time, including through the building of check dams. This should not only be encouraged but be made part of conservation strategies in legal instruments. This is not yet the case, and in some situations the rural population has been restrained from building such structures under the guise of ensuring better water flows to large dams (High Court of Rajasthan, 2004).

The regulation of over-exploitation and measures such as rainwater harvesting found in existing groundwater laws are beneficial but there are strong limitations to this micro-level, individualized approach. Protection measures need to be based on a framework that considers the aquifer as a system, including its recharge and discharge areas. This is regarded as the proper unit for the purpose of groundwater protection and regulation (Kulkarni & Vijay Shankar, 2009). It will establish a connection between different aquifers and the water cycle in general that is currently insufficiently factored in existing legal instruments. It further provides a basis for integrating the links between groundwater and surface water in recognition of the fact that they form inseparable parts of a cycle ranging from the local to the global level. There are thus direct links between global climate change and groundwater protection that must be taken into account in legal instruments.

The existing and impending groundwater crisis, therefore, demands a strong framework for protection not just for the present generation, but also in the interest of future generations. In fact, groundwater law needs to be informed significantly by the existing principles of environmental law such as intra-generational and inter-generational equity. The integration of these principles also helps to view groundwater as a part of the environment as opposed to the present regulatory view that considers groundwater as similar to a bucket that can be filled and emptied. A strong emphasis on protection and conservation also means strict regulation of activities (for example, encroachment in the recharge zones) that affect the recharge and discharge of aquifers. Examples from Rajasthan highlight the impacts of mining activities on groundwater, specifically the large amounts of water that are pumped to facilitate exploration, actual mining and processing of mined materials. The unscientific disposal of waste also impacts groundwater, for example by blocking recharge (Cullet, Bhullar & Koonan, 2015).

A framework for groundwater regulation and protection also requires an effective institutional framework. The institutional mechanism set up under the existing legal regime in India is incapable of tackling the challenges posed by climate change. Groundwater governance is marked by a centralized, command-and-control approach that is particularly unsustainable in the context of groundwater because it overlooks the highly decentralised nature of groundwater uses and the challenge of controlling the actions of millions of natural and legal persons.

There is thus a need for a more viable and effective institutional mechanism based on the principles of decentralisation and participatory, democratic decision-making. Such an institutional framework is not only viable and effective but is also in consonance with the principle of decentralisation envisaged by the 73rd and 74th amendments to the Constitution of India in 1992 that contribute to the realisation of procedural rights of democratic participation at the local level.

Model Groundwater Bill 2016: Towards a Framework Sensitive to Climate Change Related Concerns

In order to address the shortcomings of the existing legal regime, the Planning Commission of India[4] adopted the Model Bill for the Conservation, Protection and Regulation of Groundwater, 2011 (Planning Commission of India, 2012b; Cullet, 2012). This has now been updated by the Ministry of Water Resources, River Development & Ganga Rejuvenation and is known as the Model Groundwater (Sustainable Management) Act, 2016. Although the Model Groundwater Act, 2016 does not include any explicit reference to climate change, several of its provisions highlight the environmental aspects of groundwater and thus contribute to the process of making the groundwater laws in India sensitive to climate change-related challenges.

The Model Groundwater Act, 2016 introduces a number of key changes to the existing legal tools and approaches to groundwater regulation and protection, including the institutional framework for management. The Model Groundwater Act, 2016 takes a broad perspective of groundwater regulation that includes conservation and protection measures. This includes recognition of the links between regulation of groundwater and climate change in the preamble. This approach is in contrast to existing laws, which focus only on regulating uses of groundwater resources. The objectives of the Model Groundwater Act, 2016 include: promotion of sustainable groundwater use without compromising the needs of future generations; adoption of an integrated approach towards groundwater and surface water to ensure conjunctive use of these water resources; protection of ecosystems and their biological diversity; and reduction and prevention of groundwater pollution and degradation. The Model Groundwater Act, 2016 provides for the preparation and implementation of binding, aquifer-based use and protection plans, known as groundwater security plans. It further envisages the creation of groundwater protection zones for need-based regulation and protection of groundwater where specific protection measures need to be taken. A strong emphasis on protection and conservation is one of the important changes in the climate change context. Further, the Model Groundwater Act, 2016 explicitly makes a link between groundwater law and environmental law principles such as inter-generational equity and the precautionary principle.

Another important change introduced by the Model Groundwater Act, 2016 that is relevant in the climate change context is a departure from the traditional approach based

upon the artificial division of groundwater and surface water for regulation and protection purposes. The Model Groundwater Act, 2016 recognises the unitary nature of water and the integration of surface water and groundwater. This is an important step towards recognising water as a part of the environment and its link with the water cycle at different levels. This is taken up further in the Draft National Water Framework Bill, 2016 drafted alongside the Model Groundwater Act, 2016 that seeks to provide an overall umbrella framework that links surface water and groundwater regulation.

The Model Groundwater Act, 2016 also recognises the fundamental right to water as one of the foundational principles of the legal regime for groundwater and makes the realisation of the right one of its priority goals. It also recommends the abolition of the land-based groundwater right and replaces it with the principle that groundwater is a common heritage of the people held in trust by the government. These are important steps to foster equity in the regulation of access to and use of groundwater. It also helps to address the issue of over-exploitation by the powerful and the rich and its implications for the poor and the vulnerable.

The Model Groundwater Act, 2016 envisages management and regulation of groundwater at the local level and thus respects the decentralisation principle as envisaged by the 73rd and 74th amendments to the Indian Constitution. It provides for the establishment of groundwater committees at various levels to exercise regulatory and management powers. For example, the Gram Panchayat Groundwater Sub-Committee is entrusted with the power to prepare the groundwater security plan for the purpose of conservation and regulation of groundwater.

Overall, the Model Groundwater Act, 2016 seeks to replace the existing legal regime for groundwater with a new one that is based upon human rights and the principles of environmental law. This updating of the Model Bill for the Conservation, Protection and Regulation of Groundwater, 2011 in 2016 reinforces the message to all concerned actors that a new paradigm is necessary within which ample opportunities to include climate change concerns are available. However, the major challenge is to what extent different state governments will make use of this model legislation. In a context where the Constitution gives states the primary power to regulate water, it is for states to adopt legislation and adapt the model legislation to suit their needs and circumstances so that it provides an appropriate framework in the long term.

(Ground)Water and Environmental Law

Environmental law in India has been developed as a separate body of law at least since the 1970s and it has evolved over time to address emerging issues, for example waste management, environmental impact assessment and coastal zone regulation. However, it has failed to address the issue of climate change in general and the implications for water security in particular. At best, the issue of implications of climate change on (ground)water is addressed in environmental law in a rudimentary and diffused manner.

Groundwater in Environmental Law

Indian domestic environmental legislation incorporates several provisions relating to quantity and quality of groundwater. However, these laws do not specifically fill gaps in the existing water laws and the consideration of climate change issues is at best implicit.

The Water (Prevention & Control of Pollution) Act, 1974 (WPCPA) is relevant insofar as its primary objective is to prevent and control water pollution, which includes groundwater pollution (the *quality* dimension). However, the coverage of the law is limited to point sources of pollution (that is, domestic and industrial effluents). Neither does it set any standards for water pollution caused by agricultural practices and runoff pollutant levels nor are they monitored (Comptroller and Auditor General of India, 2012, p. 23). Under the Environment (Protection) Act, 1986 (EPA), the central government, through the Ministry of Environment, Forest & Climate Change (earlier MoEF), is empowered to take measures for protection and improvement of the environment. This has led to the adoption of standards for the discharge of domestic and industrial effluents into water bodies, including groundwater. Further, in the exercise of its powers under the EPA, the MoEF adopted the Environmental Impact Assessment Notification, 2006 (EIA Notification) and the Coastal Regulation Zone Notification, 2011, both of which include provisions relating to treatment and discharge of effluents into groundwater.

The domestic environmental laws also accommodate concerns relating to the availability of groundwater (the *quantity* dimension). The use of treated, recycled municipal wastewater as an alternative source for irrigation is encouraged, which can reduce or prevent over-exploitation of groundwater (MoWR, 2011; Government of India, 2008, p. 33; MoEF, 2012, p. 213), and the importance of wetlands in groundwater recharge is recognised in the Wetlands (Conservation and Management) Rules, 2010. The Central Ground Water Authority (CGWA), which has been constituted under the EPA to 'regulate and control development and management of groundwater resources in the country', [5] adopts a command-and-control approach to regulate and control groundwater extraction. For this purpose, it has issued a list of notified areas where permission for groundwater extraction through energised means is only granted for drinking water purposes and subject to certain pre-conditions. In non-notified areas, the CGWA will 'consider' granting a No Objection Certificate (NOC) for groundwater withdrawal by new/under expansion industries/infrastructure projects based on specified criteria (CGWA, 2015).

A violation of any of the abovementioned provisions can attract legal action under the relevant provisions of the WPCPA or the EPA. Despite these provisions, however, there is growing concern about the quantity and deteriorating quality of groundwater and water more generally. This suggests that the existing legal provisions have not been effectively implemented, they have failed to address the existing issues, or they are insufficient to address emerging issues.

In this context, it is often judicial decisions that have filled some of the gaps. For instance, over the years, widespread quarrying/mining has been undertaken in flagrant disregard of the abovementioned legal provisions, which has resulted in adverse impacts on riverbeds and groundwater. This has led the National Green Tribunal (NGT)[6] to restrain any mining activity in the country without obtaining environmental clearance from the concerned authority and license from the competent authorities (NGT, 2013b). The NGT has also prohibited illegal and unauthorised sand and minerals mining without leave of the concerned authority on the beaches or in other coastal areas (NGT, 2013b). Following various judicial interventions and lobbying from pressure groups, the EIA Notification was amended to include new clearance requirements for sand mining, seeking to close loopholes that were apparent in the previous framework that only

required clearance for sand mining in areas of more than five hectares (MoEFCC, 2016).

Judicial interventions have also highlighted concerns that have received little or no attention in domestic environmental law. For instance, taking note of the problem of indiscriminate over-extraction of groundwater, the NGT has prohibited illegal and unauthorized boreholes in some cities (NGT, 2013c), groundwater extraction for any use at a construction site (NGT, 2013a) or for use in packaged drinking water units (NGT, 2013d), and issuance of new tube well connections to farmers (NGT, 2014b). The NGT has also ordered the prevention of activities that restrict or prevent groundwater recharge, such as permanent constructions (including concrete pavements) in parks (NGT, 2014a) and planting of eucalyptus trees (NGT, 2014b).

Courts have also stepped in to direct the concerned government authorities to formulate policies to address the lacunae. This was the case where in the absence of regulation, the uncontrolled digging of boreholes and tube wells and activities of water tankers were resulting in groundwater over-extraction (Anonymous, 2013).

At the general level, the Supreme Court has incorporated sustainable development, the precautionary principle, the polluter pays principle and the public trust doctrine into domestic environmental jurisprudence (Supreme Court of India, 1996). The application of any/all of these principles/doctrines is imperative in order to manage the interactions between climate change and groundwater. In practice, however, the law and policy framework have been more amenable to the application of sustainable development and the polluter pays principle to groundwater. There has been less reliance on the precautionary principle, which ought to be invoked especially in a context where actions based on 'precaution' become necessary in the face of uncertainties that are common to both climate change and groundwater. However, there is a reversal in this trend especially in cases concerning groundwater pollution before the NGT. The National Green Tribunal Act, 2010 (s 20) explicitly requires the NGT to apply each of these principles while making its decision. Insofar as the public trust doctrine is concerned, while its application to surface water resources is well settled (Supreme Court of India, 1996), the same cannot be said in respect of groundwater (High Court of Kerala, 2005). Nevertheless, some of the recently proposed laws include a provision for management of water (generally) and groundwater (particularly) as a common pool resource held in public trust, which is a welcome development. These include the Model Groundwater Act 2016 (s 9) and the Draft National Water Framework Bill, 2016 (s 4).

Groundwater in Climate Change Policy

There is no climate change law at the Union/Central or State level in India, but there is increasing activity in the sphere of domestic policy. There is explicit recognition of the link between climate change and groundwater, and the adoption of domestic measures to address the emerging issues is envisaged.

The release of the National Action Plan on Climate Change (the NAPCC or the Plan) in 2008 marked the commencement of concerted efforts by the Government of India to address the impacts of climate change on various sectors (including water) – through the adoption of mitigation and adaptation measures. This was a departure from the previous piecemeal approach where different government departments and ministries were responsible for addressing specific aspects of climate change. The NAPCC lays down

the principles and identifies the approaches to be adopted to address the impacts of climate change. The approaches include existing as well as proposed actions, which are elaborated in eight national missions: National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Eco-system, National Mission for a Green India, National Mission for Sustainable Agriculture and National Mission on Strategic Knowledge for Climate Change.

Water is specifically recognised as a 'climate-sensitive sector' (Government of India, 2008, p. 1), and one of the eight missions under the NAPCC is the National Water Mission (MoWR, 2011). The main goals of the National Water Mission (all of which are applicable to groundwater) are to:

- Develop a comprehensive water database in the public domain and assess the impact of climate change on the availability and quality of water resources;
- Promote citizen and state actions for water conservation, augmentation, and preservation;
- Focus attention on over-exploited areas;
- Increase water use efficiency by 20 per cent; and
- Promote basin level integrated water resources management (MoWR, 2011, p. 5).

The NAPCC acknowledges that several of these programmes are not new. For instance, the specific action points to focus attention on over-exploited areas include an intensive rainwater harvesting and groundwater recharge programme, as well as promotion of traditional systems of water conservation through implementation of programmes for repair, renovation and restoration of water bodies.

The National Water Mission also recognises the need for the enactment and enforcement of groundwater legislation. It also states that the Mission 'will take into account' the National Water Policy 2012, which recognises the links with climate change and includes a section on 'Adaptation to Climate Change'.

Pursuant to the NAPCC, a number of states (such as Arunachal Pradesh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Mizoram, Nagaland, Odisha, Rajasthan, Sikkim, Tripura and Uttarakhand) have prepared their State Action Plan on Climate Change (SAPCC), some of which include groundwater-specific provisions. For instance, the Karnataka's SAPCC proposes a groundwater cess from which a groundwater fund will be created to finance groundwater recharge schemes proposed by public and private project proponents.

The measures identified in the NAPCC perform two functions simultaneously. They promote India's development objectives and simultaneously seek to yield 'co-benefits' to effectively address climate change (Government of India, 2008, p. 2). In other words, measures that effectively address climate change but do not further the country's 'development' objectives do not fall within the purview of the national climate change policy. The problem is that measures enumerated in the NAPCC do not seem to be directed or guided by a clear or consistent approach or framework (Dubash et al., 2013, p. 47). This makes it look like the NAPCC adopts a business as usual approach (Thakkar, 2012, p. 7). The co-benefits framework has advantages but it may also restrict the extent to which innovative protection measures may be introduced in the water sector.

The effectiveness of any law or policy framework for groundwater regulation is contingent upon the availability of information about the quantity and quality of the groundwater resources as well as the impacts of climate change on them. The NAPCC relies on the large uncertainties concerning spatial and temporal magnitude of the impacts of climate change as the reason for not considering it desirable to 'design strategies exclusively for responding to climate change' (Government of India, 2008, p. 13). However, the Government of India has recognised the urgent need for more and better information about the quantity and quality of groundwater resources and the likely impacts of climate change in order to formulate long-term adaptation measures. The National Monsoon Mission (2012-2017) is tasked with the prediction of monsoon rainfall variability in all spatial and time scales.

The increasing salience of climate change in the domestic context is also demonstrated by the renaming of the MoEF as the Ministry of Environment, Forests and Climate Change. However, significant decision-making power in respect of groundwater resources still rests with the Ministry of Water Resources, which highlights the importance of cooperation, coordination and integration.

Groundwater and Climate Change: An Urgent Issue to Address Comprehensively

The previous sections make it clear that the legal framework is yet to effectively address the links between climate change and groundwater. Several issues can be identified.

An important issue is that groundwater law in India remains, like most of water law, largely disconnected from environmental law. The basic framework governing groundwater focuses overwhelmingly on issues of access to and control over groundwater linked to land ownership. The framework thus addresses concerns of availability and use but not protection or conservation of the resource. Further, regulation is limited to individual landowners and there is no aquifer-wide perspective in existing regulation. Current legislation based on the Groundwater Model Bill 1970/2005 is inappropriate insofar as it entirely fails to rethink the framework within which groundwater regulation is conceived. Thus, it neither incorporates an environmental perspective nor reflects any concern for the links between the local and the global water cycle. The Model Groundwater Act, 2016 seeks to address these shortcomings by adopting a framework that is centred around protection measures. Yet, at present it is only a conceptual framework that needs to be adopted at the state level and implemented. In addition, even if it were adopted by states, the proposed framework would not address all the concerns raised here since it lacks a global perspective on groundwater. It introduces an aquifer-wide protection dimension to regulation but does not make the link with broader national-level or global phenomenon. This can be explained by the fact that this is a regulation conceived at the state level. Nevertheless, groundwater regulation must take into consideration rainfall and the global water cycle as well.

To some extent, the protection focus of environmental law in India addresses some of the gaps in water law. Water is an integral part of the subject matter of environmental law in general. Further, the WPCPA covers at least some of the relevant aspects of water pollution. Yet, the environmental law framework in India remains lacking in various ways. There is, for instance, no comprehensive legislative framework on water conservation and protection. As a result, water is considered as part of other

environmental protection measures, such as those related to forests, and sector-wide impacts are often overlooked.

Beyond this, environmental law in its present form is not geared towards addressing the global dimensions of water or other environmental issues. This does not mean that domestic law should address issues that need coordination at the international level. Rather this means that modern environmental law or water law in the age of climate change must be based on an understanding of the broader phenomenon that influence and impact the implementation of the measures adopted at the local level. Thus, in a context where groundwater availability is linked to recharge, which is itself linked to precipitation, failure to link the local with the global leads to the adoption of incomplete frameworks that will fail at some point.

The current context is thus one where environmental law is relatively more advanced than (ground) water law in linking the two fields. This is noteworthy and groundwater law desperately needs to be given a fresh lease on life with the introduction of groundwater regulation that considers not only use but also (and primarily) protection (the environmental dimension).

The next step concerns the introduction of measures that take into account the intricate links that exist from the local to the global level. Some of these links are easy to identify. For instance, in the State of Rajasthan, the High Court banned the construction of anicuts (check dams) above a certain height throughout the state with a view to ensure that a sufficient amount of surface water fills in a dam meant primarily to provide drinking water to urban residents (High Court of Rajasthan, 2004). This had an impact on the groundwater recharge strategies in every locality while the benefits were allotted mostly to a limited number of people, including the drinking water needs of the capital city of Jaipur. Such measures may be problematic in terms of restricting local water conservation and use strategies. Further, the measures may be completely ineffective if they are not conceived with actual rainfall in mind. There is potential for contradictory outcomes in a drought year where the lack of aquifer recharge may lead to the need for transfer of water for drinking purposes from other parts of the state or the country.

It is also necessary to integrate various broad principles of environmental law into (ground) water law. Further, a global perspective that recognises the links between the various phenomenon from the local to the global level is also required.

Conclusion

Groundwater security is threatened by ongoing climate change. Indeed, the imbalance between demand for, and supply of, groundwater will likely worsen because of the impacts of climate change. This will require strong and potentially controversial measures.

At present, the law and policy framework is deficient when it comes to addressing the broader connections between groundwater and climate change. First, the existing water law and policy framework fails to squarely address environmental concerns generally and climate change specifically. This is true despite 20 years of ‘water sector reforms’, which are premised on ‘water scarcity’ conceived as an environmental issue. Second, despite clear recognition of fundamental rights to environment, water and sanitation, neither water legislation nor environmental legislation have clearly integrated a human

right dimension, which has the potential to encourage the linking of climate change and groundwater in domestic regulation. Third, there is a tendency to view climate change as an issue to be addressed at the macro level, thus reinforcing the focus on centralisation in water law rather than promoting the constitutional mandate of decentralisation, which is particularly relevant in the context of groundwater regulation at the local level. Fourth, there are also implementation challenges that must be overcome. These include inadequate governance, inappropriate policies that provide no clear priorities or directions to government agencies of their responsibilities, and very limited financial and human resources to manage groundwater resources and water-supply systems.

To view groundwater through the lens of climate change in a country like India provides a window of opportunity to conceive groundwater regulation in the context of the global water cycle, comprehensively integrate protection and conservation at the aquifer level, effectively link surface water and groundwater, and recognise that climate change, like water, needs to be regulated on the basis of the principle of subsidiarity/decentralisation. Certainly this is a difficult task, it is not impossible, and would be well worth the effort.

References

Anonymous (2013). HC: Formulate Bore, Tube Well Policy. *The Herald (Panjim),* 29 November 2013. Available at http://www.heraldgoa.in/Goa/The-Sunday-Roundtable/hc-formulate-bore-tube-well-policy/72731.html.

Bhaduri, A. (2014). People of a Semi-arid Rajasthan Village Battle Coca Cola. Available at http://www.indiawaterportal.org/articles/people-semi-arid-rajasthan-village-battle-coca-cola.

Bijoy, C.R. (2006). Kerala's Plachimada Struggle: A Narrative on Water and Governance Right. *Economic & Political Weekly*, 41(41), 4332-4339.

CGWA (2015). Guidelines/Criteria for Evaluation of Proposals/Requests for Groundwater Abstraction. New Delhi: Government of India, Central Ground Water Authority.

CGWB (2014). Dynamic Groundwater Resource of India (as on 31st March 2011). Faridabad: Central Groundwater Board.

Comptroller and Auditor General of India (2012). *Performance Audit of Water Pollution in India*. Report No. 21 of 2011-12. New Delhi: Ministry of Environment & Forests.

Cullet, P. (2012). The Groundwater Model Bill: Rethinking Regulation for the Primary Source of Water. *Economic & Political Weekly*, 47(45), 40-47.

Cullet, P. (2014). Groundwater Law in India: Towards a Framework Ensuring Equitable Access and Aquifer Protection. *Journal of Environmental Law*, 26(1), 55-81.

Cullet, P., Bhullar, L., & Koonan, S. (2015). Inter-sectoral Water Allocation and Conflicts: Perspectives from Rajasthan. *Economic & Political Weekly*, 50(34), 61-69.

Dubash, N.K., et al. (2013). Indian Climate Change Policy: Exploring a Co-Benefits Based Approach. *Economic & Political Weekly*, 48(22), 47-61.

Government of India (2008). *National Action Plan on Climate Change*. New Delhi: Government of India.

High Court of Kerala (2005). *Hindustan Coca-Cola Beverages v Perumatty Grama Panchayat* 2005(2) KLT 554.

High Court of Rajasthan (2004). *Abdul Rahman v State of Rajasthan* DB Civil Writ Petition No 1536/2003, High Court of Judicature for Rajasthan at Jodhpur, Judgment dated 2 August 2004.

IPCC (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva: Intergovernmental Panel on Climate Change.

Kenny, J.F. et al. (2009). Estimated Use of Water in the United States in 2005. *U.S. Geological Survey Circular* 1344.

Koonan, S. (2009) Legal Regime Governing Groundwater. In P. Cullet et al. (Eds.), *Water Law for the Twenty-First Century: National and International Aspects of Water Law Reform in India* (pp.182-204). Abingdon: Routledge.

Koonan, S. (2010). Groundwater: Legal Aspects of the Plachimada Dispute. In P. Cullet et al. (Eds.), *Water Governance in Motion: Towards Socially and Environmentally Sustainable Water Laws* (pp.159-198). New Delhi: Cambridge University Press.

Kulkarni, H., & Vijay Shankar, P.S. (2009). Groundwater: Towards an Aquifer Management Framework. *Economic & Political Weekly*, 44(6), 13-17.

MoEF (2004). India – Initial National Communication to the United Nations Framework Convention on Climate Change. New Delhi: Government of India, Ministry of Environment & Forests.

MoEF (2012). India – Second National Communication to the United Nations Framework Convention on Climate Change. New Delhi: Government of India, Ministry of Environment & Forests.

MoEFCC (2016). Notification S.O. 141(E) dated 15 January 2016 (Amendments in the Environment Impact Assessment Notification, 2006), Ministry of Environment, Forest and Climate Change.

MoWR (2011). *National Water Mission under National Action Plan on Climate Change*. Comprehensive Mission Document Volume I. New Delhi: Government of India, Ministry of Water Resources.

Mukherji, A., Rawat S. & Shah, T. (2013). Major Insights from India's Minor Irrigation Censuses: 1986-87 to 2006-07. *Economic & Political Weekly*, 48(26-27), 115-124.

NGT (2013a). *Vikrant Kumar Tongad v Union of India and Others* OA No 59 of 2012, National Green Tribunal (Principal Bench), Order dated 11 January 2013.

NGT (2013b). *National Green Tribunal Bar Association v Ministry of Environment and Forests & Others* OA No 171 of 2013, National Green Tribunal (Principal Bench), Order dated 14 August 2013.

NGT (2013c). *National Green Tribunal Bar Association v NCT of Delhi* OA No 108 of 2013, National Green Tribunal (Principal Bench), Order dated 4 September 2013.

NGT (2013d). *Vikrant Kumar Tongad v Union of India* Application No. 59 of 2012, National Green Tribunal (Principal Bench), Order dated 28 February 2013.

NGT (2014a). *Akash Vashishtha v Union of India & Others* OA No. 165 of 2013, National Green Tribunal (Principal Bench), Order dated 20 February 2014.

NGT (2014b). *Safal Bharat Guru Parampara v State of Punjab and Others* OA No 9 of 2014, National Green Tribunal (Principal Bench), Order dated 5 March 2014.

Panwar, S., & Chakrapani, G.J. (2013). Climate Change and its Influence on Groundwater Resources. *Current Science*, 105(1), 37-45.

Planning Commission of India (2011). *Report of the Working Group on Sustainable Groundwater Management*. New Delhi: Government of India.

Planning Commission of India (2012a). Twelfth Five Year Plan (2012–2017) – Faster, More Inclusive and Sustainable Growth – Volume 1. New Delhi: Government of India.

Planning Commission of India (2012b). Model Bill for the Conservation, Protection and Regulation of Groundwater 2011. In Planning Commission. *Report of the Steering Committee on Water Resources and Sanitation for Twelfth Five Year Plan*. New Delhi: Government of India.

Shah, T. (2009). Climate Change and Groundwater: India's Opportunities for Mitigation and Adaptation. *Environmental Research Letters*, 4(3), 1-14.

Srinivasan, V. & Kulkarni, S. (2014). Examining the Emerging Role of Groundwater in Water Inequity in India. *Water International*, 39(2), 172-186.

Supreme Court of India (1996). *MC Mehta v Kamal Nath* (1997) 1 SCC 388.

Thakkar, H. (2012). *Water Sector Options for India in a Changing Climate*. New Delhi: South Asia Network on Dams, Rivers and Peoples.

Vani, M.S. (2009). Groundwater Law in India: A New Approach. In R. Iyer (Ed.), *Water and the Laws in India* (pp. 435-473). New Delhi: Sage.

Vijay Shankar, P.S., Kulkarni, H., & Krishnan, S. (2011). India's Groundwater Challenge and the Way Forward. *Economic & Political Weekly*, 46(2), 37-45.

Villholth, K.G. (2009). The Neglected Role of Groundwater in Climate Change Adaptation and Disaster Risk Reduction. *IOF Conf Series: Earth and Environmental Science*, 6(29), 292062.

World Bank (2010). Deep Wells and Prudence: Towards Pragmatic Action for Addressing Groundwater Overexploitation in India. Washington, DC: World Bank.

WWAP (2012). The United Nations World Water Development Report 4: Managing Water Under Uncertainty and Risk. Paris: UNESCO/WWF - World Water Assessment Programme.

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1 Units are at the block/mandal/firka level, a sub-division of districts in the administrative division of India.

2 For a sample of irrigation laws, see ielrc.org/water/doc_irrigation.php.

3 This can be compared with the United States where groundwater only accounts for 20 per cent of water use (Kenny et al., 2009:4).

4 The Planning Commission of India was a body of the Government of India set up by a Resolution of the Government of India in March 1950. Its key functions include assessment of the material, capital and human resources of the country, investigation of the possibilities of augmenting the resources and formulation of a Plan for the most effective and balanced utilisation of country's resources. On 1 January 2015, through a resolution by the Government of India, the Planning Commission of India was replaced by a new institution, namely the NITI Aayog (National Institution for Transforming India).

5 The list of notified areas is available at http://cgwa-noc.gov.in/LandingPage/Areatype/ListNotifed.pdf#ZOOM=150.

6 The National Green Tribunal was set up by the National Green Tribunal Act, 2010 for the effective and expeditious disposal of cases relating to environmental protection and has jurisdiction over all civil cases where a substantial question relating to environment in involved (s 14).