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Good governance for food, water and energy security

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Abstract

Food and water security have moved to the top of the global agenda following the food and energy price increases that started in 2007. Addressing the food, water and energy nexus is considered increasingly important for transparently and equitably meeting increasing global demand without compromising sustainability. This paper argues that given the unique regional and sector challenges of food, water and energy security, their nexus must be deconstructed to find effective, contextualized solutions. And governance challenges are at the heart of the nexus in each region. Governance is defined in various ways, but, with a few notable exceptions, the definitions have undergone relatively little analysis. In turn, governance issues are imbedded in policy, institutional, technological and financing options exercised at the global, regional, national and local levels. Furthermore, strong interactions between levels prompt policy responses to specific events and outcomes. The current governance arrangements, where they exist at all, are woefully inadequate to address the challenges. They are imbedded in a lack of strategic clarity, and among stakeholders there is an unequal distribution of power, voice and access to information, resources and the capability to exercise a sound influence which will produce equitable and sustainable outcomes. Often there are huge tradeoffs between the short-term wins of individual stakeholders and long-term holistic solutions. This paper uses illustrative examples from recent global developments, as well as from China and India, to make the case for placing empirical analysis of governance issues at the top of the global agenda. At each level, governance issues affect the choice of policies, institutions and outcomes for addressing these daunting challenges.

Selection and peer-review under responsibility of the Stockholm International Water Institute.

Keywords: food security; water security; energy security; governance; global; national; local; China; India.

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1. The short- and long-term challenges to achieving food and water security

The short- and long-term challenges in the areas of global food and water security are well known. The short-term challenge is the near 868 million hungry people that need an assured supply of food. Nearly two-thirds of those hungry people are in Asia, a densely populated region of the world that has been driving global growth, trade and finance since the 1990s. It is also a region where food security has been achieved with increasing reliance on irrigation, with generally positive impacts on food security and poverty reduction. The world's water challenges are just as daunting. Statistics are unreliable and vary, but suggest that an estimated 1.6 billion people are already under severe water stress and an additional 1.2 billion are under medium water stress. Under a business as usual scenario nearly half the world's population of 9 billion is expected to be under severe water stress, with a large share of them residing in the BRIICS countries (Brazil, Russia, India, Indonesia, China and South Africa) (Mountford, 2011). Among them, China and India will face the largest resource pressures. India's case is illustrative of challenges in South Asia (Shah and Lele, 2011). Together these two mega-countries alone constitute 38% of the global population and 20% of GDP in purchasing power terms. What happens in these two countries alone is of global significance. Countries in the Middle East and sub-Saharan Africa face similar water scarcity, albeit with different governance, institutional and financial conditions. By 2050 global food production must increase by 60% to feed the expected global population of 9 billion; much of the population growth will occur in South Asia and sub-Saharan Africa. This is the longer-term challenge.

Unpacking these global statistics is essential to understanding and analysing the severity and concentration of the challenges and the nature of the solutions. Evidence suggests that East and Southeast Asia have made more progress than South Asia in terms of coping with water scarcities and in reducing food and water insecurities since the 1990s. The decline in the number of hungry has been the most dramatic in East and Southeast Asia. China, with a population of 1.3 billion, nearly a fifth of the global population, saw a decrease from 254 million to 158 million. Southeast Asia dropped the number of hungry from 134 to 65 million (see Fig. 1). The following discussion shows what has been achieved through rapid agricultural intensification, diversification of agriculture and international trade in food and agriculture, while increasing water use efficiency and water productivity. Investing in human, rural social and physical infrastructure has been the key to this success. The decline in South Asia's numbers and total share of undernourished people is less dramatic – India saw a decrease in hungry from 240 million to 217 million (FAO et al., 2012).

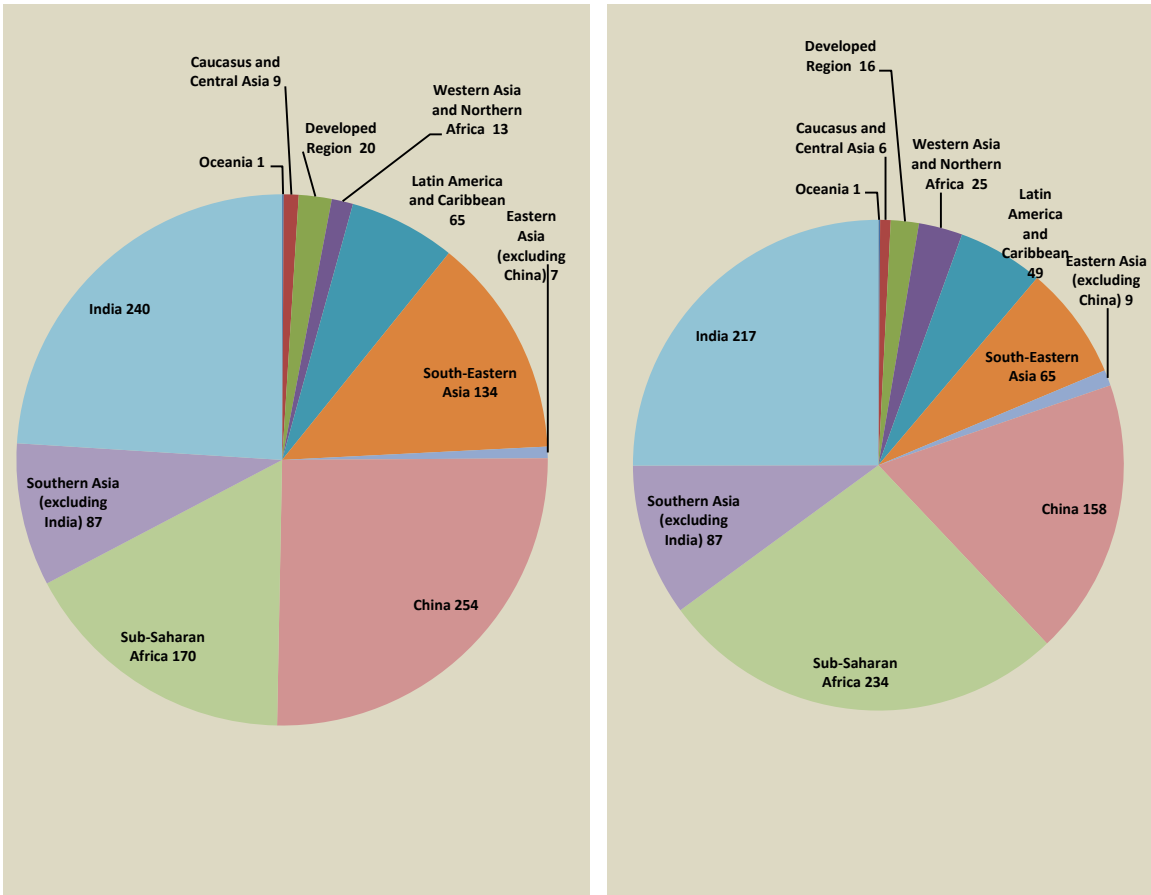


Figure 1: Number of undernourished by region, 1990-92 and 2010-12. Source: FAO et al. (2012)

The differential progress is of interest because China and India started with similar levels of poverty, agricultural endowments and internal capacities in the 1960s. A variety of indicators, such as the share of water used in agriculture and reliance on ground water, can be used to further disaggregate the state of food, water and energy (in)security. Such disaggregation suggests that the situation has improved greatly in China, but has improved only slowly, if at all, in India. India's ground water exploitation, as a share of the water used in agriculture, not only greatly exceeds that of China, but has increased tenfold from India's consumptive use level of the 1950s. It has reached unsustainable levels. India's per capita water availability is two-thirds that of China and its water storage capacity, as estimated by the Government of India, as less than a tenth of China's.[†] Overall water use has peaked in China. This may be because both water use efficiency and water productivity in agriculture is

[†] Government of India (GoI) figures include reservoirs as well as run-of-the-river systems which only divert water, but do not store it. FAO's AQUASTAT shows less difference in dam capacity between the two countries (i.e. 416 m^3/inhabitant in China and 190.8 m^3/inhabitant in India during 2003-2007). Those figures probably exclude these. In contrast, all storage figures exclude groundwater storage figures. India uses between 270 and 280 billion m^3 of groundwater annually, and that groundwater storage, if used more efficiently, has little evaporation in situ and during conveyance, therefore India's numbers would look better.

each greater and has increased over time in China. What is more, the 2030 Group projects India's water demand will reach 1.5 trillion m^3 by 2030 as compared to China's 818 billion m^3 (2030 Water Resources Group, 2009). India's water productivity is lower for most crops. There is a broad acknowledgement among policymakers that ground water over exploitation is now a serious challenge. Water quality is a challenge too in both countries; in China largely because of industrial pollution and in India because of a lack of investment in water and sanitation. India ranks next only to sub-Saharan Africa on investment in sanitation. In 2050 India's population will increase to 1.69 billion on a surface area which is about one-third of China's. China's population will peak in 2026 at 1.4 billion. These different past and future projected outcomes are the result of the differences in the nature and quality of governance. These, in turn, have resulted in the very different populations, land, water and energy policies, institutions, investments and technological choices discussed in this paper.

Box 1: Concepts of food, water and energy security

Food security
The Food and Agriculture Organization of the United Nations (FAO) defined food security as "…when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life." (World Food Summit, 1996). The multidimensional nature of food security includes food availability, access, stability and use. Physical availability is determined by food production, stock levels and net trade. The economic and physical access of households to food depends on income, expenditures, markets and prices. Stability is determined by weather conditions, political stability, and economic factors (economic recessions, unemployment, rising food prices). Use is determined by the way the human body makes the most of various nutrients depending on care and feeding practices, food preparation and diversity of the diet, intra-household distribution of food and environmental factors, e.g. water and sanitation. Combined with the good biological use of the food consumed, this determines the nutritional status of individuals. Food insecurity exists if all four dimensions are not met simultaneously. Food insecurity can be chronic, or transitory, including seasonal. Attention has shifted over time from the national to the household level and to intra-household food security, with individuals, particularly including women and children within households, as the focus of concern.

An alternative definition of food security includes treatment of food losses and waste at all levels, from the farm to the fork, e.g. post-harvest losses, conversion losses and waste (Smil 2000). It also questions equating consumption with availability, without regard to losses. These concepts are receiving increasing attention in the context of value chains, the growing role of the private sector and of public-private partnerships (Lundqvist et al. 2008). Each of these concepts implies an emphasis on different parts of the value chain, ranging from the farmer to the consumer, and involves different stakeholders and governance issues related to production, distribution and food intake.

Water security
The Global Water Partnership (GWP) (2012) has defined water security as, "Ensuring the availability of adequate and reliable water resources of acceptable quality, to underpin water service provision for all social and economic activities in a manner that is environmentally sustainable; mitigating water-related risks, such as floods, droughts and pollution; addressing the conflicts that may arise from disputes over shared waters, especially in situations of growing stress, and turning them into win-win solutions." (GWP, 2012).

The incorporation of risks and conflicts is an evolution from the earlier concept of a "water secure world where there is enough water for household needs, for social and economic development, and for ecosystems" (Grey and Sadoff, 2007). Water scarcity is the other side of a water security coin, often a result of physical, economic and institutional failures, each of which needs systematic empirical analysis to educate the public (UN-Water and FAO, 2007).

Energy security
Energy security has been viewed mainly in terms of the uninterrupted availability of energy sources at affordable prices. It was the main objective underpinning the establishment of the International Energy Agency in 1974. Oil security remains a cornerstone of the IEA. Long-term energy security is mainly linked to timely investments to supply energy in line with economic developments and environmental needs. Short-term energy security focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance. There is an evolving agenda around the promotion of diversity, efficiency and flexibility within the energy sectors so that they are able to respond to energy emergencies. And yet 87% of the energy supply comes from oil, coal and gas. Fuel wood goes hand in hand with the incidence of poverty, most notably in sub-Saharan Africa and South Asia. Energy intensity and per capita income go hand in hand. Agricultural energy use increases in the course of agricultural intensification, both directly (e.g. through the use of energy intensive fertilizers, tractors and the pumping of water), and indirectly in transportation, processing, packing, refrigeration, etc. (Lele et al., 2013).

World Food Summit, 1996

2. Confronting the gap in agricultural yields

Returning to a discussion of the long-term challenges and how to meet future agricultural production demands, it is important to note that the Organisation for Economic Co-operation and Development (OECD)-FAO's 2012 estimates for production have centred on intensive and high-yielding agricultural systems. Looking at the performance to date, North Africa – one of the world's most water short regions – has achieved the highest growth rates in total factor productivity (TFP) in agriculture followed by East and Southeast Asia and Latin America. TFP growth has been lack-lustre in South Asia and sub-Saharan Africa (Fig. 2). And there is evidence that countries such as Morocco have improved their water policies and pursued an agricultural diversification strategy (Ait Kadi, 2012). But the formalistic estimates of TFP growth in Fig. 2 do not take into account the impacts of intensification on natural resources, such as water shortages and soil degradation. Nor do they take into account deforestation through the conversion of natural forests into agriculture, since deterioration in resource quality and sustainability are not easily measurable. With evidence of extensive degradation of soils and water resources, growth of salinity, and pesticide and chemical related water pollution, the phenomenon of yield growth reaching a plateau is being noted globally (Fig. 3). Production rates have already slowed. The OECD-FAO (2012) cautions that "growing resource constraints, environmental pressures, and higher costs for some inputs are anticipated to inhibit supply response in virtually all regions."

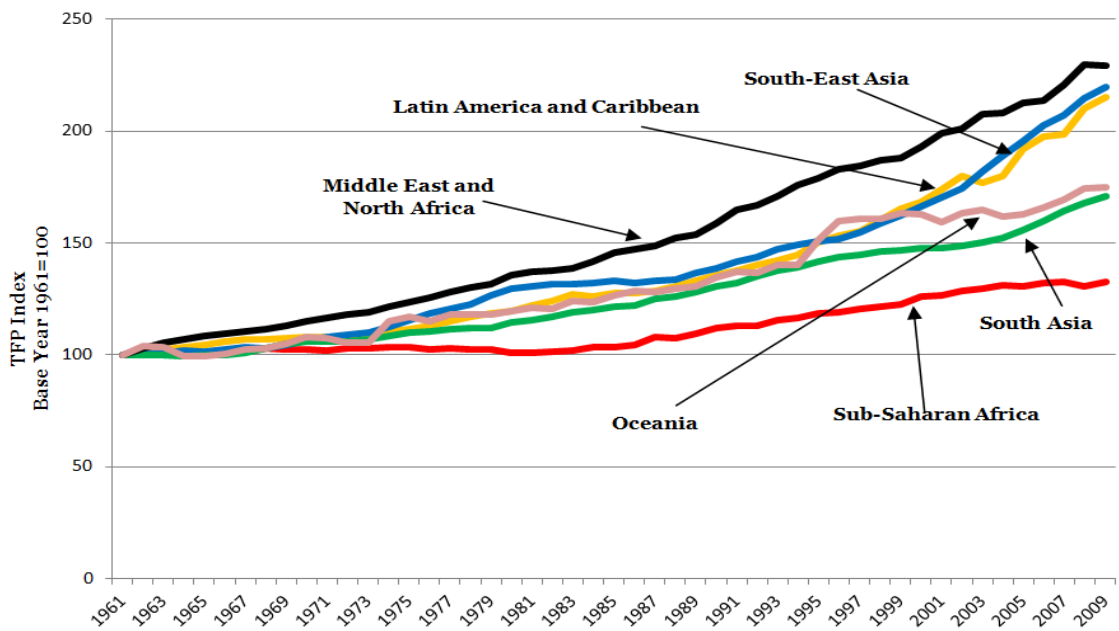


Figure 2: Agricultural total factor productivity (TFP) index growth by region (1961-2009). Source: Fuglie at al. (2012)

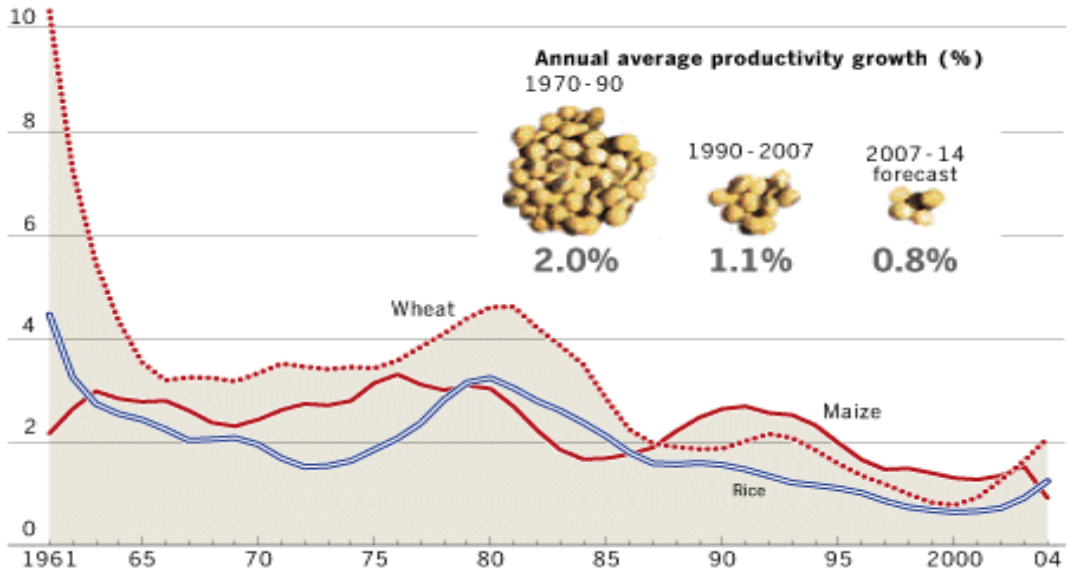
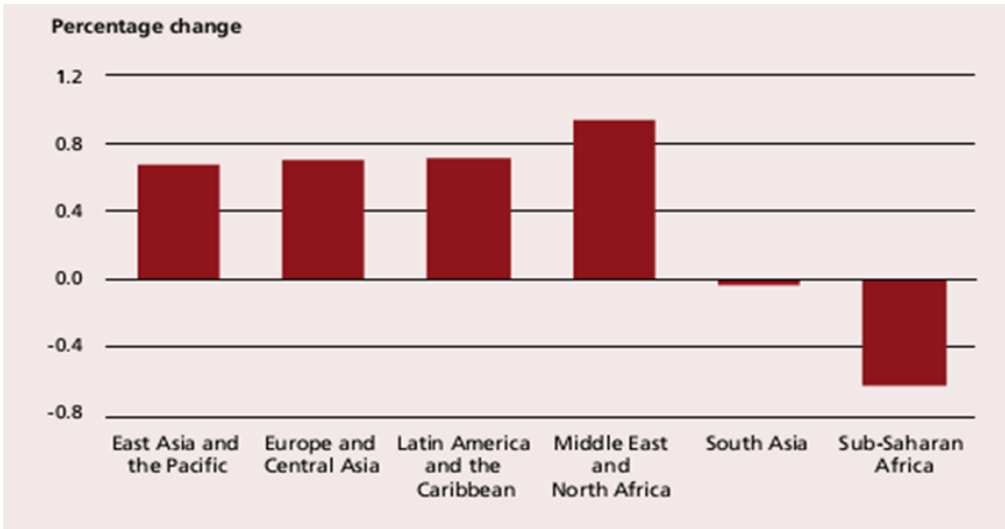


Figure 3: Annual per cent change in crop yield. Source: World Bank (2008)
Note: Fig. 3 refers to developing countries only.

The first obstacle to bridging the agricultural productivity gap is bridging the gap between the yields possible through the currently known technologies and the actual yields on farmers' fields. Bridging the larger yield gap in South Asia, as compared to others, calls for investments in applied and adaptive research and effective service delivery of seed, fertilizer and improved farm management practices. Investment in social and physical capital (e.g. primary and secondary education of farming populations, roads, railways, power and internet access) is essential. Elsewhere we have documented that such rural investment has been far greater in China than in India, explaining its more rapid structural transformation out of agriculture (Lele et al. 2011). A recent FAO report confirms that finding, namely that investment in agriculture has been growing in East and Southeast Asia – those parts of the world where independent evidence shows higher productivity growth rates. That same report estimates that investment rates during the period 1980 to 2007 have been stagnant in South Asia and declined in sub-Saharan Africa (Fig. 4) (FAO 2012).



Notes: For countries in Europe and Central Asia, average annual changes are calculated for the period 1992 to 2007.

Figure 4: Average annual change in agricultural capital stock per worker in low- and middle-income countries (1980–2007). Source: FAO (2012).

Agricultural experts are calling for a redoubling of the scientific effort to meet new environmental challenges while also raising the yield ceiling through increased investment in research and development (R&D) (Cassman 2010). They also stress that technological solutions will not suffice without policy and institutional changes that provide incentives to conserve resources. This means not only more investment in applied and adaptive research, but more investment in basic and strategic research, particularly in the context of climate change, rising temperatures and dramatic changes to hydrological cycles. While the CGIAR has expanded its efforts, large countries, such as China, India and Brazil, would also have to expand their own efforts. China is doing this by greatly expanding its investment in agricultural R&D (Beintema and Stads 2011). India still has ways to go in increasing its R&D investments and their effectiveness (Bhubaneswar Declaration 2013).

3. Agricultural water use in Asia, and its link to energy

Equally important to the technologies and infrastructure detailed above, any increase in agricultural productivity will require substantial investment in water and energy management. Agriculture is the largest consumer of fresh water resources, globally, using an average of 70% of the total water consumed. In West Asia agricultural water use is as high as 83% of total water withdrawals; and in South Asia it is 91% (FAO, 2013). Globally, irrigated agriculture represents 20% of the nearly 275 million ha of cultivated land, and accounts for 40% of global food production (UNESCO, 2008, 2012). In Asia dependence on irrigation is far greater—overall 40% of the cultivable area in Asia is irrigated.

4. Causes of groundwater exploitation

The extraordinary growth in the extraction of groundwater in India is a complex web of public policy and private sector behaviour. There was a failure of the initial large scale irrigation strategy, pursued in the post-independence period. This led to a lack of access to canal water in many areas. Combined with the low cost of pumps and drilling equipment, institutional finance, high population pressure on farm lands, stimulus programmes for public tube wells, expansion of rural electrification, flat rate tariffs and power subsidies – with unmetered power to the agriculture sector in most states all contributed to groundwater exploitation.

5. Impacts of irrigation

The public policies and the initial productivity and equity effects of ground water exploitation and farm power subsidies have been widely documented (Shah, 2009). Direct positive impacts on farmers include increased incomes and lower food prices, increased agricultural employment and wages, and farmer empowerment. This latter was a result of the increase in their assets and their access to decision making through community organizations (IEG 2008).

6. Impacts on sustainability and attempts at reforms

Groundwater resources now account for almost 80% of the recent growth in irrigation in South Asia and they are reaching the limits of exploitation.[‡] Flat power tariffs have led to power shortages and outages. These in turn have led to deeper tube wells, deployment of more powerful engines, transformer failures, power voltage fluctuations, high maintenance costs and low energy efficiency for both rural and urban consumers.

Attempts to improve the management of the power sector started in the post 2000 period. Most significant reforms were led by the State of Gujarat. The state segregated the power lines to track more effectively the use of power in agriculture and improve measurement of the subsidies owed to state electricity boards by separating them from transmission and other losses. This also assured a predictable supply of power to farmers. Overall management of the power and water sectors improved, by reportedly including groundwater recharge (Shah et al., 2009). These reforms have reduced risk and uncertainty with positive impacts on-farm productivity in Gujarat and improved predictability of the state electricity board's finances. The reforms are being emulated in a few other states, such as Karnataka and Punjab, but so far with mixed results. West Bengal and Kerala are the only states where 'text book' policies of full cost recovery power charges in agriculture are followed, because fewer farmers are using pumps and they have not organized (Mukherji et al., 2012). In states, with a high use of water pumps and a thriving agricultural sector, any move to charge for metered consumption or to directly increase tariffs beyond a basic minimum has provoked intense farmer opposition (Mukherji et al., 2012; Nair and Shah, 2012). In 2011 power subsidies amounted to US$7 billion, of which the state governments reimbursed the state electricity boards US$4.7 billion for tube wells. Had India used power charges to reflect true costs, it would have generated more internal resources for the state electricity boards to expand power production. This would have avoided the problems of extreme power shortages which are inhibiting agricultural and overall growth.

Tushaar Shah, by far the most articulate analyst and champion of water and energy governance issues in India, notes that the green revolution technologies worked in tandem with groundwater irrigation to create some 40 million ha of irrigated area by 2001. "Much of the increase in India's food production is due to this subsidized electricity." (Mukherji et al., 2012).

Initially, vibrant water markets stimulated by flat tariffs extended the benefits to poor water buyers. This enabled Indian food production to become more resilient to droughts. But now a large number of states and watersheds have been classified by India's Central Groundwater Board as semi-critical, critical and over-exploited. Yet in 2013 India's Central Electricity Authority reported 18.7 million electrical pumps, up by 15.5% from 2010 (and 0.15 percent in one month). Most of the growth of pumps occurred in 11, mostly western, states with the greatest over exploitation of water (Central Electricity Authority 2013, 2010) (Figs. 5a and 5b).

[‡] Additional potential for increased production could be found in the world's rain fed agricultural systems. The low production capacity of these systems at the present is evidence of the widespread neglect in investment in agricultural research and extension in rain fed areas, rather than any inherent deficiency in potential yields (Cassman, 2010).

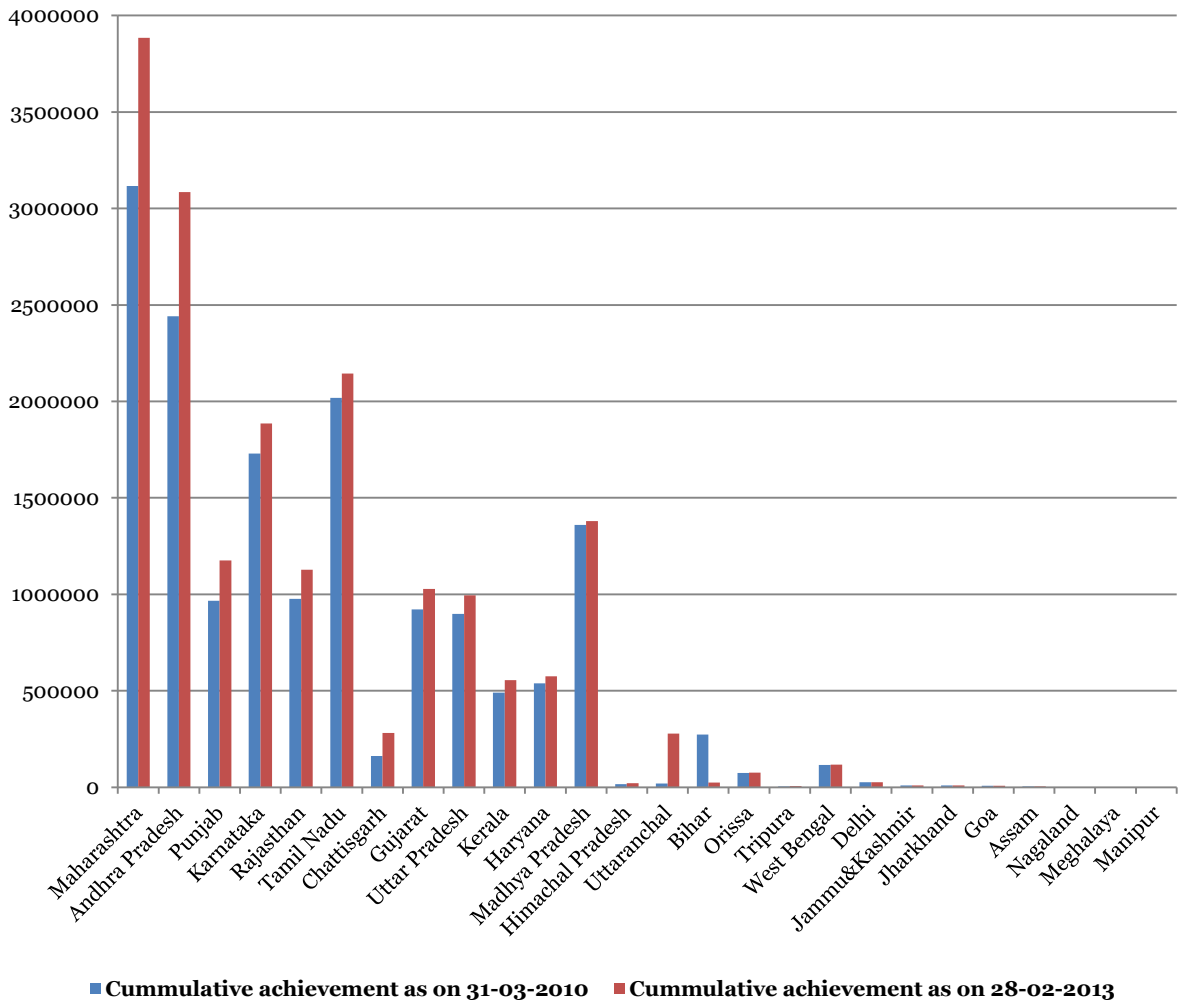


Figure 5a: Growth in the number of electrically powered pump sets in Indian states between 2010 and 2013. Source: Central Electricity Authority (2013, 2010).

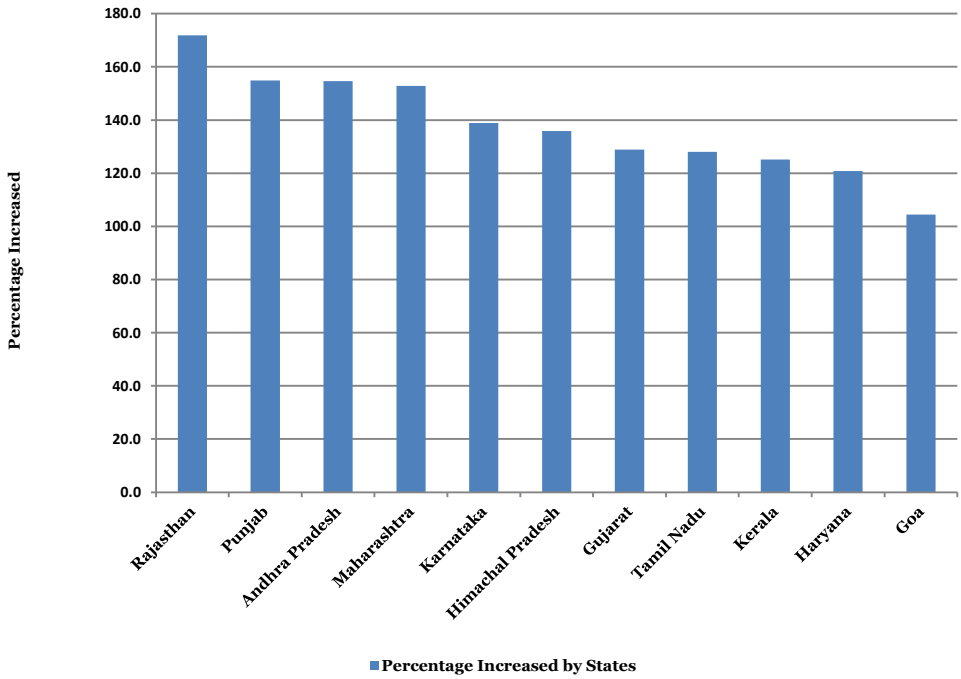


Figure 5b: The extent of over exploitation of water through the use of electrically powered pump sets in relation to the estimated ultimate ground water potential in 11 Indian states (as of 31 March 2012). Source: Central Electricity Authority (2013, 2010).

7. Role of dams

Throughout the world, an important strategy for harnessing water has traditionally been the construction of multipurpose dams. They have served the needs of agriculture, energy and growing cities, and helped protect populations from flood hazards, particularly in Asia, where such hazards have increased measurably. Indeed the largest such investments have been in China and the most assistance for the construction of dams by the World Bank has been in South Asia. Increasingly, international assistance agencies have questioned the development of new dams on the basis of their economic, social and environmental benefits. Yet countries have continued to invest in dams, albeit with different levels of efficiency and effectiveness (Lele, 2013; Chellaney, 2011). China's water strategy, based on damming rivers, is by no means free of controversy and contains several anomalies. China's large investment programme in hydropower development has been accompanied by an exemplary record of resettlements. The government has resettled 19 million people as a consequence of large infrastructure development projects since the 1950s. Critics have questioned this approach on the grounds of the lack of a voice for settlers to exercise personal freedom. India's controversial Narmada project, in contrast, was plagued by a poor resettlement policy which led to the establishment of the permanent Inspection Panel as an institutional mechanism to increase the World Bank's accountability to stakeholders. India continues to lack a systematic policy on resettlements, an increasing problem in expanding the much needed infrastructure. Indeed, more broadly it lacks a land policy (discussed later in this paper). There is evidence that land related conflicts are growing in both China and India, and yet less is known about local dissent in China. This is in part because scholarship in the Chinese languages is not easily accessible to most external scholars. Although the press is less vibrant in reporting political dissent, there is scholarly evidence that China's local governments have been acquiring land from farmers and selling it at high prices as a source of local government revenue (Man and Hong, 2011). India lacks a transparent

process for the fair acquisition of land and other natural resources. The consequences of this for tribal populations as well as the public exchequer are made evident by the scandals surrounding the mining sector in several states.

Beyond building dams, which tends to have a strong appeal among national policymakers, increasing the supply of water also means the need to increase the efficiency and productivity of the water used in agriculture. Increasing water use efficiency calls for reducing water losses in transmission and the non-beneficial use of water (i.e. reducing leakage or evaporative losses in water conveyance and application). Historically this aspect of water management has received more attention. It is exemplified by the extensive debate on canal lining, where China generally gets high marks, but where India has mixed results at best. Even in China people dispute the adverse environmental impacts on ecosystem functions of dams and canal lining. On-farm water conservation has received less attention, although recently conservation has been aided by the spread of drip irrigation technologies; there is the proviso that public policies on water exploitation are managed well. The latter can be achieved by adoption of agricultural practices that reduce runoff and increase the infiltration and storage of water in the soil in rain fed agriculture. On a larger scale, small, decentralized water harvesting and storage systems contribute to increasing water availability and agricultural production at the household and community levels. However, large programmes of small-scale water harvesting, like the watershed management programmes developed in Andhra Pradesh and other states of India, have shown significant negative impacts on the catchment's hydrology and downstream water availability. There have been important adverse distributional effects and issues of sustainability have been raised. The improvement of policies and institutions has thus become a must, an issue we turn to later in the paper.

An additional approach is increasing crop productivity with respect to water. That is, producing more crop or value per volume of water applied, as discussed above under bridging the yield gap. The third option is to re-allocate water toward higher value uses through intra-sector transfers. Limiting the irrigated area under a particular crop would reduce evapotranspiration. Alternatively, water could be diverted toward higher value crops through inter-sector transfers (transfers to municipal supplies, for instance). While diversification is taking place in India, China has diversified its agriculture to a greater extent and has systematically increased reliance on international trade in agriculture. It has also created massive employment in the manufacturing sector. India, however, has been stuck in a food self-sufficiency strategy based on rice-wheat and occasional exports of large surpluses caused by a combination of pricing policies, weather changes and lack of public sector storage. All the efficiency increasing strategies in agriculture, which use water better, have important income distribution and economy-wide policy and political implications across states, over time and among the different classes of farmers. Exporters win and the hungry lose. In short, the various policy choices and their impacts on producers and consumers are intimately related to the issues of governance and accountability to the public for results on development outcomes at large.

8. The challenge of good governance

Governance has been conceived at different levels by different analysts. There is insufficient clarity on what constitutes good governance, notwithstanding Elinor Ostrom's (1990) eight principles of good governance in the management of commons.[§] The World Bank's governance indicators empirically rank 210 countries using six

[§] These principles are: 1) clearly defined group boundaries; 2) rules governing the use of collective goods matched to local needs and conditions; 3) ability of most individuals affected by these rules to participate in modifying the rules; 4) the respect by all concerned authorities for the rights of community members to devise their own rules; 5) a system for monitoring members' behaviour and a broad based understanding by the community members themselves to undertake this monitoring; 6) a graduated system of sanctions which is enforceable and enforced; 7) the presence of low-cost conflict resolution mechanisms; and 8) and appropriate provision, monitoring, enforcement, conflict resolution and governance activities organized in multiple layers of nested enterprises.

criteria. Their methodology has flaws in the representativeness of the responses on which the ranking is based, but the relative positioning of the countries, presented in Table 1, offers a start and seems plausible. China ranks 200th among 210 countries on voice and accountability, compared to India's ranking of 86th. China ranks 126th, relative to India's ranking of 100th, on the rule of law and 149th in the control of corruption as compared to India's 136th. China, however ranks higher than India in political stability, government effectiveness and regulatory quality (Table 1). These latter three characteristics of China are critical for why a particular water strategy, which relies on large scale formal infrastructure and command and control, has been effective. These are precisely the areas in which Indian water strategy has gradually become ineffective. Quite independently of this view, Tushaar Shah (2009) perceptively attributed the decline in the formal irrigation system in India to the end of the command and control associated with colonial rule. Before diving further into the unique circumstances of China and India, the next sections discuss the global backdrop for understanding food and water security governance at the country level.

Table 1: Worldwide governance indicators for Brazil, China, India, Indonesia, South Africa and the U.S.

Country	Voice and accountability		Political stability and absence of violence/terrorism		Government effectiveness		Regulatory quality		Rule of law		Control of corruption	
	Estimate	Rank	Estimate	Rank	Estimate	Rank	Estimate	Rank	Estimate	Rank	Estimate	Rank
Brazil	0.50	76	-0.04	113	-0.01	95	0.17	94	0.01	94	0.17	79
China	-1.64	200	-0.70	157	0.12	84	-0.20	116	-0.46	126	-0.67	149
India	0.41	86	-1.20	183	-0.03	97	-0.34	127	-0.08	100	-0.56	136
Indonesia	-0.08	112	-0.82	165	-0.24	113	-0.33	124	-0.65	146	-0.68	152
South Africa	0.57	72	0.02	109	0.37	75	0.44	73	0.10	87	0.03	86
United States	1.13	30	0.54	76	1.41	25	1.49	18	1.59	20	1.25	31

Source: World Bank (2011)

Note: Estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance.

9. Governance of food and water security at the international level

The FAO has described the governance of food security as the "formal and informal rules and processes through which interests are articulated, and decisions relevant to food security in a country are made, implemented and enforced on behalf of members of a society" (FAO, 2011: 17). Unlike in the case of water, the food security governance framework has typically ranged from the global to the local levels, involving global supply and demand, international trade rules overseen by the World Trade Organization, food safety rules and food aid. There is also an increased space for the involvement of the private sector and NGOs – all the way from the global to the national level, down to the community, household and individual levels. Intra-household dynamics and the voice and power of women have begun to receive increased attention as determinants of nutritional outcomes. Unilateral policies of major exporting countries to adopt mandates and subsidies to produce biofuels have had global impacts on supplies and prices. They have had adverse impacts on the world's poor, but there are weak global governing mechanisms to address the consequences. Each importing country retrenched into protective food self-sufficiency policies by imposing export bans, which, fortunately have not lasted long. The Agricultural Market Information System (AMIS), launched by G 20, is too small a response to this crisis.

In 2000, the Global Water Partnership (GWP) stated in its report Towards Water Security: a Framework for Action that "the water crisis is mainly a crisis of governance" (GWP, 2000: 16). Rogers defined water governance,

mainly at the national level, as "the capability of a social system to mobilize energies, in a coherent manner, for the sustainable development of water resources. The notion includes the ability to design public policies (and mobilize social resources in support of them) which are socially accepted, which have as their goal the sustainable development and use of water resources, and to make their implementation effective by the different actors/stakeholders involved in the process" (Rogers, 2002:1). This definition proves to be useful, but illusive, in terms of finding examples to demonstrate its practice, with a few exceptions such as Morocco.

Both intra-and international water conflicts have been on the rise (Chellaney, 2011; Lele, 2013). More than 40% of the world's people live in 263 river basins that straddle international borders (Pearce, 2012). Only a third of those basins function under trans-boundary agreements (personal communication Wouters, 2013). In 1997 the UN adopted a relatively mild Convention on the Non-Navigable Uses of International Watercourses. It contains a statement of principle that nations should ensure the "sustainable and equitable use of shared rivers" (Wouters, 2013). China – the water tower of Asia – is the source of five major rivers (the Indus, Brahmaputra, Irrawaddy, Salween and Mekong) originating in its Tibetan plateau. China has the largest number of rivers rising in any country and passing into others (Chellaney, 2011). But it has not signed the UN treaty, ensuring its sovereignty over waterways flowing through its territory. For the treaty to come into full force, 35 nations must ratify it in their legislatures; so far 28 have done so.

Will these treaties come into force and will they make a difference to global water governance, when there are strong and weak states? There is growing tension between national sovereignty and the interests of the riparian countries in the regions, as for example, in the Mekong Delta. Currently there is no supra-national authority with jurisdiction over trans-boundary disputes. Under Chapter VII of the UN Charter (threats to security) the UN agencies cannot intervene without the consent of the countries concerned, except in the case of threats to peace (Wouters 2013). Furthermore countries of unequal size, political power and differing strength of internal governance have different interests in involving international organizations in reaching water agreements (Lele, 2013). The Indus Agreement on water sharing between India and Pakistan in 1960, mediated by the World Bank, is still adhered to even during conflicts between the two countries. But the prospects of reaching such effective international agreements seem low today given the weakening clout of international organizations and the rising power of nation states. This has led to reluctance on the part of national governments to internationalize disputes or negotiations. Whereas the Indus Agreement has been adhered to, problems of salinity, salt water intrusion and other environmental impacts of dams have been significant and have led to new questions. Should we focus on sharing water resources or on sharing the benefits which result from their effective collective management; benefits which can arise from good collective governance with transparent accountability?

The unwillingness to internationalize dispute management is understandable, given that currently 28 UN agencies, regional commissions and non-UN organizations and programmes work on 13 different overlapping water related programmes. The FAO's Assistant Director General for Sustainable Development, Alexander Mueller, notes that there is much scope and certainly a need for greater coordination among these programmes (Müeller 2006). To this we must add the growing competition among international organizations with overlapping mandates and stagnant support – other than an ever increasing number of dedicated trust funds. Since the four Dublin Principles were adopted and Agenda 21 was established in Rio in 1992, our understanding of what works has evolved considerably. Multipurpose dams, water users' associations (based on participatory irrigation management) and water pricing or cost recovery are no longer the silver bullets they were once thought to be. Solutions are becoming politically, socio-culturally and environmentally contextual and hence more country and location specific. Each of the old silver bullets has a role to play in appropriate contexts as we will see below in the case of China and India. Besides, water is by far the most complex resource to manage because it knows no national boundaries and weak states are in a poor shape to manage water either domestically or internationally.

10. Importance of governance: a hypothesis tested in the case of water management in China and India

10.1 Constitutions, property rights, and the role of command and control vs. a decentralized democracy

According to China's constitution all natural resources, including land, water and forests, are the property of the people (meaning state). A land 'reform' after the revolution led to the collective cultivation of agricultural and forest lands. While forced and at times violent this collectivization resulted in an egalitarian distribution of land with clear land rights vested in the state. Indeed, a World Bank Report on Land Policy in India noted that there is no 'involuntary' landlessness in China or Vietnam, unlike India (World Bank 2007). The household responsibility system, introduced in 1981, resulted in a contractual system whereby farmers were leased land on a long-term basis and given quotas to deliver a small portion of the production to the state. The households were left free to make decisions on what to plant and where to sell any surplus. While remaining politically authoritarian, China's sub-national governments have increasingly played a key role in promoting the reform and liberalization started at the local level. This has led to the national embrace of the household responsibility system promoted by the party. It was followed by an active land rental market with economic growth prompting an explosion in land rental activity. The constitution and a unitary line of command provide considerable power and scope to the state to develop long-term policies and strategies which ensure effective, equitable access to water to all households – households who have access to land.

According to India's constitution, the country's 28 states have responsibility for agriculture, water and forests. The centre, a powerful actor in the immediate post-independence years, which invested in large scale, donor underwritten irrigation schemes, has become weaker and ineffective. This is in contrast to the situation in the energy sector, where several independent evaluations have increased accountability for results. Shah and Singh (2012), as well as Mihir Shah, member of the planning commission responsible for water, make the case that the water sector has demanded little accountability even for the resources the centre allocates to the states. Perhaps this arises in part because the once all powerful Congress party does not control many state legislatures and the centre coalition needs other parties to maintain it. This is in sharp contrast to China's one party system. Additionally, the sector ministries have maintained the iron grip of the colonial period and been reluctant to modernize their management and operations, unlike those in China.

India has made several half-hearted efforts to improve land records and land administration, but these fragmented attempts are often thwarted by the interest groups in the departments that maintain these records (World Bank 2007). When they succeed, they improve and lead to higher levels of investment and productivity. They improve the welfare of those who own land, but even these successes have been slow in coming and have not yielded nation-wide results. A large number of households are landless, without tangible assets and are caught in a poverty trap from which it is difficult to escape. Their landlessness makes them extra vulnerable to water insecurity, since access to water is often tied to access to land. Even those who hold land are subject to rural inequalities, since some have access to irrigation while others must rely on rain fed agriculture, or those downstream, on unpredictable supplementary irrigation. Therefore, any effort to improve land administration policies should include improved access to land for the landless and those with insecure tenure. In this way the poor might increase their assets and better their livelihoods. The Government of India's core policies of land reform have included the abolition of intermediary interests, tenancy legislation, and land ownership ceilings. Where such reforms have occurred the implementation of land reform has been slow. There is a huge backlog of court cases on competing land claims and a large amount of wasteland under the control of the government.

In contrast to the Chinese land rental market, participation in land reform in India has declined continuously since independence, despite the fact that land rental is virtually the only land access option available to the large landless population. Throughout India's entire history of independence there have been more households renting land than there were households which have benefited from land reforms. This highlights the magnitude and importance of land policy (World Bank 2007).

10.2 Investment in irrigation, infrastructure and institutions

China's investment in irrigation has been an estimated at US$60 million per year for a period of ten years. These investments have directed substantial amounts of assets toward the assessment of hydrological resources, geographic and other information systems, rehabilitation of dams requiring deferred maintenance, canal lining and the deployment of other state of the art technologies. The command and control nature of the Chinese state, combined with the active role of local governments, has enabled China to invest in multipurpose dams and canals involving several provinces, while planning and implementing large scale reforms based on pilot programmes (e.g. the adoption of the household responsibility system for agricultural and forest lands). Many of their dams take into account the needs of other sectors, such as industry, in addition to the agriculture sector. This explains agriculture's lower share of water use in China as compared to that in India, where water use in other sectors has been growing in an unplanned and often surreptitious way.

In the five years of the 11th five year plan, India invested approximately US$70 million in irrigation as part of its water resources development. This is nearly what China invests every year in water management. A recent World Bank report noted that "despite the apparent role that it could play in achieving the Millennium Development Goals, irrigation investment, had fallen out of favour. Lending declined from the peak of the 1980s and whereas it rose again after the mid-1990s, the focus has shifted to rehabilitation and institutional reform rather than on new construction. This shift has been prompted by inefficiencies within irrigation systems resulting from poor operations and maintenance (O&M) and cost overruns as a result of which ex post rates of return have frequently fallen well short of 10 percent" (IEG 2006). Tushaar Shah however argues that India has focused more on construction and less on modernization of its irrigation system (Shah et al. 2012).

India needs to invest extensively in the development of quality human capital and institutions at all levels in order to improve its water management; perhaps even more so than it needs to invest in infrastructure (for power, transport, water and sanitation). Most of all, it needs a new mind set that demands more accountability for results. Paradoxically, the Chinese policymakers, who the lead author has interviewed over the years, explain their focus on results as a consequence of the absence of party politics and (national) elections. The only way the Chinese party can maintain legitimacy is by demonstrating results.

10.3 Strong and weak records of implementation

Fig. 6 lists the performance ratings assigned by the World Bank's Independent Evaluation Group to the World Bank's seven largest borrowers for overall agricultural projects and for irrigation and drainage projects during 1972 and 2011. India outperformed Brazil, Mexico and Indonesia in the agricultural sector as a whole, but not China. Furthermore, well over 90% of the irrigation and drainage projects in China were rated as marginally satisfactory or above, the highest proportion of any country. In contrast, India's performance ratings in the irrigation and drainage sector have been the lowest among the seven largest borrowers in that sub-sector.

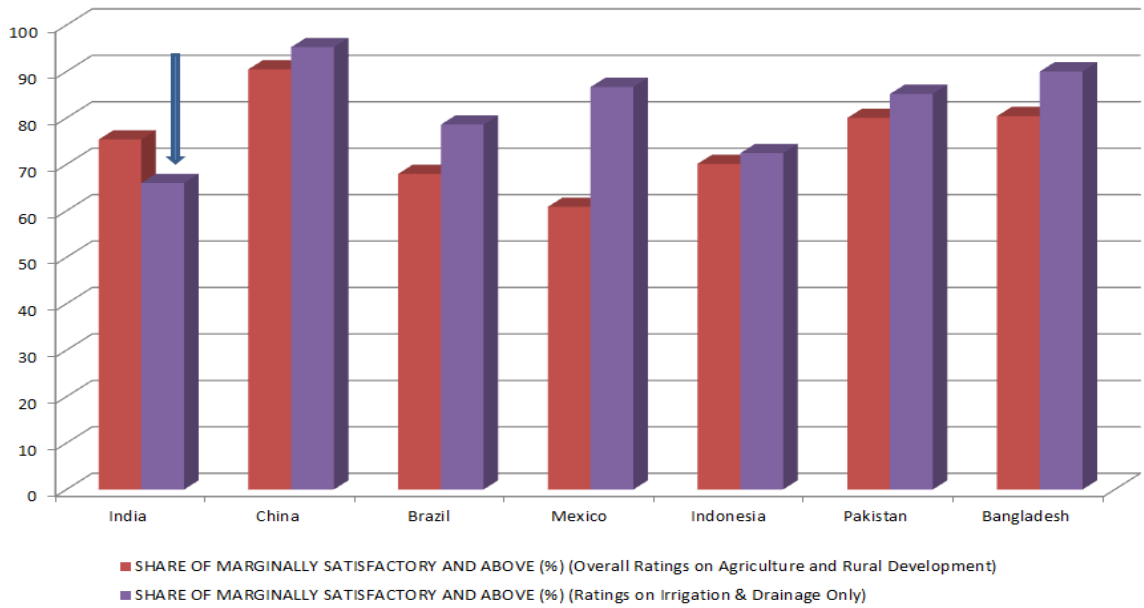


Figure 6: Fractions of the 176 irrigation and drainage and 517 agriculture and rural development projects of the World Bank's seven largest borrowers, rated marginally satisfactory and better. Source: IEG (2012)
Note: Analysis is on the basis of Exit FY (1972-2011)

10.4 Incentives, penalties, and participatory approaches

China uses a combination of positive incentives and penalties, as well as administrative directives on restrictions on water use within and across sectors. Other tools include the pricing of water and financial incentives to reduce water use. Water users' associations are a key player for managing these incentives and penalties, and an important mechanism for fostering participatory approaches. While these institutions exist in both China and India, they function very differently. Shah et al. (2012) note that, even though China embraced participatory irrigation management later than India, it has made more rapid strides in effectively using water user's associations combined with management support from the government water managers. Increasingly, China's local governments are finding themselves accountable for outcomes. And communities are finding new pathways for engaging with the system, via water users' associations, in applying both regulatory and other methods for reducing water use. Local officials serve as the coalition partners of reformist central leaders or initiate policy breakthroughs on their own. State ownership of water (and forest lands), while devolved to the households at the will of the local governments, has increasingly been followed by very capable water users' associations which are effectively taking responsibility for O&M at their level.

By contrast, India's Panchayati Raj institutions are weak, where elite capture is pervasive. Himanshu Thakkar (2012), a civil society activist and founding director of the South Asia Network for Dams, Rivers and People, summarizes it well: "the issue of multiple agencies will remain – the problem is thinking in exclusive and non-interacting silos, and the lack of coordination between agencies in a transparent, participatory way. We seem to have too much faith in technology, infrastructure, funds, and funding agencies, and we seem to lack faith in people, in democracy…." We argue that India is falling behind in developing an integrative approach to technology, infrastructure, funds and accountability of institutions. While India cannot adopt China's model, these comparisons do help to throw light of the huge challenge India faces to catch up on water governance. This is especially so

given its current ground water exploitation crisis and the already low rates of agricultural productivity growth. It calls for attention to policy as if on a war footing.

11. A way forward

Water is by far the most complex of natural resources to manage. It has no boundaries and therefore is not amenable to political or administrative restrictions. Nor is it amenable to simple analytical devices, such as centralized or decentralized governance and markets vs. states. It calls for good governance at all levels including, particularly, an understanding of the roles of and linkages between policies and institutions at various political and administrative levels. It requires the involvement of all stakeholders, and their collective impacts on the short and long run outcomes. China and India present two different archetypes of centralized and decentralized, authoritarian and democratic systems. Yet China seems to be making a successful transition from centralization to decentralization and is perhaps inching toward a more balanced approach to the strategic management of water in the context of overall development than is India. This does not mean China's approaches are free from criticism or immune to disasters, which may come to light more slowly in a more controlled system, as Amartya Sen contended. In contrast, India's decentralized approach is not recognizing the importance nor taking advantage of its large country status to address long-term strategic issues facing its water sector. It is not learning lessons systematically or fast enough to be ahead of the impending more severe water crisis. It needs a holistic strategy, rather than piecemeal approaches to examine the changing role of water in a rapidly growing economy with demographic pressures on resources which are unprecedented in size and complexity. To address the tremendous pressure on water it will need central leadership and it will need to ask such radical questions as:

- Should it place a moratorium on future growth in the number of electric pumps in states which have already reached a critical level of water exploitation?
- Should it bite the bullet and raise water and power charges slowly and methodically as a way to increase water use efficiency?
- How should it deal with politically vocal farmer constituencies who demand the short-term palliatives typical of a democracy, but who do not get the quality of services they deserve?
- How can it learn from its own successful reforms to scale up systematically?

Such an approach will call for a strong degree of consensus on solutions among the political and administrative elite. The consensus must be based on strong analytical work, and consensus is not easily achieved in any democracy as the financial crisis in developed countries has made clear. It would call for courageous collective leadership and out of the box thinking. It requires commitment to implementation, systematic monitoring of interventions and results and a greater focus on management with a single minded focus on improved outcomes for the masses, to assure India's long-term food and water security. Technology will be critical in increasing efficiency, including the new information technology. But technology does not substitute for real leaders, or sound ideologically free policies and institutions.

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