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INSIDE

About the photograph:
A village in Rajasthan electrified by women barefoot solar engineers

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The water and energy debate: Can solar power provide solutions?

Farmers turn to the rain god, Indra, when all else fails. Perhaps now they can give the sun god, Surya, a shot as well?

If God appeared in the dream of a paddy farmer in India's West Bengal and said, "You have made me happy with your hard work. Make three wishes and they will be granted," the farmer will invariably say, "I want rain, rain and rain."

That thought kept playing over in my mind after meeting with farmers in the paddy fields of the Siliguri and Jalpaiguri districts of West Bengal.

Located in India's northeast, the region is famous for its scenic beauty, tea plantations and paddy fields. While the fertile soil makes it ideal for growing a variety of crops, the area is almost entirely dependent on rainfall for irrigation, like many other parts of the country.

To reduce their dependence on the monsoons, the region's farmers have sought to pump up groundwater for irrigation – much the same as farmers in the rest of the country. The result is that today, India has become the world's largest user of groundwater irrigation, despite inheriting the world's largest canal irrigation network in 1947.

Groundwater is pumped up using electric or diesel-powered pump sets. Diesel-powered sets are more prevalent in the eastern part of the country, partly because electrification in this region is much poorer. Altogether, some 9 million diesel-powered pump sets have been deployed across India for irrigation.

In addition, 12 million electricity connections have been taken for agricultural purposes. It may come as a surprise, but agriculture alone uses up to 20 percent of all the electricity consumed in India, with most of this being used for irrigation.

In some states this share is even higher, with agriculture accounting for as much as 30-50 percent of all the electricity consumed in the state. Clearly, pumping up groundwater for irrigation is a highly energy-intensive exercise.

Let's see how this impacts the energy and water sectors – both sectors that are critical for India's growth and development. In many states, power for agricultural purposes is highly subsidized. This, combined with an unreliable supply of electricity, often leads farmers to leave their pumps on all the time. As a result, both electricity and water are wasted, with too much energy being used to extract too much groundwater, often way more than needed.

The problem is particularly acute in Punjab and Haryana, where farmers are given electricity for agriculture-related tasks at no cost, usually at night. The result is that farmers often leave their pumps running throughout the night, leading to a rapidly depleting water table and over-irrigated farms, not to mention all the wasted electricity. Not only that, farmers frequently suffer snake bites when they go out to manage the flow of water into their fields at night time, making this a particularly trying exercise for them.

Clearly, the current scenario is not sustainable. For, if all India's arable land were to be irrigated in this water and energy-intensive manner – more than half of the cultivated land is yet to be irrigated – the country's water and energy needs for agriculture alone will soar dramatically.

But there could be an alternative. Solar energy, long considered ideal for home

A paddy farmer with his umbrella on a rainy day in West Bengal

Some facts about Solar

Global prices of solar photo voltaic (PV) cells have fallen from $77/watt in 1977 to $0.36/watt in 2015 and will keep falling in the times to come.

Germany has more than half of the world's solar installation. More than 50 percent of its electricity comes from solar.

Germany, China and USA are the top three countries in solar capacity; India is at the 10th position.

India has installed almost 5 GW of grid connected solar power. PRA prices have fallen from Rs 15 to Rs 5 per unit in the last five years.

India's target is to install 100,000 solar pumps each year.

Photo: Mathieu Schoutteten / Creative Commons

With prices of solar modules having fallen by 70 percent in the last four years, these pumps are fast becoming a viable financial solution for irrigation

lighting uses, has suddenly become attractive for pumping up irrigation water. India already has some 25,000 solar pumps in the fields, and farmers everywhere seem happy with their performance and potential. Moreover, with prices of solar modules having fallen by 70 percent in the last four years, these pumps are fast becoming a viable financial solution for irrigation.

Let's address some common concerns regarding the use of solar power for irrigation:

1. Won't solar pumps deplete India's groundwater even further?

It is sometimes argued that solar pumps, which use free solar resources, will make farmers even more careless about wasting groundwater, leading to excessive extraction. This may indeed be true in areas that are not geographically suited for their use, such as in western and southern India where ground water tables are already low; here, solar pumps will have to be used very carefully. On the other hand, in high ground water table regions like the Ganga-Brahmaputra Basin in eastern India, they could be quite successful.

Moreover, if farmers could sell their surplus solar electricity to the grid at good rates, they would think twice before pumping up groundwater unnecessarily. The state of Karnataka is banking on just this. Under its "Surya Raitha" scheme, the state electric utility announced a tariff of Rs 9.56 for every unit of solar power sent to the grid. Currently, 300 farmers are piloting this approach and have turned in their traditional diesel-run pumps voluntarily. The scheme is being monitored to see how it works.

Another option is being tried out in West Bengal. Here, a World Bank irrigation project is exploring a service contract model where a solar pump operator provides a farmer with a fixed amount of water for a certain fee. If proper limits are set and enforced, this model can put a price on water and help in controlling the amount of water that is pumped up for irrigation. Compliance can be monitored through inexpensive GPRS and remote sensing technologies. In the non-irrigation season, the un-utilized power from solar pumps can be used by small agro-mills for drying crops.

2. Isn't it prohibitive to install and operate a solar pump?

The upfront cost of a solar pump – say 2 HP which is capable of irrigating 5 acres of land – is about 10 times more than that of a conventional diesel-powered pump ($5,000 vs $500). This is despite the significant reduction in the price of solar modules from $3 per watt in 2009, to less than $1 in 2015.

Larger solar pumps may not be as beneficial in areas where land holdings are small, unless the water pumped up can be shared among a group of farmers

Undoubtedly, small and marginal farmers may not have the ready cash to buy these solar pumps or be able to borrow money from a commercial bank to do so, since banks still don't consider solar pumps as 'bankable technology'.

But think about the long-term returns. It costs virtually nothing to run a solar pump which can last for at least 25 years with little overhead or management costs. The cost of producing power from a solar pump works out to around $0.15 unit per unit – compared to $0.30 for a diesel- powered one. Thus, the farmer can recover his initial investment in 6-9 years. This clearly makes the solar pump the more viable option in the long run. And once commercial and public banks in India start lending to install them, it could make a significant difference in the lives of farmers, as well as impact the critical power and water situations in the country.

3. Is solar energy reliable in all seasons?

In many parts of India, cloudy weather conditions, particularly during the monsoons,

prevent solar pumps from working for 60-70 days a year. But since it generally rains a lot at this time, irrigation may not be necessary. Nonetheless, there will still be a few days when you might not see the sun. Given these factors, solar pumps can prove to be a reliable source of power 90 percent of the time. The remaining period can be taken care of by adding a facility to store energy or water.

Moreover, larger solar pumps may not be as beneficial in areas where land holdings are small, unless the water pumped up can be shared among a group of farmers.

4. Are solar pumps environment friendly?

Undoubtedly, electric and diesel powered pumps consume a great deal of energy. Diesel powered pumps account for 13 percent of India's total diesel consumption, and 19 percent of the coal used to generate electricity is consumed for this purpose. If half of India's diesel pumps were replaced with solar photo-voltaic pump sets, the country's diesel consumption could be reduced by about 7.5 percent. And if every

Electric and diesel powered pumps account for nearly six percent of India's total carbon emissons. If these were to be replaced with solar power pumps, this aspect of the carbon footprint would be completely wiped out

mechanism that uses electricity to pump up groundwater water were refitted with a solar pump, an electricity distribution company's losses could be reduced by an average of Rs 30,000-Rs 35,000 per pump each year.

Electric and diesel powered pumps also have high carbon emissions. They emit 16-25 million mt of carbon per year, accounting for nearly six percent of India's total carbon emissions. If these pumps were to be replaced with solar pumps, this aspect of the carbon footprint would be completely wiped out, and India's "dirty" groundwater economy be transformed into a clean one.

By contrast, solar pumps are 'clean' and use a renewable source of energy. Farmers can pump up groundwater for six to 10 hours daily – and even more during the winter and summer months when irrigation is needed the most – using free, uninterrupted energy supply during the day time.

5. What policy would be the best for India?

The ground water situation across India is very diverse. In some areas, ground water is over-exploited, whereas in others, further development is possible. There are also differences between areas that have shallow aquifers and deep systems, and between alluvial soil and hard rock regions. The East-North and West-South contexts are also different.

In eastern India, the use of solar pumps is likely be a very attractive option. In West Bengal, for instance, where the ground water table is high and floods are frequent, the risk

of over-pumping of groundwater and the resultant depletion of aquifers is not as acute. In such a scenario, a capital cost subsidy can be effectively deployed to increase the use of solar pumps.

In the western region, however, where groundwater tables are already low, it may be more appropriate to adopt power purchase policies where farmers can sell the extra solar power they generate to distribution companies at a preferential price, rather than using it for extracting ground water indiscriminately.

All said and done, we need to explore these options further and fully understand the impact of solar pumps on groundwater levels in India. Once this is fully understood and both the infrastructure and governance for selling electricity back into the grid are in place, solar powered pumps may well prove to be the answer to a farmer's prayers, while also easing the critical energy and water situations in India.

Contributed by Amit Jain, Energy Specialist, World Bank, India

Bhutan's commitment to an ambitious target offers an example for South Asia

South Asia is among the regions of the world that is likely to be most affected by climate change. We are already experiencing this. There is increasing variability of the monsoon rainfall and an increase in the number of droughts. An approach that includes a commitment to ambitious goals, mainstreaming climate change measures, and cooperating with neighbors, could lead to real progress, said Annette Dixon, World Bank's Vice-President for the South Asia Region

The mountain kingdom of Bhutan may not seem an obvious place to look for lessons on addressing climate change. But on a recent visit here, I was impressed with how much this small country has achieved and also with its ambition. Bhutan has much to teach South Asia and the wider world.

These lessons are especially relevant as the world negotiates in Paris a new pact on climate change at the International Climate Change Summit, known as COP21, which we all hope will move the global economy to a low-carbon and more resilient path.

The talks aim to agree on a way to keep global warming to a maximum of 2 degrees celsius from pre-industrial era levels. There is widespread agreement that going above this threshold would have serious consequences.

South Asia is among the regions of the world that is likely to be most affected by climate change. We are already experiencing this. There is increasing variability of the monsoon rainfall, more heavy rainfalls such as those that caused the recent flooding in India, and an increase in the number of droughts.

A World Bank report in 2013 predicted that even if the warming climate was kept at 2 degrees this could threaten the lives of the millions of people in South Asia. The region's dense urban populations face extreme heat, flooding, and disease and millions of its people could be trapped in poverty. Droughts could especially affect north-western India, Pakistan and Afghanistan.

These are big problems. They may look much bigger than anything Bhutan, a very small country in a populous region, can teach South Asia and the world. But I see three lessons. First, a commitment to ambitious goals will be critical to save the world from climate disaster. To stop the world from warming too much, climate experts estimate that global greenhouse gas emissions must be cut by up to 70 percent by 2050. Carbon neutrality (zero emissions) must be achieved within this century.

Bhutan declared in 2009 that it would remain carbon-neutral and has made the most ambitious pledges on cutting emissions at COP21, according to Britain's Energy and Climate Intelligence Unit think tank. It is carbon-neutral already because of its vast forests absorbing carbon emissions. But staying neutral as emissions from industry and transport rapidly rise will not be easy. It will require aggressively maintaining its tree cover and finding ways to grow economically in a carbon-neutral or reduced way. To achieve this, the Royal Government of Bhutan has embedded its commitment to maintain its forest cover at more than 60 percent.

Second, mainstreaming comprehensive climate change measures across the economy is the way to go. The alternative of a case-by-case approach will result in gains in one area that are negated by setbacks in others. Bhutan has taken the approach of mainstreaming climate change and resilience in policies on disaster risk management and weather monitoring, water-related services, agriculture, urban transport, information and communications technology (ICT), hydropower, and forest management. In ICT, for example, Bhutan is positioning itself as the country of green, reliable energy to attract private green investment and jobs.

Third, there are big potential wins in the fight against climate change from cooperating with neighbors. This could even save lives. With the earth warming, the number of natural disasters are increasing. In the past two decades, over 50 percent of South Asians (more than 800 million people) have been affected by at least one natural disaster. South Asian countries can gain from cooperating on disasters that stem from shared climate change-related challenges.

When I was in Bhutan, I announced a new weather and disaster improvement project to expand weather forecasting and natural disaster early warning in Bhutan and the South Asia region. I also announced a pilot program for climate resilience that has the potential for considerable expansion.

Climate change is the defining challenge of our era. But an approach that includes a commitment to ambitious goals, mainstreaming climate change measures, and cooperating with neighbors, could lead to real progress.

This article was originally published in the Financial Express on 10 December 2015

ICR Update

This is a short summary of the Implementation Completion Report (ICR) of a recently-closed World Bank project. The full text of the ICR is available on the Bank's website. To access this document, go to ***www.worldbank.org/reference/*** *and then opt for the Documents & Reports section.*

Rajasthan Water Sector Restructuring Project

Context

Water is a scarce resource in the desert state of Rajasthan where the rural sector accounts for 77 per cent of the population, the majority of whom are poor. The government was faced with the challenge of better managing its increasingly scarce water resources for agriculture which accounted for 33 percent of the state's GDP and 70 percent of employment.

Project Development Objectives

The objective was to (a) strengthen the capacity for strategic planning and sustainable development and management of surface and groundwater resources in Rajasthan; and (b) to increase agricultural productivity through improved surface irrigation systems and strengthened agricultural support services, involving greater participation of users and the private sector in service delivery in Rajasthan.

Rajasthan Water Sector Restructuring Project	
Approval Date:	19 February, 2002
Closing Date:	31 March, 2013
Total Project Cost	US$ 195 million
Bank Financing:	US$ 124 million
Implementing Agency:	Water Resources Department, Government of Rajasthan
Outcome:	Moderately Satisfactory
Risk to Development Outcome:	Moderate
Overall Bank Performance:	Moderately Satisfactory
Overall Borrower Performance:	Moderately Satisfactory

The key deliverables included preparation of river basin plans, rehabilitation of canal irrigation systems, increasing irrigated area and establishing well-functioning and financially sustainable water user associations (WUAs).

Project Beneficiaries

The Project was expected to benefit about 258,000 farm families and create about 37,000 jobs per year.

Achievements

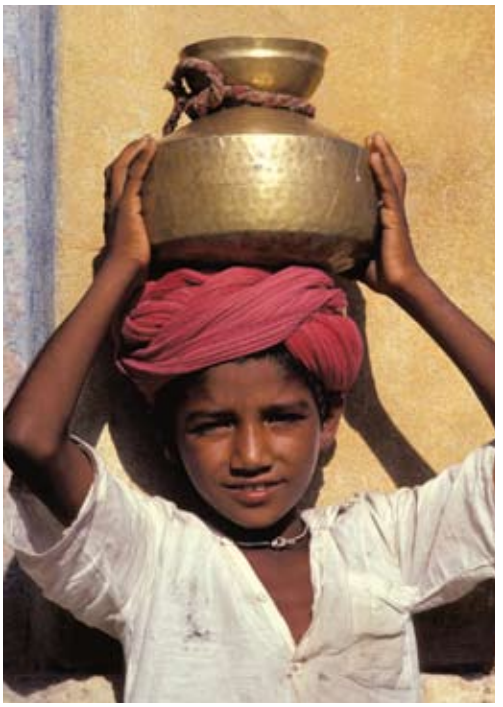
Over all, the Project benefited about 222,300 farm families of which 55 per cent were small and marginal farm holders. By end of the Project, about 38,235 families benefited from the poverty alleviation impacts due to project-led incremental financial benefits and about 59,615 families benefitted from the improved irrigated agriculture-led poverty alleviation impact. River basin plans were prepared for all 15 river basins in the state against the target of eight. The canal irrigation system was rehabilitated in 652,568 ha area, against the target of 670,000ha. The gross irrigated area increased by about 146,386 hectares against the target of 100,000 hectares. This resulted in increasing yield of wheat, mustard and cotton by almost three times. The Project also successfully created 525 well-functioning Water User Associations (WUAs) against the target of 546 WUAs. These WUAs managed the irrigation water in their area of operation and collected water charges.

Lessons Learnt

- ***Managing complexity in complex sectors:*** A Bank project designed to address the multiple development objectives and technical and policy reform issues, is unlikely to achieve its objectives in a project cycle of 5 to 6 years. This most often requires repeated extensions, resulting in inefficient use of Bank's resources and delayed benefits. It is important to separate the reform vision (long-term) from the actions to be achieved in a single project cycle (short-term). This is all the more necessary in projects in low income states, where the absorptive and management capacity of our clients may need to be increased before smooth implementation is possible.

- ***User fees for water are politically charged and not easily reformed:*** The sustainability of rehabilitated irrigation schemes hinge on the appropriate operation and timely maintenance of those schemes. This requires a steady flow of funding through user fees, subsidies, or a combination of both. One major lesson from this operation is that mandating the increase of fees does not necessarily results in increased fees. Moreover, increased fees do not necessarily translate into increased revenue, if the incentives to pay are not in place and collection rates are not sufficient. A recent review of the World Bank's Water Strategy identified full cost recovery of water services delivery as economically desirable but rarely achieved in practice. It noted that underpricing of water supply services is widespread, even in upper-middle-income and high-income countries.

- ***Invest appropriately to increase client capacity:*** Low institutional capacity of government departments and implementing agencies, which is all the more pronounced in low-income states, will negatively impact project



implementation and outcomes. In addition to providing needs-based training to staff and officers of government departments and implementing agencies, more consistent technical assistance may be needed to generate the behavior change and skills upgrading required to manage more technically sophisticated water management systems.

- ***Developing WUAs is a long-term process:*** Institutional capacity building of WUAs takes substantial long term efforts and support, much beyond the training and capacity building that can be provided within a single project period.
  It is important, therefore, that the client have an in-house program to provide technical support, training, and capacity building to WUAs. In addition, WUAs should be legally empowered to collect and retain a portion of water charges, and raise additional funds, including from their own members, to carry out their mandated functions.

- ***Sustainable groundwater management is best done at the aquifer level through the legally empowered community organizations:*** To achieve sustainable management of groundwater, it is essential to have commitment of the community. Information, education and communication are essential for motivating communities to the need for restraint and cooperation in the use of groundwater. This takes a lot of time but can be made to work with enabling legislation together with the active and continued technical support to the community organizations.

Recent Project Approvals

Swachh Bharat Mission (SBM) Support Operation Project

The World Bank Board has approved a US$1.5 billion loan for the Swachh Bharat Mission (SBM) Support Operation Project to support the Government of India in its efforts to ensure all citizens in rural areas have access to improved sanitation – such as a toilet or latrine with a focus on changing behaviors – in ending the practice of open defecation by 2019.

Specifically, this Project will support the rural component, known as SBM – Gramin (SBM-G), over a five-year period using a new performance-based program which links funds directly to results, ensuring that benefits are delivered to the people in need – more than 60 percent of India's rural population.

Today, of the 2.4 billion people who lack access to improved sanitation globally, more than 750 million live in India, with 80 percent living in rural areas. More than 500 million of the rural population in India continue to defecate in the open, suffering from preventable deaths, illness, stunting, harassment and economic losses.

The SBM-G program focuses on ensuring usage of toilets along with their construction. States and their implementing agencies will be given incentives for meeting performance standards. Performance will be measured against the states' ability to reduce open defecation, sustaining their open defecation free (ODF) status and improving solid and liquid waste management in rural areas. The financing mechanism promotes the leadership of the states, which will have flexibility in innovating and adopting their own delivery models.

Bihar Kosi Basin Development Project

The World Bank Board has approved a US$ 250 million credit for the Bihar Kosi Basin Development Project.

The Project will address the long-term challenges of enhancing flood management capacity and agricultural production in the Kosi River Basin, building on the ongoing reconstruction work that started following the 2008 Kosi river floods.

The Project will benefit about 10 million rural people, mostly small, marginal and landless farmers, in the districts of Araria, Madhepura, Purnea, Saharsa, and Supaul.

In 2008, the Kosi River breached a portion of the embankment system and caused unprecedented floods in Bihar. The breach affected over 3.3 million people and caused over US$ 1.2 billion in damage.

Phase I, under implementation since March 2011, was designed to help address the short- to medium-term recovery needs of the flood-affected population. So far about 31,000 houses have been completed through an owner-driven construction process; and 66 bridges and 14 roads have been completed to restore and enhance connectivity.

Under the current Project, approved by the Board, the state will enhance its resilience to floods and increase agricultural production and productivity in the targeted districts. It will also help improve the Government of Bihar's capacity to respond promptly and effectively to future disasters.

Recent Project Signings

Andhra Pradesh Rural Inclusive Growth Project

The Government of India, the Government of Andhra Pradesh and the World Bank have signed a US$ 75 million credit for the Andhra Pradesh Rural Inclusive Growth Project to enhance agricultural incomes of small and marginal farmers and ensure increased access to services related to health, nutrition, sanitation and social entitlements.

The Project will focus on increasing economic opportunities for small and marginal farmers, especially from Scheduled Caste (SC) and Scheduled Tribe (ST) households in the 150 most backward mandals (cluster of villages across gram panchayats) of the state. It will invest in developing a network of social enterprises for food, nutrition, sanitation and other social enterprises which operate at community and district level. It will also support the Government of Andhra Pradesh in its efforts at creating an enabling policy framework, and enhancing market access for farmers with real time analytics across sectors.

Several Memorandum of Understandings (MoUs) with leading private sector organizations are being planned to enable farmers to better access markets. Investments will also be made in improving access to services in the areas of health, nutrition, and water and sanitation and increasing coverage and effectiveness of India's social safety net programs.

The credit agreement for the Project was signed by Raj Kumar, Joint Secretary, Department of Economic Affairs, Ministry of Finance, on behalf of the Government of India; Sunitha Kolaventy, Finance Secretary, on behalf of the Government of Andhra Pradesh; and Onno Ruhl, World Bank Country Director in India, on behalf of the World Bank.

New Additions to the Public Information Center

This is a select listing of recent World Bank publications, working papers, operational documents and other information resources that are now available at the New Delhi Office Public Information Center. Policy Research Working Papers, Project Appraisal Documents, Project Information Documents and other reports can be downloaded in pdf format from 'Documents and Reports' at www.worldbank.org

Publications may be consulted and copies of unpriced items obtained from:

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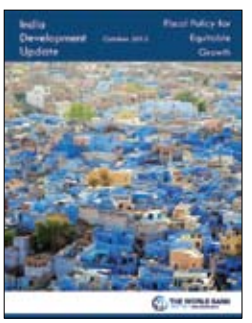
India Publications

India Development Update: Fiscal policy for equitable growth



By Frederico Gil Sander, Saurabh Shome, Smriti Seth and Jaba Misra
Available: on-line
English; Pages 80
Published: October 2015
Report No.: 100453

India's economy expanded by 7.3 percent in FY14-15 and 7.0 percent in Q1 FY15-16 (y/y). Industrial growth increased and despite government services slowing down, services expanded. Domestic drivers increased, while exports declined. Private consumption growth stayed strong and investments gained momentum. Gross domestic product is expected to increase gradually to 7.5 percent in FY15-16. The positive outlook is dependent upon the implementation of important domestic reforms which include: boosting the balance sheets of the banking sector through a sustainable solution of the debt overhang of primarily power and road infrastructure firms, continuing to improve the ease of doing business and enacting the crucial Goods and Services Tax, and enhancing capacity of state and local governments to deliver public services as more resources are devolved from the centre.

India: Policy Research Working Papers

WPS 7473

Households or locations? Cities, catchment areas and prosperity in India
By Yue Li and Martin G. Rama

This paper combines insights from poverty analysis and urban economics, and develops a methodology to assess spatial performance with a high degree of granularity. This methodology is applied to India, where individual household survey records are mapped to

"places" (both rural and urban) below the district level. The analysis disentangles the contributions household characteristics and locations make to labor earnings, proxied by nominal household expenditure per capita. It shows that one-third of the variation in predicted labor earnings is explained by the locations where households reside and by the interaction between these locations and household characteristics such as education. In parallel, this methodology provides a workable metric to describe spatial productivity patterns across India.

The paper shows that there is a gradation of spatial performance across places, rather than a clear rural-urban divide. It also finds that distance matters: places with higher productivity are close to each other, but some spread their prosperity over much broader areas than others. Using the spatial distribution of this metric across India, the paper further classifies places at below-district level into four tiers: top locations, their catchment areas, average locations, and bottom locations.

The analysis finds that some small cities are among the top locations, while some large cities are not. It also finds that top locations and their catchment areas include many high-performing rural places, and are not necessarily more unequal than average locations. Preliminary analysis reveals that these top locations and their catchment areas display characteristics that are generally believed to drive agglomeration economies and contribute to faster productivity growth.

WPS 7481

The exposure, vulnerability, and ability to respond of poor households to recurrent floods in Mumbai
By Archana Mahesh Patankar

This paper examines poor households in the city of Mumbai and their exposure, vulnerability, and ability to respond to recurrent floods. The paper discusses policy implications for future adaptive capacity, resilience, and poverty alleviation. The study focuses particularly on the poor households, which tend to have greater exposure and vulnerability to floods and limited ability to respond given the constraints on physical and financial resources.

The study seeks to understand the implications of the fact that poor households are more likely than non-poor households to be located in flood-prone areas. The study used the land use maps for the selected flood-prone areas to determine the extent and spread of poor and non-poor households and other types of assets and activities in areas with chronic and localized flooding. Primary data were obtained through detailed household surveys to understand the vulnerability and impacts of the extreme floods of July 2005, recurrent floods and the ability of households to respond and cope. The study examined the option of relocation to flood-free areas and identified factors that influence families' decisions regarding relocation. The study finds that a significantly large proportion of poor households are located near areas with chronic and localized flooding. These households are either below the poverty line or have low incomes and reside in informal settlements or old and dilapidated structures. Future climate risks are likely to put greater burden on the poor and push them further into poverty unless well directed efforts are made to protect them.

WPS 7470

Measuring progress towards universal health coverage: With an application to 24 developing countries
By Adam Wagstaff, Daniel Cotlear, Patrick Hoang-Vu Eozenou and Leander Robert Buisman

The last few years have seen a growing commitment worldwide to universal health coverage (UHC). Yet there is a lack of clarity on how to measure progress towards UHC. This paper proposes a 'mashup' index that captures both aspects of UHC: that everyone—irrespective of their ability-to-pay—gets the health services they need; and that nobody suffers undue financial hardship as a result of receiving care. Service coverage is broken down into prevention and treatment, and financial protection into impoverishment and catastrophic spending; nationally representative household survey data are used to adjust population averages to capture inequalities between the poor and better off; nonlinear tradeoffs are allowed between and within the two dimensions of the UHC index; and all indicators are expressed such that scores run from 0 to 100, and higher scores are better.

In a sample of 24 countries for which there are detailed information on UHC-inspired reforms, a cluster of high-performing countries emerges with UHC scores of between 79 and 84 (Brazil, Colombia, Costa Rica, Mexico and South Africa) and a cluster of low-performing countries emerges with UHC scores in the range 35–57 (Ethiopia, Guatemala, India, Indonesia and Vietnam). Countries have mostly improved their UHC scores between the earliest and latest years for which there are data—by about 5 points on average; however, the improvement has come from increases in receipt of key health interventions, not from reductions in the incidence of out-of-pocket payments on welfare.

WPS 7451

Effects of land misallocation on capital allocations in India
By Gilles Duranton, Syed Ejaz Ghani, Arti Grover Goswami and William Robert Kerr

Growing research and policy interest focuses on the misallocation of output and factors of production in developing economies. This paper considers the

possible misallocation of financial loans. Using plant-level data on the organized and unorganized sectors, the paper describes the temporal, geographic, and industry distributions of financial loans.

The focus of the analysis is the hypothesis that land misallocation might be an important determinant of financial misallocation (for example, because of the role of land as collateral against loans). Using district-industry variations, the analysis finds evidence to support this hypothesis, although it does not find a total reduction in the intensity of financial loans or those being given to new entrants.

The analysis also considers differences by gender of business owners and workers in firms. Although potential early gaps for businesses with substantial female employment have disappeared in the organized sector, a sizeable and persistent gap remains in the unorganized sector.

WPS 7448

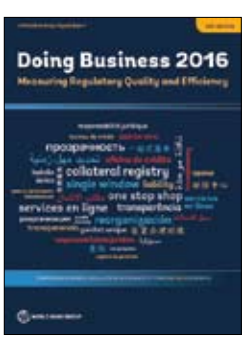
The effect of metro expansions on air pollution in Delhi

By Deepti Goel and Sonam Gupta

The Delhi Metro (DM) is a mass rapid transit system serving the National Capital Region of India. It is also the world's first rail project to earn carbon credits under the Clean Development Mechanism of the United Nations for reductions in CO2 emissions. Did the DM also lead to localized reduction in three transportation source pollutants? Looking at the period 2004–2006, one of the larger rail extensions of the DM led to a 34 percent reduction in localized CO at a major traffic intersection in the city. Results for NO2 are also suggestive of a decline, while those for PM25 are inconclusive due to missing data. These impacts of pollutant reductions are for the short run. A complete accounting of all long run costs and benefits should be done before building capital intensive metro rail projects.

Other Publications

Doing Business 2016: Measuring Regulatory Quality and Efficiency



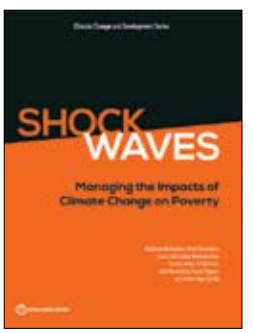
By World Bank
Available: on-line
English; Pages 349
Published: October 2015
ISBN: 978-1-4648-0667-4
e-ISBN: 978-1-4648-0668-1
Doing Business

Doing Business 2016 is the 13th publication in a series of annual reports comparing business regulation in 189 economies.

This year the publication addresses regulations affecting 10 areas of everyday business activity including: Starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts, resolving insolvency.

Doing Business 2016 updates all indicators as of June 1, 2015, ranks economies on their overall ease of doing business, and analyzes reforms to business regulation. This report illustrates how reforms in business regulations are being used to analyze economic outcomes for domestic entrepreneurs and for the wider economy.

Shock Waves: Managing the Impacts of Climate Change on Poverty



By Stephane Hallegatte, Mook Bangalore, Laura Bonzanigo, Marianne Fay, Tamaro Kane, Ulf Narloch, JulieRozenberg, David Treguer and Adrien Vogt-Schilb

Available: on-line
English; Pages 227
Published: November 2015
ISBN: 978-1-4648-0673-5
e-ISBN: 978-1-4648-0674-2

This report examines the potential impact of climate change and climate policies on poverty reduction. It also provides guidance on how to create a "win-win situation so that climate change policies contribute to poverty reduction and poverty-reduction policies contribute to climate change mitigation and resilience building. The key finding of the report is that climate change represents a significant obstacle to the sustained eradication of poverty, but future impacts on poverty are determined by policy choices: rapid, inclusive, and climate-informed development can prevent most short-term impacts whereas immediate pro-poor, emissions-reduction policies can drastically limit long-term ones.

Investment Climate Reforms: An Independent Evaluation of World Bank Group Support to Reforms of Business Regulations

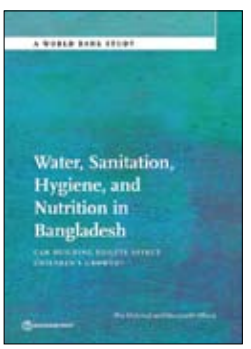
By World Bank
Available: on-line
English; Pages 250
Published: October 2015
ISBN: 978-1-4648-0628-5
e-ISBN: 978-1-4648-0629-2
Independent Evaluation Group Studies

This evaluation by the Independent Evaluation

Group (IEG) assesses the relevance, effectiveness, and social value of World Bank Group support to investment climate reforms as it relates to concerns for inclusion and shared prosperity. IEG finds that the World Bank Group has supported a comprehensive menu of investment climate reforms and has improved investment climate in countries, as measured by number of laws enacted, streamlining of processes and time, or simple cost savings for private firms. However, the impact on investment, jobs, business formation, and growth is not straightforward.

IEG recommends that the World Bank Group expand its range of diagnostic tools and integrate them in the areas of the business environment not yet covered by existing tools; develop an approach to identify the social effects of regulatory reforms on all groups expected to be affected by them beyond the business community; and exploit synergies by ensuring that World Bank and IFC staff improve their understanding of each other's work and business models.

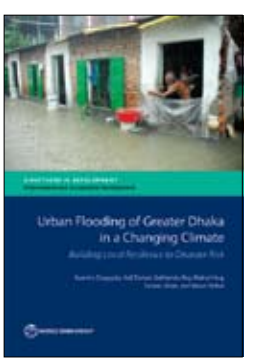
Water, Sanitation, Hygiene, and Nutrition in Bangladesh: Can Building Toilets Affect Children's Growth?



By Iffat Mahmud and Nkosinathi Mbuya
Available: on-line
English; Pages 91
Published: October 2015
ISBN: 978-1-4648-0698-8
e-ISBN: 978-1-4648-0699-5
World Bank Studies

This report provides a systematic review of the evidence to date on the relationship between water and sanitation and nutrition. It also surveys the potential impact of improved water, sanitation, and hygiene (WASH) on undernutrition.

Urban Flooding of Greater Dhaka in a Changing Climate: Building Local Resilience to Disaster Risk



By Susmita Dasgupta, Asif Zaman, Subhendu Roy, Mainul Huq, Sarwar Jahan and Ainun Nishat
Available: on-line
English; Pages 256
Published: October 2015
ISBN: 978-1-4648-0710-7
e-ISBN: 978-1-4648-0712-1
Directions in Development – General

Dhaka faces the recurring phenomena of urban flooding and waterlogging following intense rainfall nearly every year. As a low-elevation city with a tropical monsoon climate, Dhaka has a long history of river flooding as a natural hazard. Recent major floods have been worse in terms of depth and extent of inundation and duration, especially in fringe areas, where many of the city's poor reside. Rapid, unplanned urbanization and the gradual filling up of low-lying flood plains, rivers, canals, and other water bodies traditionally used to drain or retain water during rainfall have exacerbated the problem. A growing concern is that, in a changing climate, characterized by heavier and more erratic rainfall in the Ganges-Brahmaputra-Meghna (GBM) Basin during the monsoon season, the situation may worsen.

Toward New Sources of Competitiveness in Bangladesh: Key Insights of the Diagnostic Trade Integration Study

By Sanjay Kathuria and Mariem Mezghenni Malouche
Available: on-line
English; Pages 162
Published: October 2015
ISBN: 978-1-4648-0574-5
e-ISBN: 978-1-4648-0582-0
Directions in Development – Trade

Bangladesh faces one of its greatest development challenges: to provide gainful employment to the over 2 million people that will join the labor force each year over the next decade. Moreover, only 54.1 million of its 94 million working age people are employed. Bangladesh needs to use its labor endowment even more intensively to increase growth and, in turn, to absorb the incoming labor.

The report identifies four pillars to sustain and accelerate export growth:

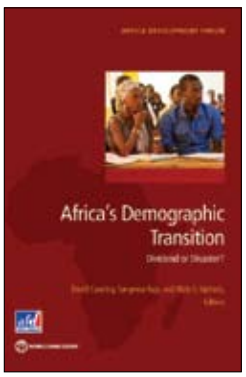
(1) breaking into new markets through better trade logistics to reduce delivery lags and better exploitation of regional trading opportunities;

(2) breaking into new products through more neutral and rational trade policy and taxation and bonded warehouse schemes, concerted efforts to spur domestic investment and attract foreign direct investment, and strategic development and promotion of services trade;

(3) improving worker and consumer welfare by improving skills and literacy, implementing labor and work safety guidelines and making safety nets more effective in dealing with trade shocks; and

(4) building a supportive environment, including sustaining sound macroeconomic fundamentals and strengthening the institutional capacity for strategic policy.

Africa's Demographic Transition: Dividend or Disaster?

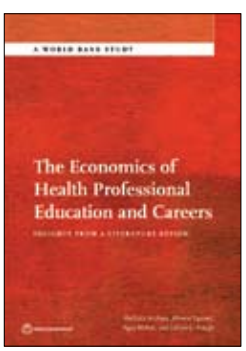


By David Canning, Sangeeta Raja and Abdo S. Yazbeck
Available: on-line
English; Pages 214
Published: October 2015
ISBN: 978-1-4648-0489-2
e-ISBN: 978-1-4648-0490-8
Africa Development Forum

Africa is poised on the edge of a potential takeoff to sustained economic growth. This takeoff can be abetted by a demographic dividend from the changes in population age structure. Declines in child mortality, followed by declines in fertility, produce a 'bulge' generation and a large number of working age people, giving a boost to the economy. In the short run, lower fertility leads to lower youth dependency rates and greater female labor force participation outside the home.

Smaller family sizes also mean more resources to invest in the health and education per child boosting worker productivity. In the long run increased life spans from health improvements mean that this large, high-earning cohort will also want to save for retirement, creating higher savings and investments, leading to further productivity gains.

The Economics of Health Professional Education and Careers: Insights from a Literature Review



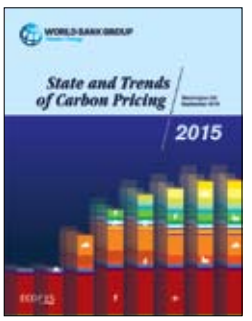
By Barbara McPake, Allison Squires, Mahat Agya and Edson Araujo
Available: on-line
English; Pages 88
Published: October 2015
ISBN: 978-1-4648-0616-2
e-ISBN: 978-1-4648-0617-9
World Bank Studies

This publication aims to inform the design of health professionals' education policies to better manage health labor market forces toward UHC. It documents what is known about the influence of market forces on the health-professional formation process.

The contexts of the market for health professional training have been subject to important changes in recent decades.

In particular, changes have been felt in the growing extent of employment of mid-level cadres of health professionals; changes in technology and the associated growth of high skilled occupations; the increasing interconnectedness of national health systems through globalization, with its implications for international health professional mobility; and the greater complexity of the public-private mix in employment options.

State and Trends of Carbon Pricing October 2015

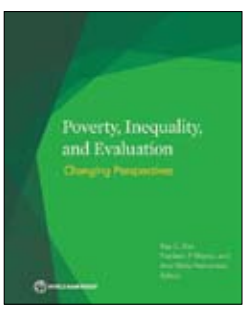


By World Bank
Available: on-line
English; Pages 60
Published: October 2015
ISBN: 978-1-4648-0725-1

The report is about the key developments and prospects of existing and emerging carbon initiatives. A challenging international carbon market has not stopped the development of domestic carbon pricing initiatives.

Today, about 40 national and over 20 sub-national jurisdictions responsible for almost one fourth of global greenhouse gas emissions are putting a price on carbon. Together, these initiatives cover the equivalent of almost 6 gigatons of carbon dioxide, or about 12 percent of global emissions.

Poverty, Inequality, and Evaluation: Changing Perspectives



By Ray C. Rist, Frederic P. Martin and Ana María Fernandez
Available: on-line
English; Pages 310
Published: October 2015
ISBN: 978-1-4648-0703-9
e-ISBN: 978-1-4648-0704-6

The basic premise of this book is that the conversation on the future of development needs to shift from a focus on poverty to that of inequality. The poverty emphasis is in an intellectual and political cul de sac. It does not address the fundamental question of why people are poor nor what can be done structurally and institutionally to reduce and eliminate it.

The various chapters illustrate in the context of various countries and sectors around the world, the significant contributions that evaluators can make in terms of improvement of the analytical framework, analysis of the performance and results of specific programs and projects, as well as assessing and designing better public management systems in terms of poverty and inequality reduction.

India Project Documents

Technical Education Quality Improvement Project III

Date	02 Dec 2015
Project ID	P154523
Report No.	ISDSA16092 (Integrated Safeguards Data Sheet)
	SGF153 (Environmental Assessment)
	SGF1537 (Indigenous Peoples Plan)

Uttarakhand Workforce Development Project

Date	02 Dec 2015
Project ID	P154525
Report No.	PIDC30731 (Project Information Document – Concept Stage)
	ISDSC14670 (Integrated Safeguards Data Sheet)

National Rural Livelihoods Project

Date	04 Nov 2015
Project ID	104164
Report No.	100639 (Procurement Plan – Jharkhand Mission)

Madhya Pradesh Higher Education Quality Improvement Project

Date	04 Nov 2015
Project ID	P153251
Report No.	RES21001 (Project Paper)

Swatch Bharat Mission Support Project

Date	03 Nov 2015
Project ID	P154523
Report No.	E4842 (Environmental Assessment)

Eastern Dedicated Freight Corridor Project

Date	26 Oct 2015
Project ID	P114338
Report No.	RES19028 (Project Paper)

Uttarakhand Disaster Recovery Project

Date	23 Oct 2015
Project ID	P146653
Report No.	100508 (Procurement Plan)

Second National Cyclone Risk Mitigation Project

Date	23 Oct 2015
Project ID	P144726
Report No.	100508 (Procurement Plan)

Second Kerala Rural Water Supply and Sanitation Project

Date	21 Oct 2015
Project ID	P121774
Report No.	100522 (Procurement Plan)

From the Blogworld

How the Insurance Industry Can Make Our Roads Safer

By Karla Gonzalez Carvajal and Nathalie Louat

Road crashes are a global health and development challenge with significant human and economic costs, especially in developing countries. The leading cause of death among people aged 15-29, road crashes kill 1.25 million people every year and injure another 50 million – more deaths than from malaria or tuberculosis. In low and middle-income countries, this is estimated to reduce GDP by 3 to 5 percent. The United Nations recognized the severity of this challenge by adopting specific road safety targets in the Sustainable Development Goals: to halve the number of global deaths and injuries from road crashes by 2020.

Read more: http://tinyurl.com/grqvv4u

Shrinking ice: A potential meltdown for South Asia

By Saurabh Dani

In mid-August, close to a 12.5 sq. km of chunk of ice separated from the Jacobshavn glacier in Greenland and tumbled down into the sea. The Jacobshavn is rumored to be the glacier that downed the Titanic. While the event was small compared to the huge ice chunk break-aways in the Antarctic, the spotlight was welcome. A few weeks back, Obama become the first US President to visit the Arctic.

Halfway across the globe, in the South Asia region, another ice-snow regime is under threat and has the potential to trigger catastrophic economic and social consequences.

The Hindu Kush-Himalayan region is widely called the third pole with three mighty rivers – Ganges,

Brahmaputra and the Indus that indirectly support over 700 million people across South Asia.

Read more: http://tinyurl.com/gmbfy7t

It is time to be climate operational

By Anita Marangoly George

The world forged a historic climate deal in Paris in December, cheered on and celebrated by people around the world. Getting to that agreement

has involved years of work and collaboration that resulted in what many of us thought we would not witness in our life time. The agreement is in – now it's time for us to help the countries we work with to put their Intended Nationally Determined Contributions (INDCs) into action.

Being in Paris was exhilarating. The World Bank Group team was active on many fronts – the support for carbon prices, the Africa Climate Business Plan, our work on renewable energy, energy efficiency and contribution to energy access. How do we waste less, pollute less and do more to promote energy access?

Read more: http://tinyurl.com/j5v9nxe

Will India leapfrog toward universal health coverage?

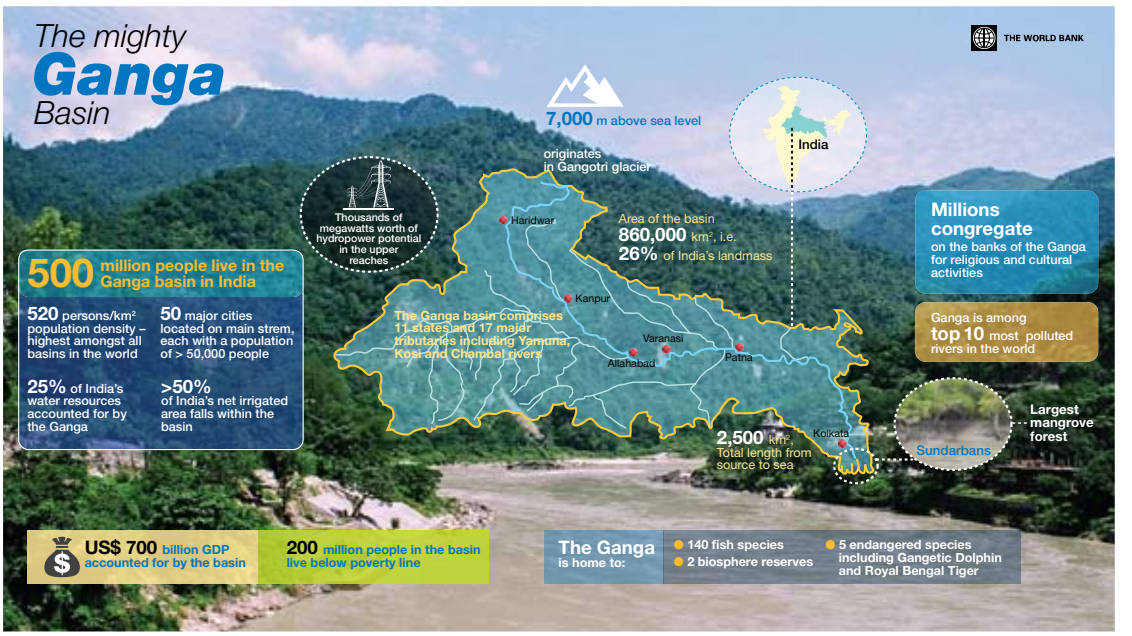
By Somil Nagpal

It's that time of year again, when we observe a day dedicated to the most ambitious health goal of all: universal health coverage, or UHC. On UHC Day (Dec. 12) we commemorate the date in 2012 when the United Nations unanimously endorsed a resolution urging governments to ensure that all people can access health care without financial hardship.

In India, where most people have dug deep into their pockets to pay doctors, pharmacies and diagnostic centers (or 'out-of-pocket spending') as the norm for a long time, vulnerability to impoverishment caused by medical expenses remains high. Though government health spending is estimated to have risen to 30 percent of the country's total health expenditure – up from about 20 percent in 2005 – and out-of-pocket payments have fallen to about 58 percent, dropping from 69 percent a decade ago, these levels are still high and not commensurate with India's level of socio-economic development.
In China, government spending accounts for 56 percent of total health expenditure.

Read more: http://tinyurl.com/jnegzud

The National Ganga River Basin Project



The Ganga is India's most important and iconic river. It flows down from its glacial source in the high Himalayas to course through five states in the northern plains before draining into the swirling waters of the Bay of Bengal through the Sunderbans delta, the largest mangrove system in the world. Along its 2,500 km journey, the river enriches huge swathes of agricultural land and sustains a long procession of towns and cities.

The sprawling Ganga basin, an area of 860,000 sq km spread across 11 states, is the world's most populous river basin. It is home to more than 600 million Indians, close to half the country's population; and over 40 percent of the country's GDP is generated in this region. The basin provides more than one-third of India's surface water, 90 percent of which is used for irrigation. Paradoxically, this fertile region is also home to some of the poorest sections of India's population, with more than 200 million people living below the national poverty line.

As India's holiest river, the Ganga has a cultural and spiritual significance that far transcends the basin's boundaries. It is worshipped as a living goddess and, since time immemorial, people from across the country have flocked to the many historic temple towns the lie along the river's banks to pray and bathe in its flowing waters.

Pollution in the Ganga

Despite this iconic status and religious heritage, the Ganga today is facing formidable pollution pressures, along with the attendant threats to its biodiversity and environmental sustainability. An ever-growing population, together with inadequately planned urbanization and industrialization, has affected the quality of the river's waters. Today, the Ganga's waters are sullied by the incessant outpouring of sewage, as well as by the large volumes of solid and industrial waste that are churned out by human and economic activity along the river's banks.

The absence of adequate infrastructure, along with weak environmental governance and little technical expertise to manage these extreme pollution pressures, has resulted in the rapid deterioration of the water's quality in recent decades.

The Ganga's mainstem runs through 50 major Indian cities, almost all of which have a population of more than 50,000 people. These towns and cities generate some 3 billion liters of sewage every day, only a fraction of which is treated before it reaches the river. While domestic sewage accounts for 70-80 percent of the wastewater that flows into the Ganga, Industrial effluents add another 15 percent, with far-reaching impacts on human and aquatic health due to their toxic nature. And, in the absence of adequate solid waste management in most cities, mounds of uncollected garbage add to the pervasive pollution.

World Bank Assistance

The World Bank is supporting the Government of India in its effort to rejuvenate the Ganga River. The $1 billion National Ganga River Basin Project is helping the National Ganga River Basin Authority (NGRBA) build institutional capacity for rejuvenating the river. It is also financing key infrastructure investments in the five mainstem states – Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal. The Project has two key components: Component 1 ($200 million) supports institutional development that includes the

operationalization of institutions at the central and state level; a communications and stakeholder engagement program; water quality monitoring; and technical assistance for city service providers and environmental regulators. Component 2 comprises a $800 million financing window for infrastructure investments in four sectors: wastewater collection and treatment, control of industrial pollution, solid waste management, and riverfront development.

The Institutions

The National Mission for Clean Ganga (NMCG), the operational wing of the NGRBA, has been set up to coordinate the river's clean-up program. State Program Management Groups (SPMGs) have been established in all five mainstem states. Investments are being implemented by multiple executing agencies, mainly parastatal organizations such as the Uttar Pradesh Jal Nigam, Bihar Urban Infrastructure Development Corporation, Kolkata Metropolitan Development Authority and some Urban Local Bodies (ULBs).

The Investments

The Project aims to plug some of the major infrastructure gaps in cities along the Ganga's mainstem. Several key investments have been identified primarily to address the problem of untreated domestic sewage from towns and cities along the river. Work has already begun on wastewater investments in the cities of Rishikesh/Haridwar, Allahabad, Patna, and Kolkata, as well as in smaller towns that lie along the river. This will result in the installation of over 300 MLD of new sewage treatment capacity and over 2,000 km of new sewerage networks in these urban centres.

Building on lessons learnt from earlier efforts to clean the Ganga, these investments have been designed to ensure their long-term sustainability. The new wastewater investments will be developed in the PPP mode but innovative 10-year Design–Build–Operate (DBO) contracts will ensure that the private operator maintains the infrastructure for 10 years. This period will be utilized for strengthening the technical and financial capacity of the ULB service providers to manage the long-term operation of these assets. In a bid to ensure that the new assets do not remain unutilized, all houses/properties will be connected to the sewerage networks; these networks will, in turn, be connected to new or existing treatment systems.

In addition, an ongoing $43 million investment in river-front development in Patna, will not only build a new 6-km promenade along the river but also help upgrade public infrastructure such as toilets, bathing areas and other public amenities at 21 ghats. An internationally-recognized research institute concerning all aspects of the river, known as the Ganga Knowledge Center, has also been established; the institute is in the early stages of operationalization.

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