



The World Bank Group

# Water Allocation and Investment Decisions in Water Infrastructure

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# Outline

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- **The debate of green growth and CC as a new opportunity to revisit allocation**
- **The accelerated challenges**
- **Rigidity**
- **Flexibility: operational challenge**
- **The World Bank's response**



# Infrastructure is central to growth

Sector	Example	Time scale (years)
Water	Dams, reservoirs	30–200
Land-use planning	New development in flood plain or coastal areas	>100
Coastal and flood defenses	Dikes, sea walls	>50
Building and housing	Insulation, windows	30–150
Transportation	Port infrastructure, bridge, roads, railways	30–200
Urbanism	Urban density, parks	>100
Energy production	Coal-fire plants	20–70

- **A framework for green infrastructure** must
  - Build on efforts to address overall constraints on infrastructure finance
  - Develop strategies to both minimize the potential for regrets and maximize short-term co-benefits to address social and political acceptability constraints

- Infrastructure policies are central to green growth strategies, because of the huge potential for regret and substantial potential for co-benefits.
- The infrastructure gap offers opportunities to “build right” and leapfrog; but huge unmet needs also can imply difficult trade-offs between “building right” and “building more”.

# The world's water challenges are growing rapidly, and could jeopardize the goal of "green growth for all"

**Climate impact:** Major increases in climate variability expected, with increased frequency of droughts and floods. Heaviest impact will be borne by the poorest, who are already underinvested in adaptation to current climate

## Health and human settlements



Major demand increases...

- Changing settlement patterns, with a 2004-15 to see 40% increase in urban population without basic WSS access
- 80% of all people lacking WSS access in rural areas
- Half of urban water supplies are from groundwater with very little knowledge of hydrology
- Rapid urbanization

...with the potential to derail growth

Lack of sanitation access can cost countries up to 6% of GDP

## Food and agriculture



- 70% increase in food production will be required in 40 years (with it already 70% of withdrawals)
- Half the world's food is grown on groundwater, much of which is unsustainable
- Use of crops for biofuels affecting food prices

Unreliable water supply and farm-to-market access can deprive farmers of 2/3rd of their potential income

## Energy and industry



- Global energy consumption expected to increase by ~50% from 2007-2035
- Water-intensive thermal and hydro account for 90% of current power generation
- Power outages caused by lack of cooling water already seen in many countries

Energy security is threatened by water challenges; 3% of Kenya's GDP from lost hydro production over 1998 - 2000

## Environment



- Ecosystem damage largely coincides with high water stress (e.g., Indo-Gangetic Plain, North China Plain) and fertilizer runoff (dead zones)
- Over-consumption of water, water pollution and inadequate pricing of the resource results in loss of massive ecosystem benefits

Losses of biodiversity and ecosystem services with increasingly visible economic cost (e.g., China losing 5% GDP to pollution)

Competition for water allocation

Impaired water quality affecting all uses

# Water management in Inclusive Green Growth

- ***Correct distortions in water allocation decisions***
  - *New mechanisms for allocating* water resources should embrace economic principles of allocative efficiency to correct for market failures and imperfections (a study of China\* finds that improving water allocation could increase per capita income by 1.5 percent a year between 2000 and 2060).
- ***Expand the use of water pricing mechanisms to manage demand***
  - The price of most water services does not include investment, operation, and maintenance costs or the scarcity value of the resources. Pricing could be used as an effective tool to ensure optimal allocation.
- ***Create new markets***
  - *Tradable water* rights are an effective water management instrument in the long term but they need strong institutions.
- ***Strengthen the framework for analyzing the relationship between growth and water***
  - This information would allow more informed decision-making processes by providing a clear understanding of the economic tradeoffs of policies in different sectors (such as energy, agriculture, urban, land use, environment, and health).

# **Removing rigidity in allocation is more necessary than ever as developing countries are liberalizing economies at fast pace putting a premium on flexibility**

- **Infra planning, design and operation based on rigid long term systems can impose high infra costs**
- **Over-investments with additional costs in terms of capital and operating subsidies (many of these are regressive)**
- **Rigidity limits allocation when flows are variable**
- **Shorter time span to reallocate in case of more severe extreme events (even low probability but high impact)**
- **Rigidity limits improving efficiencies in main water-using sectors**
- **Legal barriers can limit infra design**

# **But flexibility brings operational challenges**

- **Financial engineering of unknown timing and size of infra investments**
  - **Dynamic flow of econ benefits and costs (including intergenerational challenges)**
  - **Framing of concession and management contracts**
  - **Compensation agreements (eg. operation of multi purpose dams)**
  - **Admin costs could be higher (better info on balances, increased enforcement capacity, stronger conflict resolution mechanisms)**
  - **Political costs and benefits may differ and must be understood**
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# **And it is not easy to implement – we need to be opportunistic: the climate change discourse**

- Helps to remove some of the political issues on the discussions on allocation**
- Allows for new analysis to show the trade offs of rigid vs flexible systems**
- Accelerates awareness of existing governance failures adequate institutions?, flexible? (eg. Chile 2005 reform, Australia)**
- Intelligent and flexible design and operation of water infrastructure (ie. ‘on demand’ intervention and infra that scales to needs)**

# The World Bank's Response

- **Engaging more on the political level to discuss allocation**
- **Accelerate institutional reform not only in water sector**
- **Flexibility in large infra design to promote reallocation of water but based on solid analytical framework**
- **Strengthen support for bottom-up regulation**
- **Communication strategies for different stakeholders**
- **Back to distributional analysis to look at balancing social equity with economic efficiency**
- **Ensure inclusion of all users (ie, environment) when designing infra and allocation mechanisms**
- **Better understanding of political costs and benefits of allocation**



# The World Bank's Response

- **Sector level analysis to inform investment decisions incorporating different tools**
    - **Partial equilibrium (ie, MSIA Zambezi)**
    - **General equilibrium (past work in Morocco, Mexico, etc)**
    - **More emphasis on dealing with uncertainty and managing risks**
    - **RDM in Vietnam**
    - **Will look at real options applications for water**
    - **Integrated resource planning, entry point other sectors (eg energy-water nexus)**
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