World Bank

The Water and Energy Nexus

A New Approach to Hydropower Development The vision of the World Bank

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Outline

- *The Global Context for Renewable Energy and Hydropower*
- *A New Dimension of Value for Hydropower*
- *The Bank is back in Hydropower*

Hydropower in the global energy context

Hydropower accounts for 20% of the world's electricity supply

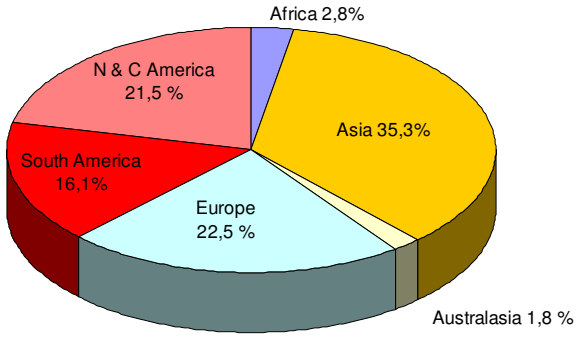
- 81% of electricity from non-biomass renewable resources

37% of the world's hydro potential is exploited, largely in developed countries

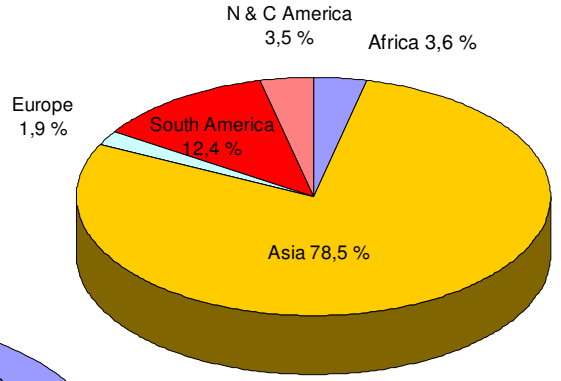
- 91% of unexploited potential lies in developing countries

Under a conservative forecast, hydropower is expected to grow 16,000 TWh/year through 2030 in developing countries

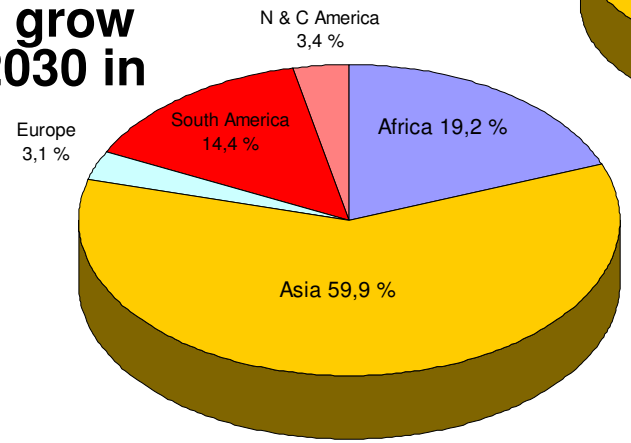
In operation ~ 760 GW



Under construction ~ 126 GW

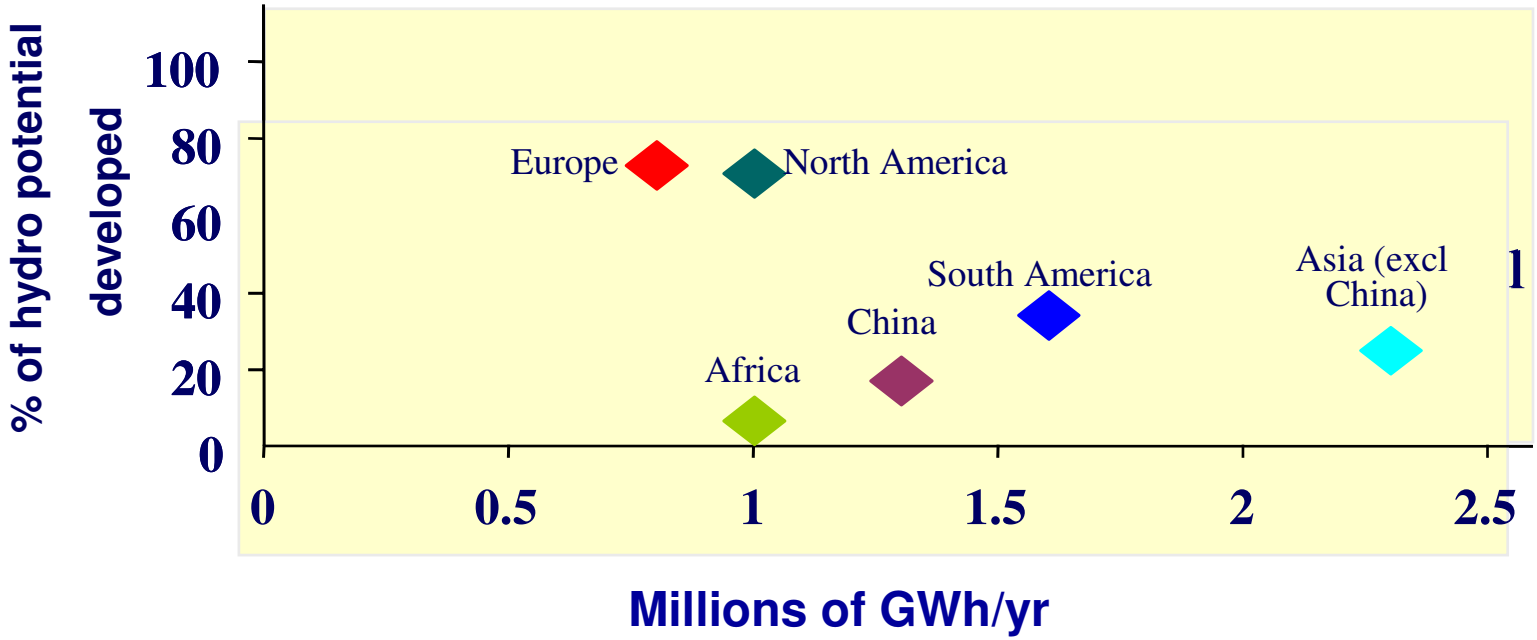


Planned ~ 450 GW



Source: World Atlas 2006 "The International Journal on Hydropower & Dams

Renewable Energy Resources are Abundant.... but under-used



Clean Energy Investment Framework
The Strategy

3 Pillars

- Increase Energy Access in Sub-Saharan Africa

- Transition to Low Carbon Economy

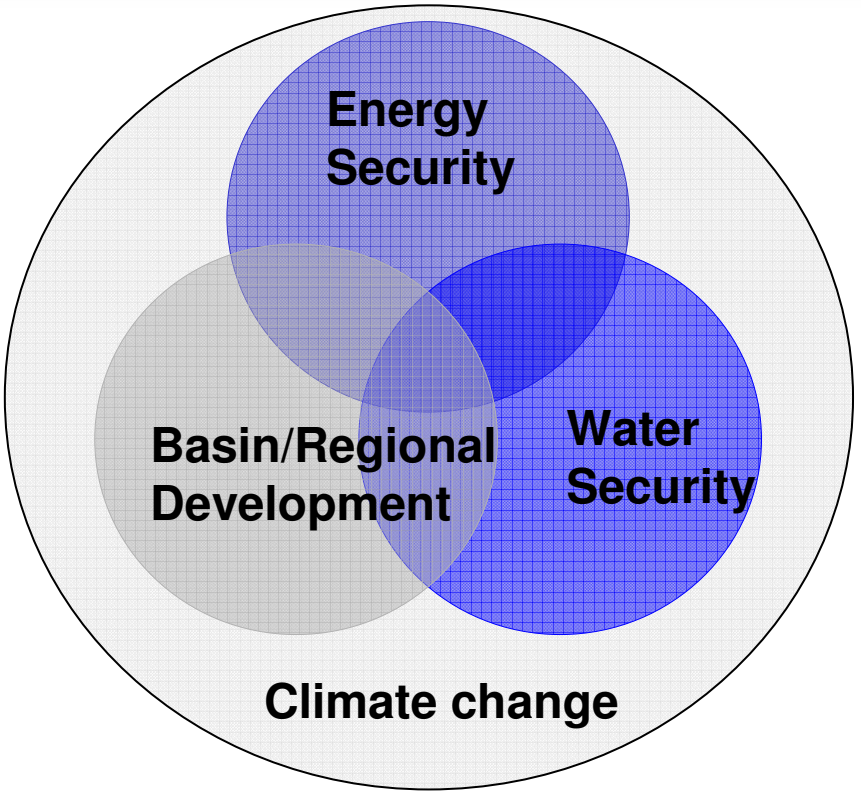
- Adaptation to Climate Change

Lighting Africa – Joint World Bank/IFC Initiative

Goal: Rapid scale-up of access to clean, reliable and affordable modern lighting & basic energy services for 250 million people across Africa by 2030

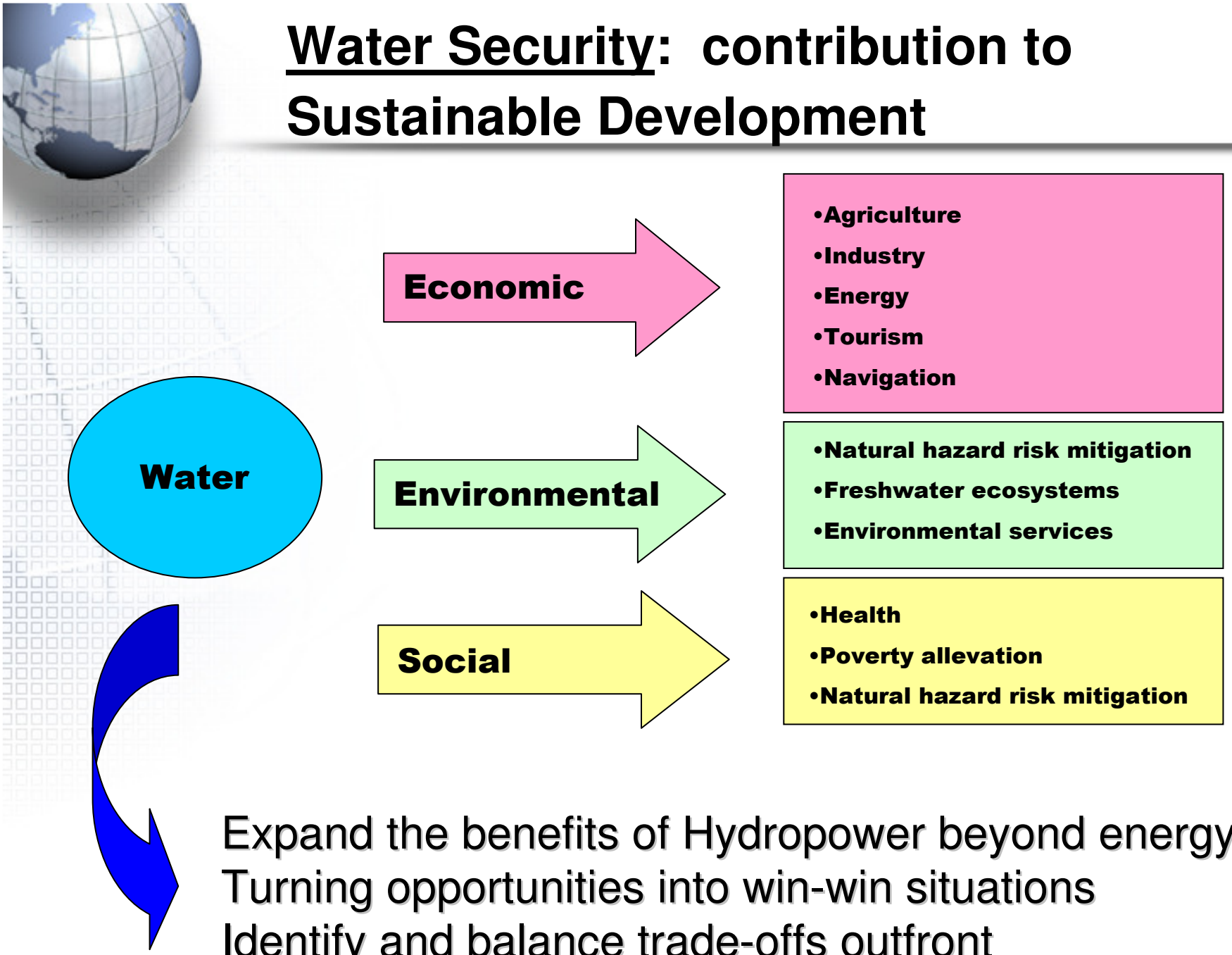
New Dimensions of Value

- Greater focus on energy security in an increasingly complex sector
- More mature understanding of the cost of hydrologic variability and the concept of water security
- Development programs and natural resource management based on basin/regional and transboundary development
- Shaped by the imperative of mitigating and adapting to climate change



The strategic value of hydropower is multi-dimensional and expanding

Water Security: contribution to Sustainable Development



Expand the benefits of Hydropower beyond energy
Turning opportunities into win-win situations
Identify and balance trade-offs outfront

Energy Security: Hydropower brings unique features to a mixed energy system

By strengthening electricity grids across fuel sources and regions

✓Coordinating with thermal units for cost efficiencies
✓Providing ancillary services for system stability and reliability (black start, load following, system reserves)
✓Matching resource wealth and demand

As a hedge against escalating oil prices

✓Oil prices doubled since 2003 and quadrupled since 1999
✓ Each $10 increase in the price of a barrel of oil reduces GDP by 0.76% (middle income countries) -1.47% (low income countries)
✓ --- developing countries depend on oil for more than– of energy needs, including countries with more than --- in available hydro potential

Regional Development

From Single Output

to multi-purpose water infrastructure

Energy for growth

Regional development

Hydromet System

Suppliers

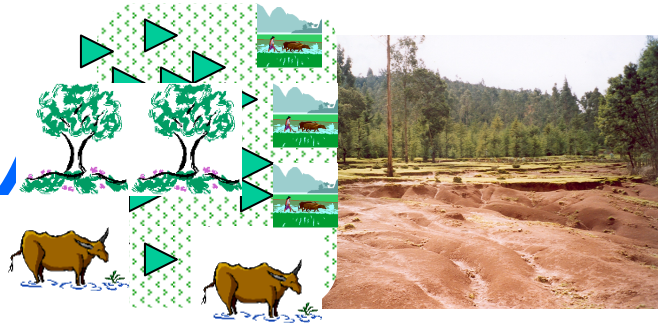
Revenue management

Balance of public/ private participation

Fisheries & aquatic ecosystems

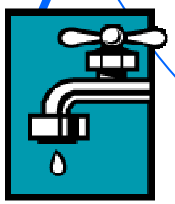
Irrigated Agriculture

Hydropower



Afforestation and Watershed Might

Flood might.



Local Community Infrastructure

Modified from N.Harshadeep, World Bank

Hydropower's Dual Role in Climate Change

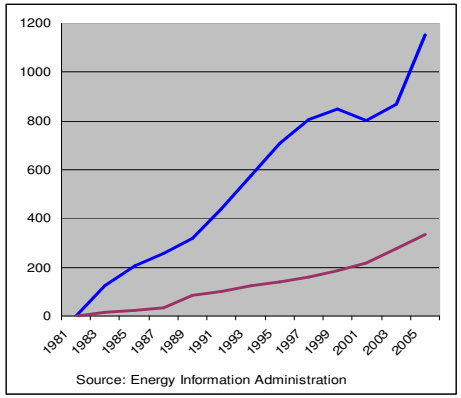
MITIGATION

Hydropower:

- ✓ accounts for 88% of renewable energy
- ✓ has ancillary benefits, such as system stability, peaking capability
- ✓ supports less certain renewable sources and thermal efficiencies
- ✓ can store energy

However:

- ✓ our understanding of emissions from reservoirs remains incomplete



ADAPTATION

Multi-purpose Hydropower:

- ✓contributes to a minimum platform of infrastructure for water security
- ✓ helps manage the temporal and spatial allocations of scarce water resources
- ✓ can mitigate catastrophic events (droughts and floods)

However hydropower needs:

- ✓ better hydrological data and analysis
- ✓ more attention to adaptive management and flexible design

The Bank is back in Hydropower

1. Regional development and cooperation

Maximize returns from riparian cooperation and web of dependency for integration

2. Sharing benefits

Managing hydraulic infrastructure for multiple purposes, for multiple beneficiaries

3. Environmental and social protection

Adopting new standards and ensuring meaningful consultation

4. Adaptation over time

Incorporating changes in society as well as technology and markets

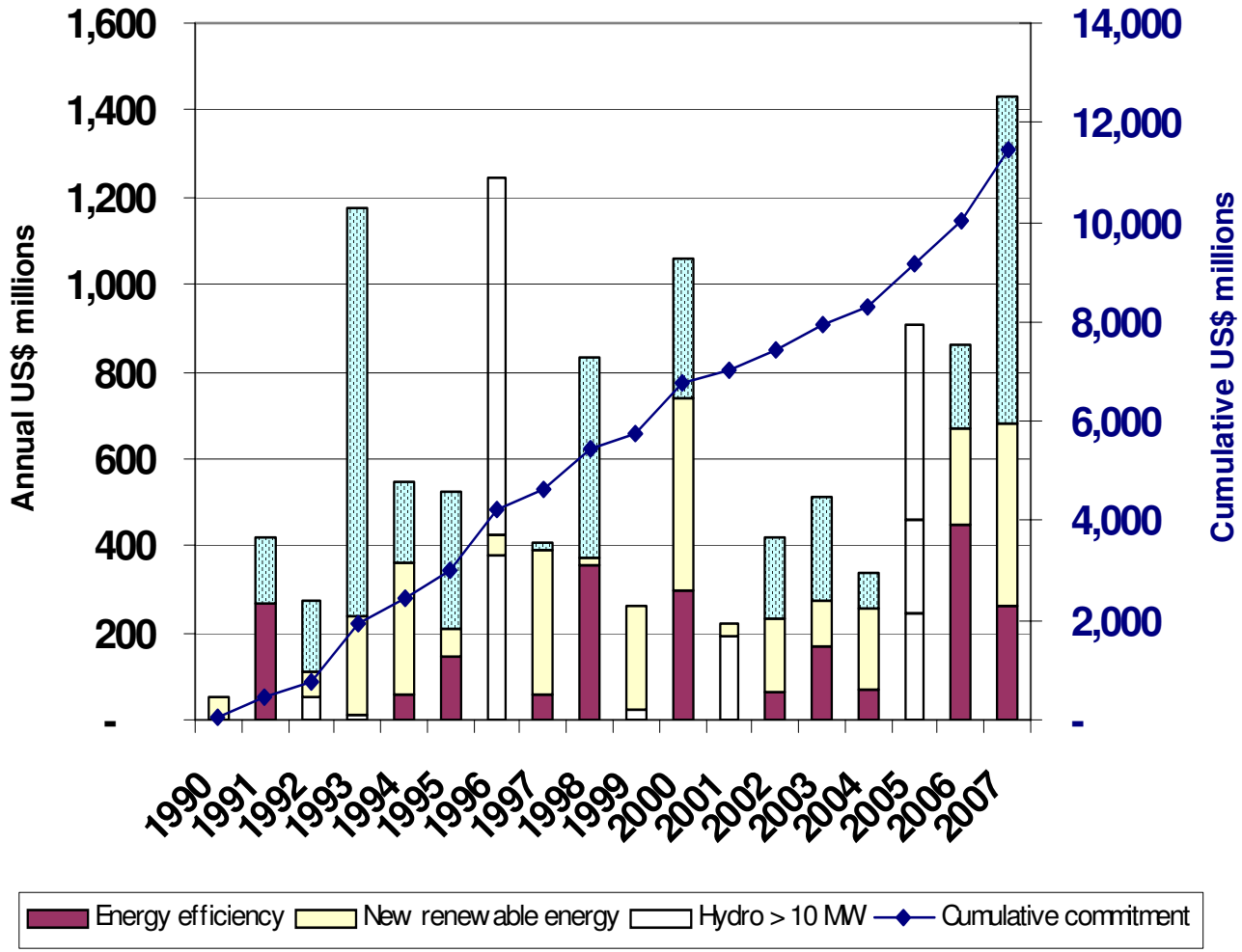
5. Financial architecture

Seeking new combinations earlier in the planning process

Mid-2000s: Global re-engagement

- Chronic electricity supply gap
  - not closed by thermal and non-hydro renewable forms of power
  - governments acutely aware of constraints to economic growth and human development posed by power shortages
- Global rise in fossil fuel prices, climate change debate and emphasis on low carbon growth → hydro more attractive
- Growing concerns over water as cause of future conflict, need for better water resources management
- New initiatives such as the IHA Sustainability Guidelines and UN initiatives

WBG Renewable Energy and Energy Efficiency Commitments, 1990 - 2007



The WBG's Value-Added

Convening Power	➔ Across sectors, participants, countries, financiers, instruments
Support across the Value Chain	➔ Investment lending, Safeguards & international good practice, Innovative cross-sectroal planning, Policy and regulatory strengthening
Country Programs	➔ Public & private economics, Tailoring to unique needs, Long term commitment, Country program synergies

The WBG has a clear role to play across the full range of hydropower options and entry points…and a long- term role in the most complex, regional, transboundary, and multi-purpose projects

Take-Away Messages

Emerging global dynamics are re-writing the role and value of hydro in development. Increasingly, its potential contribution to a complex web of energy security, water security and regional integration are being recognized. As part of that web, it is a readily accessible, core element in mitigating and adapting to climate change.

The sector's burden of **risk is both real and perceived**. The international community has made good progress in managing many risk issues particularly in environment and social inclusion; but confidence remains fragile and implementation is challenged by weak capacity and institutions.

Scaling up hydro is not limited by physical or engineering potential. Rather, the challenges lie in defining hydro's strategic role in each country/basin, and bringing adequate resources, knowledge and skills to realizing its value.

The WBG has a clear role to play in maximizing the development potential of the sector. It must lead its own scale up through direct investment in good quality projects, executed in a timely manner. Moreover, its role in policy dialogue, integrating across players and facilitating good practice can greatly influence scale up of public and private investment. Indeed, promoting sustainable hydro, in all its meaning, could emerge as the Bank's defining contribution in the sector.

Thank-you