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# Directions In Hydropower: Scaling up for Development

After a period of stagnation, the story of hydropower infrastructure is changing. Emerging global dynamics are recasting the role and value of hydropower in development, recognizing its potential contribution to a complex web of energy security, water security and regional development and integration. In addition to bringing electricity to the 1.6 billion people who lack access, hydropower offers a hedge against volatile energy prices and can play an important role in energy trade and regional power pools. As a renewable energy resource, hydropower's dual role in climate change mitigation and adaptation is critically important.

- Since its 2003 commitment to re-engage in water infrastructure, the World Bank Group, encompassing the World Bank, IFC and MIGA, has increased lending and leadership significantly. This World Bank Water Working Note, *Directions in Hydropower*:
- Examines the expanding role of hydropower and multi-purpose water infrastructure, with important opportunities for poverty alleviation and sustainable development;
- Summarizes key issues in scaling up hydropower, the rationale and context for sector expansion, and the risks;
- Outlines the World Bank Group's commitment to hydropower and role in scaling up; and
- Sets out World Bank priorities for both lending and non-lending activities to strengthen the foundations of the industry with the goal of maximizing the strategic value of hydropower investment to economically, environmentally and socially sustainable development.

## Sustainable Hydropower: Great Potential in a Complex Setting

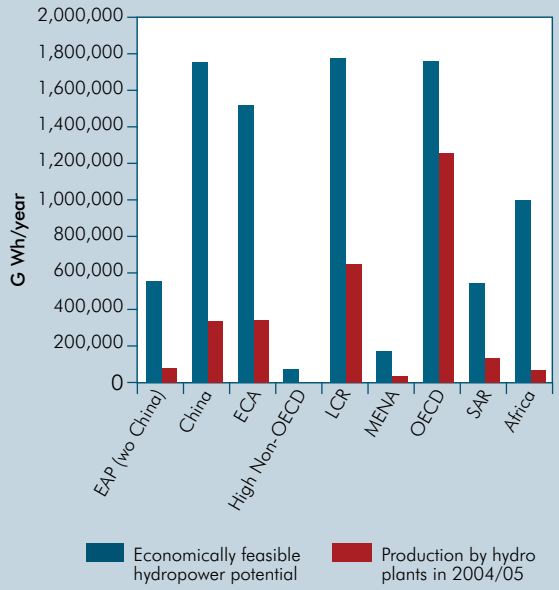
Hydropower currently accounts for about 20 percent of the world's electricity supply and over 80 percent of the supply from (nonbiomass) renewable resources. Scaling up hydropower is not limited by physical or engineering potential, yet only 23 percent of hydropower potential in developing countries has been exploited. Indeed, 91 percent of unexploited economically feasible potential worldwide is located in developing countries, with one quarter in China (see figure 1).

On the demand side, the role of hydropower and multi-purpose water infrastructure is expanding, with important opportunities for poverty alleviation and sustainable development. The key drivers, also referred to as dimensions of value, include:

- Energy security—volatility of energy prices in more sophisticated energy markets and unmet but growing demand for reliable, affordable energy in developing countries
- Climate change—hydropower plays a dual role as both the largest source of affordable power and as a low-carbon fuel with a critical roles in mitigating greenhouse gas emissions and in climate adaptation;

The following note summarizes key points in Water Working Note 21, *Directions in Hydropower: Scaling Up for Development*, June 2009. The Water Working Notes are published by the Water Sector Board of the Sustainable Development Network of the World Bank Group.

**Figure 1. Economically Feasible Hydro Potential & Production (by World Bank Region)**




*Source*: Based on International Journal on Hydropower and Dams, World Atlas 2006 and various national statistics.

- Increased attention to water management—contemporary hydropower planning must take into account multiple users of water; and
- Regional integration—hydropower infrastructure has many benefits to community, regional, and transboundary development and water management at the river basin level.

These new dimensions of value for hydropower projects, coupled with rising standards for environment and social management and governance, and the active participation of a wider range of players create new opportunities. The World Bank Group recognizes this timely and important period for hydropower and sees a clear role in maximizing the development potential of hydropower resources For the benefit of client countries.

## Hydropower Infrastructure and Development: Current Opportunities and Constraints

There has been a fundamental shift in the definition of quality in hydropower projects, driven by the changing imperatives of sustainable development. A decade of learning about environmental and social risks has shifted the definition of sustainable hydropower infrastructure and it is now broadly recognized that hydropower must be developed in the context of broader development goals, including:

1. Internalizing the impacts on affected populations;
2. Responsible environmental management (for example, ecosystem services and social impacts, both upstream and downstream of facilities, and linkages, with a focus on ecosystem services); and
3. Leveraging of regional development opportunities for social inclusion, poverty alleviation, and social development, including:
   - Integrated water and energy management (for example, more informed and transparent tradeoffs across economic, social, and environmental values)
   - Institutional development (for example, compliance and sustainability of operations.)

Sustainability initiatives of both industry and non-industry organizations (e.g., International Hydropower Association, UN Dams and Development Program) and the requirements of financing institutions have redefined the standards for environmental and social management. On this basis, there is a growing openness in the NGO community to consider hydropower a tool in a low-carbon future.

However, hydropower is and will remain risky and sometimes controversial. Implementation of good practices is challenged by lack of capacity throughout the industry and in client countries, and by weak regulatory and policy frameworks. Inherent complexities and the multi-sectoral, multi-objective nature of hydropower projects further emphasize the importance of a strong risk management approach to the sector. Key constraints in scaling up hydropower infrastructure lie in lack of financing, lack of comprehensive planning and adequately assessed project pipelines, limited hydrological data and analysis, and unsettled conditions that discourage private sector participation.

Development of hydropower has to encompass both careful project preparation and supervision (including efficient decision making) and strengthening of the sector's basic foundations along the entire life cycle of hydropower investments.

The challenges are to define hydropower's strategic role at the country, basin, and regional levels, and to mobilize adequate resources and skills to realizing its value in an environmentally and socially sustainable manner.

## The World Bank Group's Role in Scaling-up Hydropower

The WBG's involvement in hydropower development reflects international trends and demands: a significant decline in lending during the 1990s. By the early 2000s, however, several policies repositioned the World Bank Group in terms of infrastructure and risk, and established a renewed framework for hydropower. The Water Resources Sector Strategy, approved by the Board in 2003, stated that significant levels of investment in water infrastructure are required throughout the developing world. The Bank's 2003 Infrastructure Action Plan concluded that "the Bank needs to increase its engagement in infrastructure in light of growing needs, withdrawal of private investors, and a growing recognition that the MDGs can only be met in a multisectoral way." This theme is repeated in the World Bank Group's 2008 Sustainable Infrastructure Action Plan.

## A Strategic Framework to Maximize Investments

The WBG will scale up investment in sustainable hydropower through two complementary tracks:

***Track 1: Implement investment opportunities.*** After a decline in lending during the late 1990s and early this decade, WBG lending for hydropower has increased from a three-year average of US$250 million per year (2002–04) to US$500 million per year (2005–07) to more than US$1 billion in fiscal year (FY) 2008 (see figure 2). Consistent with industry-wide trends, the World Bank Group's lending prospects in hydropower shows renewed strength, with more than US$2 billion in possible projects for the next several years. The WBG will consolidate recent increases in lending to high-quality projects executed in a timely manner. In addition to direct development benefits, these projects will help demonstrate the application of progressive approaches to hydropower and the WBG's role as a partner in developing sustainable water infrastructure projects, whether small, medium or large, complex, transboundary investments. It will also support all types of hydropower—run-of-river, storage, and rehabilitation.

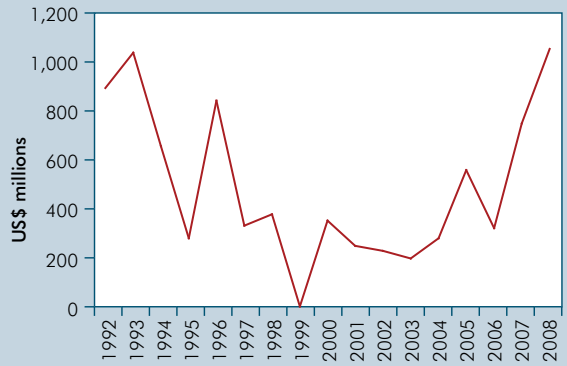
***Track 2: Strengthen sectoral foundations.*** The WBG's Directions in Hydropower identifies five priorities for engagement, all of which embed climate change:

**1. Scale up financing**: Address financial barriers and constraints to realizing projects, and increase resources to realize good practice in project preparation and supervision.

**2. Promote good practice:** Mainstream current knowledge and invest in continuous improvement, with specific emphasis on governance (for example, procurement), environmental management (for example, environmental flows), social inclusion (for example, indigenous communities) and hydrological data and analysis.

**3. Strengthen planning:** Support governments, through adequate planning and enabling policies, regulatory frameworks, and institutions, to help realize the strategic value of hydropower. This task calls for significant investment in prefeasibility studies, for development of a pipeline of quality projects, and for river basin planning to ensure identification of high-value storage sites.

**Figure 2. World Bank Group: Hydropower Components by Approval Year (FY)** (Value of WBG Contribution to Multipurpose Hydrower Components)




*Source*: World Bank: Business Warehouse; Project Staff Appraisal Reports; Project Appraisal Documents; Implementation Completion Reports; World Bank Carbon Finance Unit; and IFC.

**4. Leverage regional development:** Explore synergies among complementary projects and development opportunities for the benefit of local communities, either directly through benefits-sharing or indirectly through poverty-targeted revenue management.

**5. Build partnerships:** Enhance cooperation among internal and external players to strengthen financing options and maintain global dialogue on sustainability.

## The Future of Sustainable Hydropower in Developing Countries

Hydropower can play a strong, multi-dimensional role in sustainable development and poverty alleviation. Moving forward, hydropower development must adopt a dual perspective of integrated water resources management and energy development that takes into account the broad range of social, economic and environmental issues. Scaling up also calls for mobilizing adequate financial resources, building capacity across all layers of the sector and expanding the pipeline of high-value investments in each country or basin. The private sector brings critical resources and skills but relies on effective public sector participation to ensure a stable and inviting environment for investments.

**Hydro Value Chain**

Operations, Compliance
↓
Procurement, Construction
↓
Engineering, Feasibility Studies, Financial Architecture, Licensing
↓
Environmental and Social Management, Benefit-Sharing, Revenue Management Baseline Studies
↓
National Strategies, Sector Plans, Strategic Environmental Assessment
↓
Laws, Regulation, Market structure

Building on its strong increase in lending over the last five years, the World Bank Group will continue to help governments in all regions maximize the value of hydropower investments in an environmentally and socially sustainable manner through lending and strengthening basic foundations of the sector.

WATER PARTNERSHIP PROGRAM

The Water Sector Board Practitioner Notes (P-Notes) series is published by the Water Sector Board of the Sustainable Development Network of the World Bank Group. P-Notes are available online at *www.worldbank.org/water*. P-Notes are a synopsis of larger World Bank documents in the water sector.

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