Securing Access to Water and Energy

Information brief

Regardless of their stage of development, its location and even their resource endowments, every society faces problems with securing access to water and energy. For the poorest, where fulfilling the Millennium Development Goals is still pending, securing access to both water and energy is the cornerstone of alleviating poverty and breaking up the vicious circles of poverty and backwardness. In transition economies, making water and energy more abundant and accessible is an integral part of economic progress that comes about with important challenges such as matching limited water and energy supplies with increasing demands and managing food security. Pressured by these problems and increased water scarcity countries realize the need to shift towards other alternatives focusing on managing the resources available in order to preserve the water related ecosystems and the valuable services they provide for people, for the economy and for the preservation of the of the environment on which all these services depend.

Access to Water and Energy: a precondition to economic progress and poverty alleviation

Both water and energy are essential for life and those who don't have access to proper facilities still need to overcome their very basic needs by bearing a heavy burden in terms of years of life lost or of impaired health, time consuming activities to gather wood or water to cover only very basic needs, low education performance if any, gender discrimination and other consequences that reproduce poverty and impede economic and social progress. Both water and energy have the potential to break poverty traps by reducing mortality, improving health, increasing learning and productivity at work as well as reducing gender discrimination, conditions of childhood and other social development goals.

Sustainable development is dependent on access to water and energy. Water and energy are also absolute necessities in improving health conditions, education, food security and building infrastructure.

Nearly 40% of the world's population relies on wood, coal, charcoal, or animal waste to cook their food. Breathing in the toxic smoke causes lung disease that kills nearly two million people a year, most of them being women and children.

Electricity enables children to study after dark. It enables water to be pumped for crops, and foods and medicines to be refrigerated. Modern fuels for cooking and heating relieve women from the time-consuming drudgery and danger of traveling long distances to gather wood.

This is why basic access to water and energy might have crucial positive impacts on poverty alleviation both directly, from the improvements in access to water, sanitation and energy sources and indirectly, as lack of access to water and energy is a limiting constraint to sustainable economic growth, which is the ultimate hope for widespread poverty reduction.

Coordination between water and energy development goals has also been important since the early stages of economic development. This is true for the poor, when coal and wood produce primary energy that is essential to boil water and reduce its potential health risks but also in a developed economy where energy and water are essential inputs in the production of food and a plethora of goods and services.

- Between 1990 and 2010, more than two billion people gained access to improved drinking water sources.
- The proportion of people using an improved water source rose from 76 per cent in 1990 to 89 per cent in 2010.
- Over 40 per cent of all people without improved drinking water live in sub-Saharan Africa.
- In 2011, 768 million people remained without access to an improved source of drinking water.
- The share of urban slum residents in the developing world declined from 39 per cent in 2000 to 33 per cent in 2012. More than 200 million of these people gained access to improved water sources, improved sanitation facilities, or durable or less crowded housing,

MDG and Beyond 2015 (http://www.un.org/millenniumgoals/environ.shtml)

Increasing access to energy requires greater access to freshwater. For example in the United States where energy generation accounts for 40% of water withdrawals, water use would need to increase by 165% to meet the demand in 2025.

Water and Energy: A tale of two resources

Securing access to water and access to energy are but two dimensions of the same development problem. They respond to the same drivers (population, economic growth, etc.), they have mutually reinforcing effects and, if the two problems are not handled together, overcoming one problem might exacerbate the other.

In China, expansion plans for coal power plants might not be feasible due to water scarcity issues. And in India and Southeast Asia more than 50% of power plants are in areas that will likely face water shortages.

Scarcity and poor water management might have a detrimental impact on energy supplies and agricultural production, and vice versa. One way or the other water and energy access rely on water infrastructures. Energy development might add pressure to freshwater resources at many different levels. Still more than 70% of new energy demands will be covered by traditional fossil fuels power generation processes that may add to water demands for cooling. Energy supply deficits in emerging urban areas in transition countries require new infrastructures in distant unpopulated places where there still is some untapped hydropower potential with important impacts over rivers and other water related ecosystems. New resources using innovative technologies that are perceived as a promise to cope with future energy deficits in advanced countries might increase competition for still scarce water supplies:

By 2030, Renewable Energy demand would rise by 60% (WWAP, 2009) and EIA (2010) estimates that global energy consumption will increase by around 50% from 2007 to 2035. With rising agricultural output, both water and energy consumption would increase which would lead to increased energy and water competition within the users and stakeholders. Close to 19% rise of global agricultural water consumption is predicted by 2050. Water use might proceed beyond critical sustainable thresholds at the expense of increased scarcity; degraded water sources, resource exhaustion and impoverished water quality (See the Boxes over China and India).

Up to 90% of freshwater usage is seen in some fast-developing nations. The global average comes up to ~70%. Not, just the water use, the treatment of the wastewater requires a significant amount of energy. The interdependencies would only push the global energy needs up by 44% between 2006 and 2030 (IEA, 2009).

As a consequence, water has been over-appropriated in many regions of the world and its scarcity affects more than a third of the world population comprising 2.4 billion people. Many of them live in water-stress prone areas and by 2025 it is predicted to rise up to 2/3rd.

Water and Gender

Evidence shows that meaningful involvement of women in water resources development, management and use can lead to the design of effective new solutions to water problems, help governments avoid poor investments and expensive mistakes, make projects more sustainable, ensure that infrastructure development yields the maximum social and economic returns, and further development goals. Women for Water Partnership, the global women's civil society network in the water sector, enables women and their organizations at national to local level to participate in decision making and to become active partners in water resource management. For instance, it has provided basic services for the 10.000 community members and ensure sustainability management and efficient use of resources in the Mweteni villages in the Kilimajaro area, Tanzania.

Scarcity threatens the maintenance of the benefits of economic progress. But coping with water scarcity requires increasing energy use and reducing energy scarcity may add pressure over already insufficient water resources.

The perception of water and energy access as two different social challenges might have negative consequences and compromise social advances. For example, the costs and availability of rural energy have a decisive influence on agricultural development and poverty alleviation, at least in the short term. The basic factor behind the accelerated expansion of irrigation in Asia is considered to be the expansion of rural electrification supported by subsidized electricity. This favored the use of pumps and lead to the expansion of well-drilling: 21 million drills in India in the last 20 years and an increase in groundwater abstractions from 20 to 240 million cubic meters since 1950). However this is not sustainable, in some regions in India water tables are dropping up to 6 meters per year putting water out of the reach of most users.

Besides their direct importance for human development and poverty reduction water and energy are also indirectly linked by the joint importance of food security. Matching the simultaneous increase in energy and water demand might impair access to water with more than proportional effects over the poor. In a world where more than 568 million people remain undernourished (two out of each three in Asia where 58% of the population lives), food production already accounts for 70% of water withdrawals. The combination of growing populations and changing lifestyles and diets will increase the demand of dairy and meat products by 50% with a proportional amount in the demand for water. At the same time the emergence of biofuels for transport has led to greater competition, land and water use and higher food prices. Globally food production increased rapidly in the thirty years since 2005 when price volatility reappeared, possibly signaling the end of low food prices based on the extensive use of natural resources backed by subsidies, energy intensive inputs, such as fertilizers and the mining of non-renewable resources like groundwater.

Water needs Energy

Safe drinking water: Energy systems that fuel water pumping, boiling, disinfection, purification, distribution and storage are vital for providing a reliable supply of safe drinking water. Energy is needed to pump clean subsoil water or to boil water to reduce the health risk from fecal contamination.

Sanitation: Renewable energy technologies are well suited to providing power for water treatment and pumping. Hybrid systems that combine the benefits of conventional and renewable energy services are also being deployed, as are biogas plants that use human excreta and animal manure.

Agriculture: Water pumping can improve agricultural output significantly; access to energy services, therefore, can mean the difference between subsistence and commercial agriculture. There is a wide range of energy technologies that are affordable and feasible for small-scale agriculture operations. It should be noted, however, that irrigated agriculture is frequently chemically invasive when combined with the use of fertilizers and pesticides, and can make the water unsuitable for consumption and continued irrigation. Therefore, protection of water sources and reducing contamination from runoff should be considered in the planning and implementation of projects.

Challenges

1. Access to water and energy requires a long-term vision. As countries take advantage of the existing opportunities to develop infrastructures to increase water and energy supply the evidence of water scarcity as well as the importance of both resources for sustaining development become visible, but countries and local communities might be locked in with the inadequate institutions, built to increase supply but not as capable to manage water demands and foster water efficiency, and with an increasingly poor resource base. Once there, curbing scarcity and increasing resilience requires important changes in water management and water governance.

2. Discussions about the sustainable energy mix developing and managing the trade-offs implied by the water and energy link. Still by 2030, 75% of the increase in energy sources is expected to come from fossil fuels and result in exacerbation of climate change and water scarcity. But from the other side, alternatives to develop low carbon sources may put additional pressures on water resources. Carbon capture and storage technologies use water resources and alternative transport biofuels might be both water and carbon intensive.

UNDP is currently executing projects designed to enhance access to energy services in rural areas using locally available renewable sources. To meet the goal, these ongoing efforts aim at promoting innovative business models and financing sources, such as the Pro-Poor-Public-Private-Partnership (5P) model and carbon financing, respectively. 5Ps help to reduce pressure on government budget, demonstrate the profit incentive to the private sector and contributes to social and economic development, such as in the case of the project in Cinte Mekar in Indonesia.

3. Matching water demand and supply at a sustainable level requires a long-term adaptation strategy. At a global level accommodating advances in intermediate and poor countries within the resources available would only be possible with simultaneous improvements in water and energy efficiency. At a more local level it requires a shared vision of the risks at hand and the intangible costs implied as well as the building of social agreements over the protection of water sources and energy resources.

4. In spite of the many experiences available water crisis is avoidable. There are alternative development paths that, in water scarce and drought prone countries, need to be pushed up to the top of the policy debate. Even in these countries, where water supply opportunities have already been exhausted, there are still significant untapped opportunities to manage water and energy demands, increase efficiency and put alternative resources into the water and energy mix including non- conventional resources, low energy intensive water resources, relying on innovative technologies to reuse or recycle water, and on low water intensive electricity sources. With the best available technologies future food demands can be met with the available land and water resources; although this will need some radical changes in the institutions and incentives to manage water and energy. All these elements need to be part of the social dialogue to agree upon a vision on how to bring the water sector to sustainability.

5. But taking advantage of these opportunities requires coordinating water and energy policy. The different ways to come to terms with the water resources available consist of enhancing the efficiency with which water is used in irrigation or urban use, which imply using more energy to pump and apply water, using energy to transfer water from more abundant areas, putting into use recycled or desalinated water produced with energy intensive processes or reallocating water to its more productive places and uses which requires energy for transport and application.

6. The most important challenge moreover consists in formulating, adopting and implementing a water policy consistent with the actual facts and with long term objectives in terms of both sustainable water and energy portfolios. In the short term this means being prepared to accept difficult choices and discarding alternatives that look financially attractive in the short term. But a coherent long-term policy might also represent an important development opportunity. A consistent water and energy security policy can convey the message that the future is safe, can foster investments and stimulate innovation and, at the same time, might provide common ground to engage the private sector by demonstrating commitment with socially accepted goals.

Securing access: tools for improvement

There are still many untapped opportunities to cope with water and energy scarcity both with the resources available and by fostering technical innovation and institutional development. Most of these opportunities consist in allocating water to its more productive uses, enhancing the efficiency with which water and energy are used, developing non-conventional water resources and renewable energy sources, etc. The instruments able to take advantage of these opportunities to guarantee the sustainable access to water and energy are also varied:

Cap-Net is an international network for capacity building in sustainable water management. It is made up of a partnership of autonomous international, regional and national institutions and networks committed to capacity building in the water sector. Networks have proven to be effective at promoting the understanding of integrated water resources management and play a key role in supporting the development of IWRM and the achievement of the MDG's.

Economic instruments

- Water and energy are valuable resources that need to be priced accordingly. Energy and water pricing to provide incentives for allocating water to higher value uses -in environmental, social or economic senses, coupled with regulatory measures;
- Pricing mechanisms can be designed for different policy relevant purposes such as improving efficiency, making water and energy affordable for the poor, guaranteeing the financial sustainability of water and energy investments, matching market demand and supply with collectively agreed environmental goals, etc. The tradeoffs between these alternative goals need to be considered and price designs must be the result of transparent and participatory decision making processes.
- Energy and water markets must work to improve allocative efficiency through mutually beneficial decisions from buyers and sellers while preserving the collective goals of preserving and protecting the natural resource base and increasing adaptability and resilience to climate change, scarcity and extreme events.

Policy instruments

- Advocacy. The lack of awareness of the real costs of water and energy is one of the causes behind the water crisis. A shared vision of the problem and of the potential consequences of the water and energy crisis is a critical element to start considering costly measures and to rewire business, individuals and governments perspectives towards long-term objectives.
- The increasing importance of water and energy management require good governance practices, well defined and enforced property rights over water and energy assets and transparent and inclusive decision making processes over the goals and means of water and energy policies both at the short and the long term.
- Fiscal reforms are still required to guarantee current access to water and energy without putting into risk continuous access in the long term. This requires developing effective energy and water prices and trading institutions with well-defined water use rights, equitable pricing and realignment of environmentally harmful subsidies.
- A government program: This idea promoted by the Asian Development Bank consists in designing a strategy to work towards water access in the future for planning horizons of 10 to 20 years and programs of measures designed for an outcome oriented strategy. This program may include provisions to overcome with existing technologies and institutional inertia.

Assessment tools

- Sound economic and hydrologic assessment tools. Water and energy are complex issues with many interlinkages that make the consideration of the different trade-offs a difficult task and a clear barrier for making participatory political decisions. Perceptions that water and energy issues require sophisticated knowledge and privileged information is one of the main reasons why involving stakeholders has been difficult and many important policy issues continue being sorted out far from stakeholders discussion and even public scrutiny.
- Water accounts and water information systems: Good water governance needs to be based in good knowledge, with means consistent and independent information sources. Still many water and energy policies in most parts of the world are not submitted to a transparent ex-post assessment. Instruments and infrastructures still tend to be chosen by the promise rather than by past performance and the outcomes delivered. But trust and public involvement requires independent and transparent information.
- Prospecting models: though imperfect as they are extending the vision of water policy requires assessing future scenarios based on accurate data about the current balance between water and demand, the status of water resources and energy sources and the identification of the opportunities available in terms of alternative resources, efficiency gains, diversification, etc. and the possible trends based on plausible scenarios that might allow defining possible water shortages and the prospective benefits of the different courses of action.

Partnerships

- PPP are called to play a key role in aligning private business interest with the collective goals of water and energy management. They must be founded upon the identification of mutual interests for example enhancing water access and reducing risks of investment opportunities, disseminating information to speed up diffusion of innovative technologies, creating alliances around public objectives and private corporate responsibility strategies.

Technological developments

- Research and development policy need to recognize the water and energy nexus in such a way that diffusion of innovations in one area doesn't come at the expense of new challenges in the other.
- Development of renewable sources of energy. Water concerns must be brought to the frontline in discussions about the best energy portfolio and in setting priorities for the development of renewable sources as well as to the advance in new promising non-renewable resources such as natural gas and new water intensive processes to access untapped non-renewable resources (such as fracking).
- Development of new water sources. Energy concerns must be brought to the frontline in discussions about water policy in particular to the assessment of relatively abundant but energy intensive resources from brackish, desalinated or recycled water and with the diffusion of advanced technologies for wastewater treatment.
- Development of less water-intensive energy technologies (such as solar energy systems, wind energy systems, tidal energy systems, geothermal energy systems).

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