Water and Energy

Information brief

By 2030, Renewable Energy demand will have risen 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 and degraded water sources.

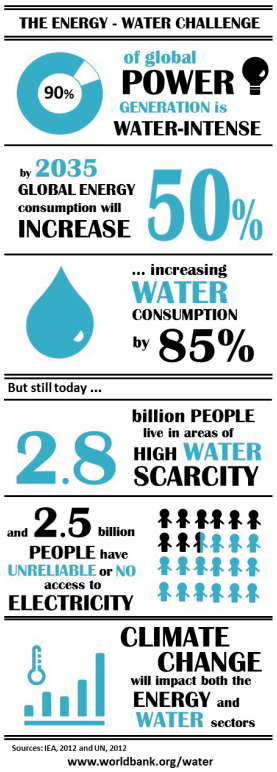
Water and energy are basic components of life, economic growth and human progress. This is a reality for the poor as securing access to both water and energy is still the cornerstone of alleviating poverty and breaking up the vicious circles and backwardness it creates. As well as for those already on the road towards development, where most of the growing demand for energy and food arises, and where making water and energy more abundant and accessible is an integral part of economic progress that comes through important challenges such as matching limited water and energy supplies with increasing demands and managing food security. Pressed by these problems and increased water and energy scarcity many countries realize at some point that progress is not anymore possible without shifting towards other alternatives. Specifically those 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 environment on which all these services depend.

The lack of energy and water is for many one of the explanations for poverty and deprivation, which demonstrates economic development is a double-edged sword. Reducing poverty, triggering economic growth and building up a more inclusive society are outstanding collective achievements that accompany new and bigger social and environmental challenges and the need to reconcile the different objectives in the continuous quest for a sustainable development path . Success in economic growth requires harnessing the potential of ecosystems to satisfy the demands of water and energy which are essential for life as well as the function of the many production and consumption processes where water and energy intervene as irreplaceable inputs. However, this can also create increasing water scarcity, higher exposure to droughts and extended impacts over natural ecosystems that become increasingly transformed.

Energy and water demand will rise with the rise in population. By 2030, renewable energy demand will have risen 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 will increase which will lead to increased energy and water competition within the users and stakeholders. A rise of close to 19% of global agricultural water consumption is predicted by 2050. The situation could be worse without any technological advancement in the energy sector or with a status-quo with water and energy policy development).

Up to 90% of freshwater usage is seen in some fast-developing nations. The global average comes up to ~70%. Not just water use, but also the treatment of 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).

1. The outcome document of the United Nations Conference on Sustainable Development, held in Rio de Janeiro from 20 to 22 June 2012, entitled "The future we want", acknowledges the need to further mainstream sustainable development at all levels, integrating economic, social and environmental aspects and recognizing their interconnectivity, so as to achieve sustainable development in all its dimensions.



Energy and water are intricately connected. All sources of energy (including electricity) require water in their production processes: the extraction of raw materials, cooling thermal processes, in cleaning processes, cultivation of crops for biofuels, and powering turbines. Energy is itself required to make water resources available for human use and consumption (including irrigation) through pumping, transportation, treatment, and desalination. Water and energy problems are connected to each other in such a way that, in spite of some partial and short term success, partial responses are bound to fail in the long term. Responses to both water and energy challenges need to be coordinated into an integral response. Solutions might not consist of promoting alternatives intended to sort out the energy problems at the expense of aggravating water scarcity, improving access to water at the expense of aggravating energy problems or, even worse, promoting alternatives attempting to improve access to water and energy at the expense of the environment.

Scarcity threatens the maintenance of the benefits of economic progress. However, 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. The energy and water nexus was coined as a focused area of study under the entire nexus to develop an understanding of the interdependencies and complications of water and energy alone. The water for energy and energy for water dependencies revolve around many elemental issues ranging from water management systems and water infrastructure to sustainable energy and efficient systems.

Improving the use of water and energy is fundamental for the entire social and management pipeline which encompasses everything within it. Parallel development of the energy and water policies is of paramount importance and not in isolation from each other. With high risks that the energy sector is now exposed to, the importance of including water in its strategic plan is more essential than ever before. The consortium, the framework to develop water and energy policies together, would directly contribute to the development of energy and water relationships.

The benefits of water and energy provision to poverty alleviation and economic progress are often accompanied by impairment of ecosystems with potentially harmful effects over nature and significant but unquantified costs. Global warming, population growth, urbanization and growing consumption of water and energy continue to disrupt our already fragile ecosystem.

Recognizing that ecosystems provide a variety of services to the water–energy nexus can help the management of trade-offs and ensure that short-term gains do not undermine services that are critical for resilience and long-term environmental sustainability. Development impacts threaten clean water provision, food provision, climate stability and water regulation. Above all reaching sustainability means tackling the joint transformations that providing water and energy to fuel and feed economic progress might have over the environment.

Challenges

A development crisis is still avoidable, water and energy can be jointly managed in a sustainable way as far as the challenges implied are pushed to the frontline of the development policy agenda. Even in these countries, where the most accessible water and energy sources have already been exhausted, there are still significant untapped opportunities to manage demands, increase efficiency and put alternative resources into the water and energy mixes.

With the best technologies and water and energy resources available there is still the possibility of matching demands in a sustainable way, 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 and energy sector to sustainability.

However, taking advantage of these opportunities requires coordinating water and energy policy. 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.

Still by 2030, 75% of the increase in energy sources is expected to come from fossil fuels and result in the exacerbation of climate change and water scarcity. On the contrary, 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.

Water and energy strategies need to be simultaneously rewired for the long term. Though important an urgency in short term current deficits and unsatisfied demands of water and energy cannot shade or relegate long term priorities and in particular the objective to rely upon a sustainable mix of both water and energy resources as a condition for building a sustainable future. The traditional options to put more and more water and energy into use are as exhaustible as the water and energy sources themselves. A transition needs to be made from non-renewable to renewable options, from increasing supply to a wise management of the resources available and from infrastructure development to a more balanced mix of infrastructures and ecosystems for the production of the valuable water and energy services people, the economy and the environment depends on.

The importance of the environment in welfare and human progress needs to be recognized through the definition of water and energy policy agenda. Restoring impaired ecosystems by recovering some of the basic functions performed in the past can be a valid cost effective alternative that reduces risks and exposure in many different ways. For instance, instead of traditional infrastructures, flood risks can be controlled by recovering rivers' flood plains and with good livestock, forestry and agricultural practices on slopes, which maximize their ability to retain water for infiltration and soil formation. The recovery of aquifers might substantially reduce drought exposure by building buffer stocks and green infrastructures, such sustainable urban drainage systems may serve storm management while increasing runoff and control temperature. All these measures intend to recover natural assets and the functions they perform might result in the simultaneous saving of substantial amounts of energy, important reductions in water provision and treatment costs and significant benefits for ecosystems and the services they provide.

Water and energy objectives need to be integrated into a more ambitious strategy for building resilience, enhancing collective security and adaptation. Climate change has the capacity to make a significant impact on the hydrological cycle, leading to a rise in extreme weather events such as floods and droughts. This fluctuation disturbs the energy management system. The changes when compounded with existing risks represent a genuine threat to energy and water access.

The strategy needs to consider the multiple social and environmental risks associated with water and energy including the following:

- Increasing water and energy demand: With the rise in water demand and its limited availability, a competition for water access comes into the play. This leads to a rise in energy demand for pumping more water which makes the process inefficient. The competition also disturbs the sustainability quotient of the system.
- Securing access to water and energy: A non-reliable system has the potential to defeat the Millennium Development Goals (MDGs). Access to water for domestic and productive uses (agriculture, industry, and other economic activities) has a direct impact on poverty and food security.

- Unsustainable water and energy supply: An unsustainable water or energy supply leads to physical depletion of resources which therefore compromises water and energy availability for the future.
- Declining water quality – dropping efficiency – rising energy demand: with rise in demand, the underground water table does not replenish itself which leads to generation of stress in the form of reduced water resources. The competition for the limited resources rises exponentially which is observed with phenomenal over-pumping (amongst the end users) to extract the same amount of water.
- Unmet social and environmental needs: Social and environmental needs remain unmet because of over-exploitation of resources. With rising demand of electricity and ever changing lifestyle, the use of water for energy production is also increasing apart from rising need of energy for water management.
- Changing expectations: Equitable, reliable water resources management programmes reduce poor people's vulnerability to shock, which in turn gives them more secure and fruitful livelihoods.
- Climate change: This is a global phenomena observed from any given point of the world. The use of natural resources and stress caused by it not only affects all regions but disturbs the global ecological balance which is observed in the form of climate change.

Tools for Improvement

Public Policy and Governance

- Construction of broad constituencies around long term vision and objectives between governments, firms and stakeholders are important to invest in water and energy conservation assuming higher costs in the short term in exchange of long-term benefits.
- Creation and promotion of public awareness to foster collective actions as well as to make individual decisions on the use of water and energy compatible with sustainable supplies.
- Improvements in governance through transparency and accountability, development oriented outcome and performance indicators promoted both by local and international institutions.
- Promotion of communication mechanisms in order to build a shared diagnostic of why institutions failed to avoid unsustainable trends. This shared vision is an important basis to agree on the challenges and the alternatives available and to recognize the trade-offs implied.

Economics and Business: economic and financial instruments

- Promotion of private public partnership to foster the redevelopment of business strategies to long term rather than short-sighted business.
- Development of water networks (preserving or recovering water sources, empowerment to local communities, promote innovation and technology development and diffusion, share risks, etc,).
- Transparency of water and energy prices and of their connection with long term sustainability objectives as well as with human and social development objectives.
- Develop of economic policy instruments properly designed and implemented to realign individual decisions of all households and firms with the long term objectives of sustainable water and energy policies. This includes payment for ecosystem services (PES), drought and flood insurance systems, water trading, pollution charges, etc.
- Outcome oriented fiscal incentives ranging from subsidies, tax deductions, price premiums and all other instruments able to play a role to trigger innovation and speed up the diffusion of innovations and newer technologies.

- Revision of energy and water prices in order to send clear signals of scarcity and promote the required change to sustainable portfolios of renewable energies and sustainable water sources.
- Improvements of water and energy regulatory bodies capable of tapping the leaks and discover room for improvement in the water and energy management systems.

Assessment tools and decision support systems

- Improved information systems related to support decisions on the allocation and reallocation of resources and to help users of water and energy to prepare themselves accordingly.
- Environment Assessment and economic valuation tools able to inform of the impact, costs and benefits of the different options available as well as to analyse the trade-offs implied in making decision about water and energy management-
- Economic and hydrologic assessment tools able to inform of complex interactions between the economy and the water systems in order to overcome existing barriers to making participatory political decisions.
- Water and Energy Accounts organised with consistent, transparent and independent information sources to support decision making, transparency and accountability.
- Prospecting models to extend the vision of water and energy policy in order to assess future scenarios as well as the prospective benefits of the different courses of action.
- Science and Industry partnerships between science, governments and industry to create and accumulate a knowledge basis as well as transparent systems to assess alternatives and outcomes of the different courses of action foreseen and undertaken.
- Information and communication technologies both to enhance efficiency in the production and use of energy and water as well as to improve water governance and the design and improvement of monitoring and enforcement.
- Resource Assessments, Life Cycle Assessments, Strategic Environment Assessments, and economic valuation and other tools able to strengthen the case for improved efficiency in both the water and energy sectors.
- Benchmarking to facilitate evaluations of firms performance in terms of producing and delivering water and energy services including life cycle assessment, ecological footprint calculator, environmental performance indexes, etc.
- Indicators and other metrics comparing water and energy use.

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