Water and Technology in the Transition to the Green Economy

Information brief

"The transition to the green economy involves no less than a technological revolution, and will have deep impacts on production structures as well as on consumption patterns" Panel of Experts to Second Preparatory Committee Meeting UNCSD (2011)

Key questions

- **Who will benefit** from technological change in the transition to a green economy?
- How can **inequity and asymmetries** in technological capabilities be addressed? How can the transition to a green economy **be made inclusive**; contributing to well-being and poverty alleviation?
- Can financing arrangements be a means to smooth out potential inequalities without the process of **structural change?**
- What is the **role of governments** in the technological revolution towards a green economy? (e.g. supporting investment in new technologies, disseminating them, and/or regulation)
- Should priority be given to improved **public sector effectiveness and governance?**
- What are the **institutional requirements** for creating the enabling conditions for the technological revolution?
- **Which (green) technologies** should be encouraged and prioritized? To what extend the technical efficiency of networks must be improved?; How to manage the water energy trade-off in irrigation and water treatment and recycling?, etc.

How can technology contribute to the transition towards a green economy?

Green technologies can contribute to the green economy because they have the potential to create **new business opportunities, markets and jobs**. They can boost water and energy efficiency and contribute to achieving the Millennium Development Goals in building a green economy. Innovative water technologies can increase the amount of water available for drinking, agriculture and manufacturing, and can allow us to use water more efficiently. This can be done by technologies in areas such as water resources assessments, reduction of water losses, wastewater treatment, efficiency of water utilities, bio technologies, etc.

Technology development – if combined with public awareness – can also contribute to **reducing water footprints** in most water sectors through increased conservation, reuse and recycling, and greater efficiency, particularly in agriculture. This can contribute to poverty reduction and socio-economic development.

Research and development (R&D) and innovation are central to the green economy. They can **reduce the costs of existing environmentally sustainable technologies** and deliver the new technologies that are needed to advance efforts to cut emissions, reduce waste and increase resource efficiency. In both developed and developing economies, innovation plays a critical role in generating employment; enhancing productivity growth; increasing energy, carbon, water and material efficiency; improving the performance of goods and services; and creating new markets and jobs through knowledge creation and diffusion.

Information and Communications Technology (ICT) is a key enabler for the green economy in all sectors. ICT applications can reduce environmental impacts and also affect how other products are designed, produced, consumed, used and disposed of. For example, they help to realize solutions for fuel efficient driving; smart electricity distribution networks to reduce transmission and distribution losses; and intelligent heating and lighting systems in buildings that increase energy efficiency. ICT also contributes to making information easily and globally accessible; to standardizing problem solving approaches; and avoiding repetition of failures.

Technologies in the agricultural sector can contribute to significant water conservation in this important water using sector, which currently accounts for 70% of global withdrawals. The dissemination of water harvesting technologies, efficient irrigation (i.e. drip irrigation) as well as technologies for the re-use of grey water in peri-urban agriculture could increase water availability for food production.

Key principles for technologies in the green economy

- **Intergenerational** principle: deep integration of sustainability as an overarching objective.
- **Precautionary** principle: take into account potential social and environmental impacts, making decisions to protect social and environmental systems even under conditions of uncertainty.
- **Accountability:** costs and burdens should be carried by those who profit and benefit instead of being transferred to the public at large or to a negatively affected population

What are the challenges and barriers for technology in the green economy?

- Technological innovations may have unprecedented beneficial or harmful impacts in the future and **accountability for the harmful impacts is often lacking**. Much depends on the framework in which they are developed and disseminated. More could be done to assess social, environmental or other impacts more thoroughly and holistically before technologies are embraced, disseminated and promoted on a large scale.
- The **technological development cycle does not exist in a vacuum**. It is influenced by government priorities, market interests, social trends and risk thresholds, and power dynamics. As a result, policies and market mechanisms do not necessarily direct technological innovation to areas or people who need it the most or advance sustainability.
- If technological development is not regulated, differences in technological capabilities between the developed and developing world may mean that **existing inequalities only get worse**.
- **Structural or policy obstacles** to technology transfer and dissemination due to intellectual property barriers, lack of investment in research and extension, and lack of funding, may lead to regional disparities in access to technology, potentially widening the income gap between the rich and poor. Such gaps in access already exist, with small pockets of private sector interests holding the majority of public-interest patents and intellectual property rights.
- **Cultural obstacles** to technological uptake, such as resistance to recycling of sewage water for drinking, can delay the adoption of technology.
- Technology is often seen as a proxy for progress and sometimes raises **unrealistic expectations** as a cure-all for society. More attention could be paid to the broader implications of its development and dissemination—or lack thereof in some sectors.
- **Inadequate governance and decision-making systems** may create market distortions towards inefficient technologies, for example through inappropriate subsidies or a lack of long-term vision.
- The **focus of investments** is too often exclusively **on those areas that will make returns in the shorter term** (i.e. specific renewable technologies that some governments favor more than others with specific subsidies).
- The current **economic and financial crisis** lowers the financial capacity of many countries to implement innovative water technologies.
- The **lack of knowledge dissemination** may hinder the application of water technologies.

What are the opportunities?

- **Climate change** creates urgency and provides a rationale for technology development and transfer, which can help to both mitigate and adapt to climate change and enhance sustainability. Consumers are also demanding technology that decreases their carbon footprint and increases the sustainability of their consumption.
- **Increasing urbanization** creates space ripe for innovation and dissemination in traditional sectors and for hard technologies such as transportation, energy, and ICT as well as soft technologies such as resource use and social media. Urban areas allow for economies of scale for initiatives on urban agriculture, social media campaigns on sustainability, etc.

Opportunities in cities...

The development of **nanotechnology** for urban water produce contributes to pollution reduction and accelerates the pace of filtration, making water re-use possible and increasingly affordable. **Grey water re-use**, along with simple water conservation technologies for urban applications (i.e. more efficient toilets and showers and in-house grey water recycling) can also make water conservation more affordable for urban dwellers. It can reduce the opportunity cost of selecting 'ecological' options at the individual and the community scale. This leads to more efficient options for urban planning and more green building design, which facilitates the efficient integration of new urban migrants.

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- An **open economy** stimulates technology transfer, since this typically occurs through market channels such as trade, foreign direct investment or licensing. Countries also need a minimum absorptive capacity to successfully adopt technologies.
- **International cooperation and collaboration on research and development** (e.g. through networks or clusters) contributes to developing, absorbing, adapting, nurturing and diffusing innovation and green technologies.
- The **least developed countries**' (LDCs) early stage of industrialization offers avenues for leapfrogging and adopting technologies which offer greater energy and resource efficiency. They can adopt new and state-of-the-art technologies. The experience of this happening with information and communication technologies is revealing of the capacity of poor countries and poor communities to achieve a jump in the technological development process. The Peepoo system in Kenya is an affordable and effective sanitation system with proven benefits in health and food safety[1] .

Highlighting practice

This section outlines several approaches for transitioning to the green economy highlighted by the organizations participating in the conference.

Innovating and expanding access to technology

- Reform of the **global intellectual property regime** to include more room for compulsory licensing, strengthening patenting standards, limiting the length of patent protection, and allowing innovators to use existing patented knowledge to generate new innovations.
- **Improved access to ICT** can contribute to a broader access to other technologies as well. Intensified commitment to ICT creates benefits across many sectors (e.g. e-health, payment services by mobile phone, market prices, social mobilizing, disaster warning, etc.).
- Creation of **patent pools** to reduce risk and lower coordination costs for innovators of technology in areas that aim to fill gaps and meet development needs.
- When projects have a high technology risk profile and are capital-intensive, they are very hard to fund with either project or debt financing or venture capital. Therefore, **financial support by governments** could be provided in the early stages of green technology development.
- **Public-private leveraging**. Enhancement of competition for private sector innovation to leverage public sector grants and creation of pulling mechanisms (e.g. prizes, advance market commitments, seed grants, etc.) to ensure technology meets the greatest needs.

Enhancing sustainability

- Capitalization of **regulatory bodies** on the national level to stimulate sustainability standards.
- **International commitment** to the development, sharing and adoption of technologies and information that enable the sourcing and monitoring of natural resources production and use (e.g. tagging of fish, timber, and garbage; satellite use for detecting depletion of aquifers and forests, and land-use change). This is critical to inform the public, markets, governments, and international community, and deflect the current development trajectory.
- Creation of **sustainability task forces or commissions** at the national level to ensure that government policies related to technology enhance sustainability and ensure access to basic services.
- **Technology transformation**. Public policies need to be concerted and aimed at scaling up sustainable technologies that might otherwise be prone to private-market failures.
- **Eco-labeling and access to information** regarding products and services (e.g. full-cost and sustainability-footprint labeling, smart metering, and awareness campaigns) can contribute to sustainable consumer behavior.
- **Knowledge sharing** and ICT platforms, with micro-credit mechanisms, help transfer and upscale user-driven and soft technologies that enhance sustainability.

Production and market policies

- Adoption of policies to **enhance competition** (e.g. in road transport and energy infrastructure), since competition provides incentives for firms to increase their efficiency, productivity and innovative efforts.
- **Standardization**, such as for packaging and international transportation, can improve efficiencies and enable economies of scale.
- **Full lifecycle costing** of production that removes distortions from unaccounted negative externalities (while also incorporating up-front investments and social impacts) will require technology to be feasible and ultimately influence the market.

[1] See: http://www2.gtz.de/Dokumente/oe44/ecosan/en-benefit-from-using-peepoo-bags-Kenya-Bangladesh-2009.pdf

- On the **demand-side**, governments can pursue policies that reinforce long-term innovation and sustainable growth through smart regulations, standards, pricing, consumer education and taxation.
- **Green public procurement** can foster the needed markets for green products and services, especially in markets characterized by network externalities (infrastructure for electric/hybrid vehicles) or where demonstration effects (i.e. consumption externalities) are important.

Closing the gap between developed and developing countries

- **Enhancement of local capacity** for technology design in developing countries. These countries should be given the chance to climb the technological ladder from the initiation stage – where technology as capital goods are imported; to the internalization stage – where local firms learn through imitation under a flexible intellectual property rights regime; and the final generation stage – where local firms and institutions innovate through their own research and development.
- **Technology transfer policies** could help LDCs overcome barriers that they currently face.
- Expansion of the space for **technologies in the public domain** and stimulation of the transfer of publicly-funded technologies to developing countries.
- Construction of a **network of technology experts** to advise developing countries.
- Creation of **international R&D cooperation agreements**, global demonstration programs, knowledge-sharing platforms, and a global database on freely available technologies and best practices in licensing.
- **International financing sources** to support clean technology adoption and trade-related capacity building in green sectors can catalyze and sustain LDCs' transition to a green economy.
- **Improvement of skills and training**, including through closer coordination between the public sector and industrial partners to identify education and training needs.

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