THE ROLE OF CLIMATE TECHNOLOGIES IN GREEN TRANSITION PATHWAYS

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Battling climate change is one of the greatest challenges of our generation, and climate technologies have a key role to play in our efforts to move towards sustainable pathways through a green transition. It stands clear that climate change is not solely an environmental issue but is intricately linked to challenges of eradicating poverty. There is already great potential in the climate technologies that exist and those that are under way, however, it is key to enhance the scale of action that will create the frameworks that will facilitate this transition.

A key starting point to enhance the effectiveness of our actions is to understand what kind of technologies are best suited to a country's specific climate change situation. There is no one-size-fits-all technological solution or transition pathway, and all technologies must be adjusted to fit within the specific local socio-political and institutional context. Under the UN Climate Convention, countries are reporting on their climate technology needs, and the energy, agriculture and water sectors are clearly those where most action is required.

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UNEP-CCC is a leading international research and advisory institution on energy, climate and sustainable development. UNEP-CCC works with a wide range of international institutions, national governments and research organizations to assist developing countries in their efforts to move toward low carbon, climate resilient and sustainable development.

INTRODUCTION

Two of today's greatest challenges are those of ending poverty and fighting climate change. New and existing green technology has the potential to save our climate while lifting millions out of poverty. In other words, upscaling the development, use and transfer of climate technologies are key to meeting the Sustainable Development Goals, as well as the 2015 Paris Agreement. There is an urgent need to act strongly now and expect to continue efforts over the coming decades.

The transition to a low-carbon future can bring major economic gains. Energy efficiency can help boost incomes. Low-carbon technologies can open up new sources of growth and jobs. New technologies could help create a comparative advantage for some of the poorest countries. Using the example of cell phones, developing countries can avoid some of the cost of large grids through cutting the need for telephone wires. At the same time smarter grids can both enhance energy efficiency and enable new technologies whilst cutting costs of diffusion.

TECHNOLOGY NEEDS OF DEVELOPING COUNTRIES

All countries, including developing countries, should ultimately want to go on low emission development paths. Not only is it the future, but it brings huge benefits beyond climate change. Renewable energy sources can free countries from a dependence on imported fossil fuels. Cleaner transport and cooling mean less pollution and better health. Halting deforestation protects water supplies, controls flooding and provides biodiversity and so forth.

There is no one-size-fits-all technological solution or transition pathway, and all technologies must be adjusted to fit within the specific local socio-political and institutional context, influenced by cultural norms, attitudes and assumptions. Understanding what kind of technologies are best suited to a country's specific climate change situation is hence the starting point for effective climate action. Before investing in technologies that reduce greenhouse gas emissions and adapt to climate change impacts, it is essential to assess and analyse a country's specific needs. This information can then be used to set priorities and identify appropriate technologies.

As an established process back in 2001 under the United Nations Framework Convention on Climate Change (UNFCCC), the Technology Needs Assessments (TNAs) are designed to do precisely this type of in-depth analysis, being defined as "a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of Parties".[1] Today, countries are using their TNAs as a means to concretize implementation pathways to reach their nationally set targets for both sustainable development and low carbon climate resilient pathways.

Since 2009, UNEP DTU Partnership and UNEP have led the implementation of the GEF-funded Global Technology Needs Assessments (TNA) project[2] in close to 100 countries, mainly being developing countries. Looking into the climate technology priorities of the developing countries that have undertaken a TNA since 2010,[3] which actually counts almost all developing countries, - and more than half of all the countries in the world, it stands out very clearly that (not surprisingly) the energy sector is a key focus for reducing greenhouse gas emissions, while agriculture and water sectors are top priorities for protecting and increasing resilience of economies and our nature to the unavoidable impacts of climate change.

Understanding what kind of technologies are best suited to a country's specific climate change situation is the starting point for effective climate action

Priority sectors, Adaptation Technologies

The analysis is based on data collected between 2013 and 2021 from 79 countries' TNAs available on www.tech-action.org.

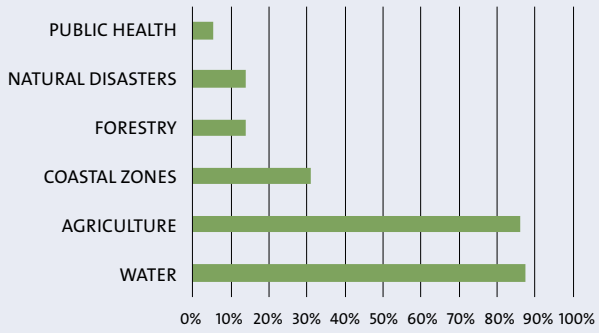

Figure 1

Priority sectors, Mitigation Technologies

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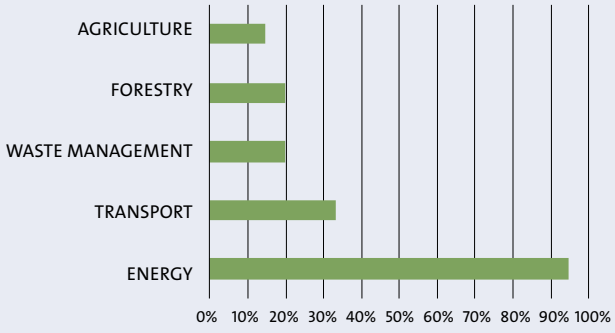

Figure 2

Within the sectors, the technology needs identified for mitigation cover a broad array of technologies, from small scale solar PV, hydropower and electrical vehicles to improved forest management, waste recovery and improved public transportation. In the energy sector, a majority of technologies are related to electricity generation. Other technologies focused on energy efficiency, energy management (energy strategies and plans as a technology) or heat production (often linked to electricity generation). Solar energy (including solar PV, solar thermal/ concentrated solar power) was the most prioritised technology, followed by hydropower, energy efficiency in building and lighting system and bioenergy.

1 UNFCCC 2001, Decision 4/CP.7.

2 www.tech-action.org.

3 All country reports are available on www.tech-action.org.

The technologies prioritised for adaptation include capital intensive technologies such as irrigation systems and drought-tolerant crop species for agriculture, and storm surge barriers and seawalls for coastal protection, as well as technologies such as water, crop and soil management technologies, where enhanced awareness and capabilities are key factors rather than capital expenditure requirements. In the agriculture sector, the top prioritised technologies are within crop diversification and new varieties, including introduction of climate resilient crops and diversification of crops. Drip irrigation systems, and water catchment and harvesting are as well ranking high in the agricultural sector, pushing water related technologies as a high priority for many.

UPSCALLING USE OF SMART WATER METERS IN TANZANIA

Tanzania experiences water resource scarcity, which are already further exacerbated by climate change impacts.

Non-Revenue Water – water that is produced for consumption and lost before it reaches the customer – is a serious challenge in the country. On average 37% of the water supply in urban areas is lost as Non-Revenue Water, while in a large city as Dar es Salaam it is estimated to be up to a 50 % loss. The challenges that the national water authorities in Tanzania face with Non-Revenue Water, result in water supplies that do not meet the demand. The consequence of water losses is reduced financial viability of water utilities, which again results in poor services and inadequate water access, availability and affordability. Tanzania's TNA[4] for the water sector identifies Smart Water Meters as a key priority technology for Tanzania to address this problem. The TNA identifies and analyses barriers and the enabling framework conditions, which are required for introducing water leakage management through smart water metering systems, and thereby to start the digitalization of the water sector in Tanzania. Embarking into a smart water metering programme is a huge challenge and involves extensive planning, training of personnel, customer information system and management. A higher awareness of water consumption is a key contribution by the smart water meters, but digitalization will also have a significant impact on preserving the country's water resources in general.

Technologies like Smart Water Meters, together with the implementation of enabling actions, will contribute to alleviating the climate change-induced impacts on the water sector, threatening people's livelihoods, infrastructure and ecosystems.

4 Available at www.tech-action.org.

CHALLENGES AND ENABLING FRAMEWORKS FOR TECHNOLOGY TRANSFER

An enabling framework denotes the entire range of institutional, regulatory and political framework conditions that are conducive to promoting and facilitating the development, use and transfer of technologies. This includes the country-specific circumstances that encompass existing market and technological conditions, institutions, resources and practices, which can be subject to changes in response to government actions. Enablers may target both technology supply- and demand-side aspects of the development and transfer of technologies.

To create the frameworks for the wider use of climate technologies, a key aspect to consider is access to and cost of finance. From what countries have reported, through their TNAs, on the challenges they identify for specific technologies and their successful development, use and transfer, it stands clear that access to capital and investments remain the main challenge for developing and most vulnerable countries to access green technology. The role of the private sector in developing and transferring technology could be extended if provided with the right incentives. This leads us back to the role of national governments in creating the right enabling conditions for both domestic and international technology development and transfer. The introduction of incentives, such as subsidies for investment and tax exemptions, would likely result in an increase in profitability for the private sector in investing in the required implementation of technology, hence encouraging further investments.

Challenges to Technology Transfer

The analysis is based on data collected between 2013 and 2021 from 79 countries' TNAs available on www.tech-action.org. Challenges to technology transfer are identified for 787 technologies with a total of 4079 reported challenges.

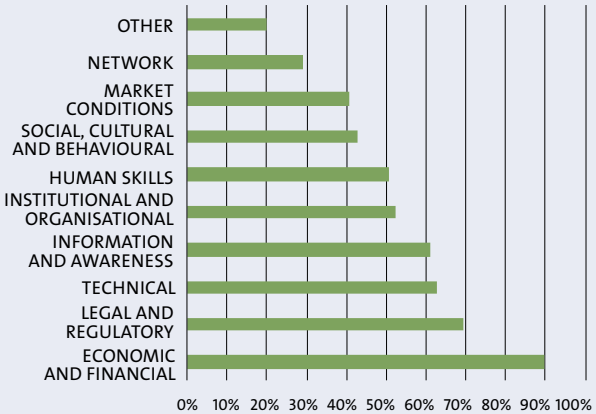

Figure 3

To enhance the engagement of the private sector in the green transition and accelerated uptake of climate technologies, there is a need to implement initiatives to: 1) grow market demand for renewable energy, 2) increase focus on higher energy efficiency, and 3) create a greater role for the carbon market. Private sector participation in low-carbon green growth initiatives is oftentimes hindered by limited financing options and access to technology in developing countries, biased supply chain dependence on imports, limited partnerships between the public and the private sectors, a lack of capacity, regulatory uncertainty, and the absence of a long-term price signal for the carbon market.

Besides access to and cost of finance, it is key to look into the structural factors that inhibit the transfer and deployment of a technology, including regulatory, policy or other features that define a given sector. For example, in the energy sector, legal and regulatory constraints are identified for the transfer and use of 66% of the technologies. Therefore, by updating and enforcing technical regulations for appliances and strengthening the associated governance and legal frameworks, use of, for example, energy-efficient appliances in the residential and public sectors can be increased, thus contributing to climate change mitigation.

The role of the private sector in developing and transferring technology could be extended if provided with the right incentives

Several mitigation technologies, notably solar PV but also wind power, have seen dramatic drops in prices and large-scale deployment in world markets. However, many climate technologies are still at a stage in the technology life cycle where they exhibit limited maturity and affordability and entail special capacity requirements. Their advancement towards market maturity is likely to come through continued development and support measures in the major markets that are technology leaders, enhancing both their performance and bending the cost curve.

Considering the economic and environmental potential of the transition to a climate-neutral economy, while also taking into account the short-term structural changes that may affect already vulnerable populations, it is clear that carefully designed policies are imperative to harness transition benefits and limit its downsides.

The transition to a low carbon climate resilient economy provides both an opportunity and a challenge. Ensuring an inclusive and just transition requires achieving deep emission reductions both reducing the effects of climate change on the most vulnerable and ensuring the benefits and burdens of climate action are equitably distributed. To have a complete range of solutions to reach a full transition to low carbon climate resilient development paths, there is a need for international technology transfer but also a need for local anchoring with local production, skills upgrading and strengthening of local markets.

Finally, to be successful in the green transition, there is an urgent need for increased cooperation among private actors, public actors and international actors to build global and national partnerships for upscaling the use of climate technology.