Regional Technology Brief - Africa

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TNA TECHNOLOGY NEEDS ASSESSMENT

REGIONAL TECHNOLOGY BRIEF

AFRICA

AFRICA is among the most vulnerable continents to climate change. By 2030, it is projected that between 75 and 250 million people on the continent will be exposed to increased water stress due to climate change. Africa's vulnerability to climate change is driven by a range of factors, including weak adaptive capacity, a high level of dependence on ecosystem goods for livelihoods, and less well-developed systems of agricultural production. The impacts of climate change on agricultural production, food security, water resources and ecosystem services are likely to have increasingly severe consequences on African lives in general and on the continent's efforts to achieve the Sustainable Development Goals. Managing these impacts requires scaling up the deployment of technologies for adaptation in the management of ecosystem goods and services and agriculture production systems in Africa. At the same time there is an urgency to reduce carbon dioxide emissions through, for example, increasing the use of renewable sources of energy and clean technologies, and resolute action to prevent deforestation and land degradation.

Enhancing the development, transfer and uptake of technology is a key pillar of the international response to climate change. Since 2009, the Technology Needs Assessment (TNA) project has supported 31 countries in the African region, the objective being to assess countries' technology needs in relation to climate change adaptation and mitigation.

TNA COUNTRIES IN AFRICA

2009-2020
Benin, Burkina Faso, Burundi, Central African Republic, Chad, Djibouti, Eswatini, The Gambia, Ghana, Guinea, Côte d'Ivoire, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Rwanda, São Tome and Principe, Senegal, Seychelles, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia

2020-2023
Comoros Union, Ethiopia, Guinea-Bissau, Lesotho, Somalia, South Sudan

gef

UNEP DTU PARTNERSHIP

UN environment programme

TNA TECHNOLOGY NEEDS ASSESSMENT

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2020

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www.unepdtu.org

UNFCCC
Bonn, Germany
www.unfccc.int

TECHNOLOGY NEEDS

TNAs were strongly emphasized in the Paris Agreement, and they also play a central role in the 'implementation' theme of the newly agreed UNFCCC Technology Framework, which provides overarching guidance on the UNFCCC's Technology Mechanism. Enhanced support to developing countries in conducting and implementing effective TNAs and implementing Technology Action Plans (TAPs) will be instrumental in enhancing implementation of the Paris Agreement. Thanks to the information that TNAs provide about the potential, ability and scale of climate technologies, they can play a unique role in the formulation and implementation of NDCs.

TNAs are used by developing countries as a highly practical tool that provides an effective and solid foundation upon which they can both scale up and implement action on climate technologies in their efforts to

Solar panel photovoltaic in a rural area.
Photo © Malevic

pursue the targets they agreed under the Paris Agreement, as well as in reaching their national Sustainable Development Goals.

With funding from the Global Environment Facility, UNEP through the UNEP DTU Partnership, supports developing countries in preparing their TNAs and TAPs within the Global Technology Needs Assessment project. By 2020 close to a hundred developing countries have joined the project, of which 37 are in Africa.

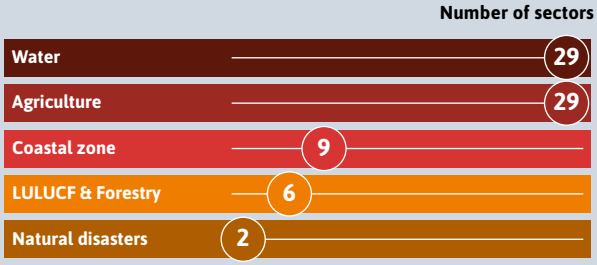
Technical assistance, capacity building and guidance are provided by UNEP and UNEP DTU Partnership with its Regional Centres for the TNA project, which in the African region are ENDA based in Senegal and University of Cape Town, South Africa.

ADAPTATION TECHNOLOGIES

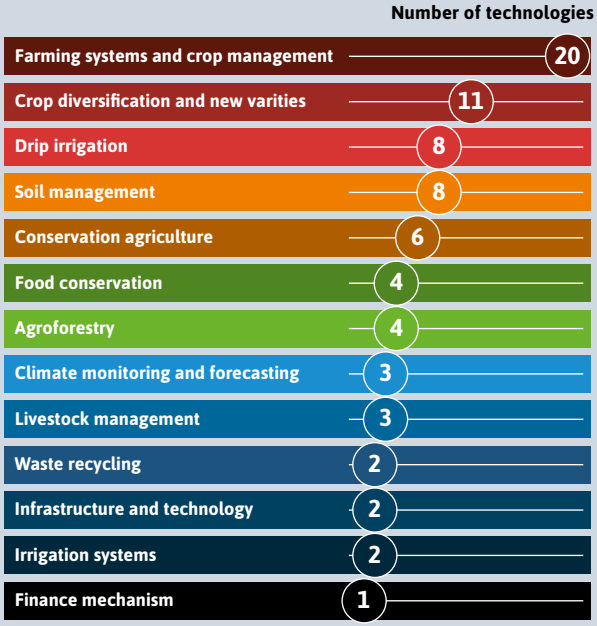
Ten years of TNA activities show similar patterns across African countries in their priorities for adaptation to climate change. 94 percent of African countries have prioritized agriculture and water as their key sectors for adaptation when assessing their technology needs. This is particularly because of the continent's very high dependency on agriculture. Increases in temperature and rainfall reduction associated with climate change will reduce agricultural production and increase the demand for more land and water to compensate for climate stresses. The coastal zones sector has been prioritized by 29 percent of countries, alongside land use, land-use change, and forestry (LULUCF & Forestry) (19 percent).

For the agricultural sector, countries have prioritized technologies for the management and diversification of crops, the development of new crop varieties, drip irrigation, soil management and food conservation. The diversification of crops and the introduction of new crop varieties constitute effective measures with which to build a resilient agriculture sector. For example, Kenya has prioritized the development of drought-resistant sorghum, Côte d'Ivoire the improvement of plantain and cassava varieties, and Mali the improvement of crop varieties through breeding techniques. Promot-

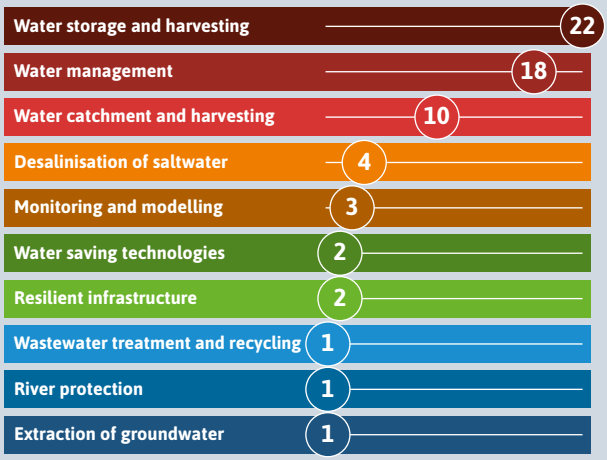
TNA ADAPTATION PRIORITY SECTORS, 31 AFRICAN COUNTRIES



TECHNOLOGIES FOR ADAPTATION IN THE AGRICULTURE SECTOR (27 AFRICAN COUNTRIES)



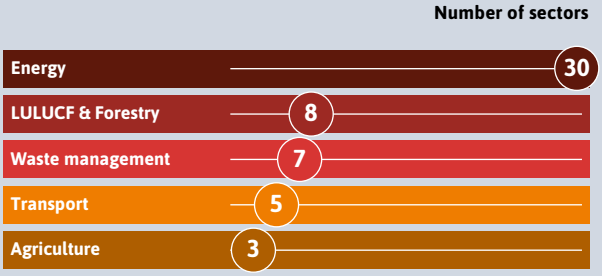
TECHNOLOGIES FOR ADAPATATION IN THE WATER SECTOR (27 AFRICAN COUNTRIES)



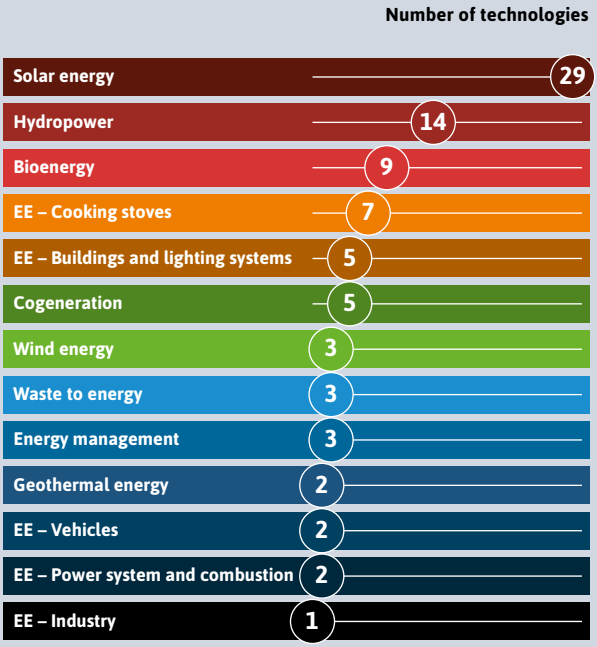
ing resilient, drought-tolerant and early maturing food crops are also priorities for Madagascar and Guinea.

In the water sector, water storage and harvesting, water management and water catchment are the most prioritized technologies. Many countries, such as Ghana, Morocco, Seychelles, Burundi and Eswatini, identified rainwater-harvesting as their priority technology. Mali and Guinea identified water boreholes for small-scale irrigation, domestic water and livestock, while other countries such as Ivory Coast and Togo are focusing on improving the water supply and developing safe water facilities in peri-urban and semi-rural areas. Finally, coastal zone management and restoration, climate monitoring and forecasting, and hard coastal protection are the most prioritized technologies for coastal zone adaptation.

TNA MITIGATION PRIORITY SECTORS, 31 AFRICAN COUNTRIES



TECHNOLOGIES FOR MITIGATION IN THE ENERGY SECTOR (26 COUNTRIES)



MITIGATION TECHNOLOGIES

For African countries, it is key to pursue low carbon development paths and to reduce future greenhouse gas emissions. 97 percent of African countries prioritize the energy sector. Land use and forestry (26 percent) and waste management (23 percent) follow the energy sector as top identified mitigation sectors. These figures highlight the role of renewable energy technologies in decreasing the level of greenhouse gas emissions and in improving countries' access to energy, thus bringing social and economic benefits, besides environmental ones.

Many African countries have announced ambitious plans to limit their greenhouse gas emissions through their Nationally Determined Contributions (NDCs) under the Paris Agreement and have prioritized solar energy, hydropower, bioenergy, energy-efficient cooking stoves and efficient lighting systems as top technologies in the energy sector.

Solar energy technologies are by far the most commonly prioritized technologies in respect of mitigation, representing 22 percent of the overall mitigation technologies prioritized by African countries, and accounting for 33 percent of overall energy-related technologies. The range of solar technologies is broad, and choices vary greatly from one country to another. To illustrate, Ivory Coast prioritized the development of photovoltaic solar kits and photovoltaic pumping systems, while Senegal chose solar lanterns and solar water heaters as its priorities. Several countries identified large-scale and more complex solar technologies:

Thermo-solar power plant Ain Beni Mathar Integrated Combined Cycle Thermo-Solar Power Plant. Photo © Dana Smillie World Bank

GOVERNMENT OF TOGO INITIATES ACTIVITIES ON RENEWABLE ENERGY TECHNOLOGIES

In its TNA process, Togo focused its mitigation efforts on the energy sector, especially power production. A high-power hydroelectric power plant, small and mini-hydroelectric power stations, and grid-connected solar PVs were identified as the country's top technology priorities. Based on its TNA and TAP, the Government of Togo initiated several activities:

- completion of topographical, geotechnical, environmental and social impact studies regarding the development of a 30MW solar power plant in Blitta.
- analysis and harmonization of concession agreements regarding the production and purchasing of electricity.
- completion of geological and geotechnical studies for the development of the Sarakawa 24MW hydroelectric site. In addition, environmental and social impact studies are being conducted in relation to the hydroelectric site's development.
- setting up a subsidy scheme disbursing 2,000 FCFA per month per client to increase the take-up of solar PV kits.

Morocco chose large-scale concentrated solar power technology, while Mauritania prioritized the development of a cylindrical-parabolic plant. The technologies' levels of complexity thus also differ greatly one to another, and the scope for action is broad.

In the land use and forestry sector, technologies related to forest management, reforestation and forest conservation were given a high priority, while in the waste management sector mechanical-biological waste treatment, along with waste recycling and composting, constitute first-choice technologies.

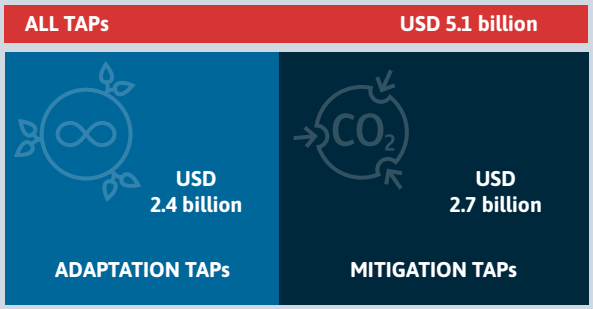
Implementation of these priority mitigation technologies of developing countries, would help reduce greenhouse gas emissions.

FINANCIAL NEEDS

Taking their priority climate technologies as a starting point, countries also prepare Technology Action Plans (TAPs) to support the implementation of these technologies on the desired scale in order to achieve the climate and development benefits they have already identified in their TNAs.

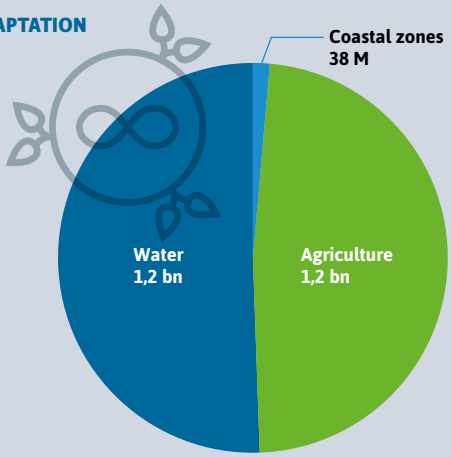
A TAP consists of several actions, which can take different forms. For example, an action can be a technology demonstration project with the aim of overcoming public opposition to a specific technology. Another example of an action could be a programme to train local engineers in addressing the barrier of a lack of the skills needed to operate a specific technology. An action could also aim to overcome indirect barriers to technology uptake or diffusion, with associated co-benefits, such as the provision or upgrading of infra-

22 AFRICAN COUNTRIES' ESTIMATED FINANCE NEEDS FOR TAP IMPLEMENTATION

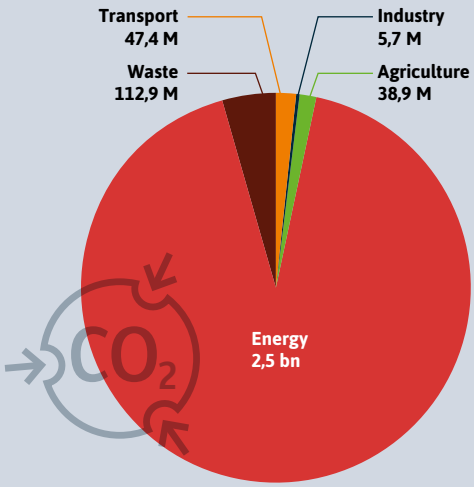


DISTRIBUTION OF ESTIMATED FINANCE NEEDS (USD) IN TAPS, AFRICA

ADAPTATION



MITIGATION



structure. Every TAP contains an indicative investment proposal for each technology, to be taken into account when it comes to funding by potential public and/or private funders.

ADAPTATION FINANCE

The total estimated finance required for implementation of 22 countries adaptation TAPs amounts to USD 2.4 billion. Here the finance needs are primarily related to actions in the agriculture and water sectors, these being the key priority sectors for adaptation in Africa. In Tanzania, a TAP to increase the use of improved seed varieties targeting 150,000 small-scale farmers has a total cost of USD 1.3 million distributed between actions on capacity-building, research and development, and the development of appropriate regulatory frameworks. Generally, for adaptation purposes lower shares of the finance are reported as being required for hardware capital investments, with larger shares going into capacity building and awareness raising.

MITIGATION FINANCE

For mitigation technologies, the total estimated financial needs for implementation of the 22 African countries' TAPs is USD 2.7 billion. The energy sector takes up the major share of financial needs, 92 percent of which relate to mitigation, whereas the other sectors' shares of the finance required are considerably lower, partly reflecting the fact that the energy sector is where most technologies are prioritized, and hence that sector has the largest number of TAPs. The single most significant type of financial need is the capital cost of investments.

For example, in Eswatini's TAP for the installation of 14,000 1.5 kW solar home systems and 14,000 20 kW institutional solar PV systems, the costs relate primarily to the establishment of a subsidy scheme for purchases of the systems, though finance is also needed for awareness-raising, training, and research and development. In Mauritius, the TAP for energy efficient boilers has a total cost of USD 874,500 and targets 25 percent of all boilers used in industrial and commercial appli-

cations. The TAP proposes a financial incentive scheme in the form of a 20 percent grant on the capital cost of installing boiler economizers, supplemented by awareness raising and training.

CAPACITY BUILDING NEEDS

Through the TNA process, countries also identify their need for capacity building related to their priority technologies. Typically, this is related to institutional and organizational capacity building, as well as the training of technicians, extension officers, and so forth. For example, Ghana's TAP for community-managed water systems describes a need to 'ensure that the necessary expertise and logistics are available at the local level to give communities the necessary training to enable them manage the technology adequately and derive optimum benefit from it'. Mozambique's TAP for conservation agriculture identifies a need for the 'training of trainers', whereas Tanzania's TAP for mini-hydro power lists 'specialized training aimed at building the capacities in relevant institutions – in areas of fabrication, installation, operation and maintenance'. These are examples of the capacity building needs that have been identified. More information for each country can be found in the available TNA and TAP reports.

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STRENGTHENING OF THE CAPACITY FOR A DROUGHT EARLY WARNING AND FORECASTING SYSTEM IN GHANA

In Ghana in 2013, the agricultural and water sectors were identified in the climate change Technology Needs Assessment report (TNA) as the main sectors in need of adaptation technology for purposes of climate change. Specifically, for both sectors an "Integrated Climate Monitoring and Early Warning System" was recognized as the top technology priority in Ghana's TNA, on the basis of which Ghana then went ahead and prepared a readiness proposal to the Green Climate Fund, which was subsequently approved.

The aim of the readiness activity is thus to strengthen Ghana's capacity to build an early warning system for droughts based on its existing knowledge and capacity. This will increase the country's ability to adapt to climate change and increased climate variability within the agriculture and water sectors and will have positive impacts on the organizations and stakeholders involved in dry-season management, including local farmers.

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