TECHNOLOGY NEEDS ASSESSMENT

REGIONAL TECHNOLOGY BRIEF

ASIA PACIFIC

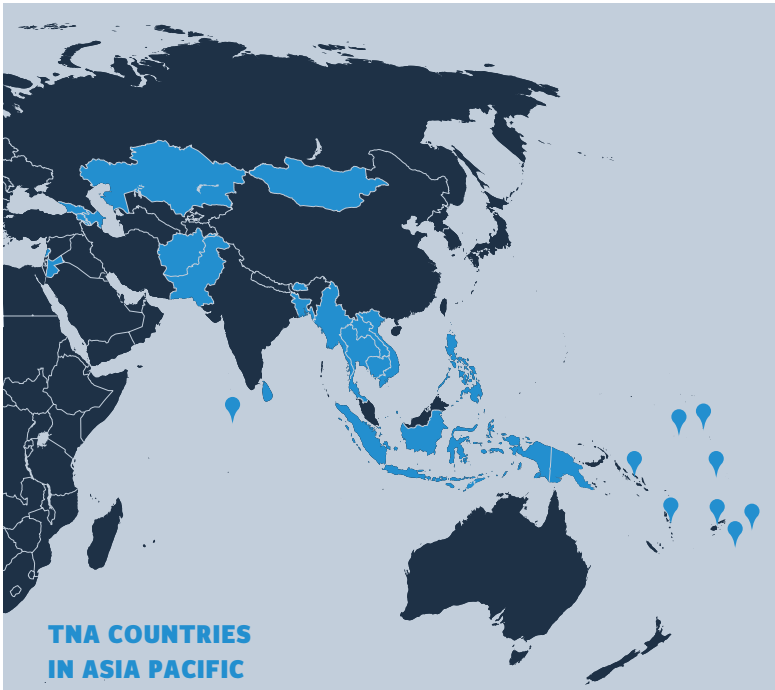
The **ASIA PACIFIC** region accounts for 60 percent of the world's population, 30 percent of its land area and a relatively small share of its freshwater resources. The region has also to a large extent become the factory for the entire world, with a large percentage of global manufacturing activities, resulting in a proportionally greater share of greenhouse gas (GHG) emissions. Asia Pacific developing countries accounted for 38 percent of GHG emissions in 2018, and there has been an 80 percent growth in emissions in the region since 1990.

The region's developing countries have already replaced developed countries as the largest contributors to GHG emissions, while Asian cities are plagued with some of the highest levels of air pollution in the world. Scaling up technologies that reduce both GHG emissions and air pollution in cities is therefore part of the overarching framework for prioritising technologies within the energy and transport sectors.

Climate change will severely impact agricultural production and water sources in the Asia Pacific region. Combined with a large population, the impacts will have stark consequences for food security and for the region's efforts to achieve the Sustainable Development Goals in general. Managing these challenges requires scaling up the deployment of technologies for adaptation in the agriculture and water sectors in the Asia Pacific region.

In addition, the many Small Island Developing States (SIDS) in the region are particularly vulnerable to the impacts of climate change through rises in sea locations prone to natural disasters.

Enhancing the development, transfer and uptake of technology is a key pillar of the international response to climate change. Since 2009, the global Technology Needs Assessment (TNA) project has included thirty countries in the Asia Pacific region, to assess and articulate countries' technology needs concerning climate change adaptation and mitigation.



TNA COUNTRIES IN ASIA PACIFIC

2009-2021

Afghanistan, Armenia, Azerbaijan, Bangladesh, Bhutan, Cambodia, Fiji, Georgia, Indonesia, Jordan, Kazakhstan, Laos, Lebanon, Mongolia, Myanmar, Nauru, Pakistan, Philippines, Sri Lanka, Thailand, Vanuatu, Vietnam

2020-2023

Kiribati, Maldives, Niue, Papau New Guinea, Solomon Islands, Timor-Leste, Tonga, Tuvalu

gef

UNEP DTU PARTNERSHIP

UN environment programme

TECHNOLOGY NEEDS ASSESSMENT

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TECHNOLOGY NEEDS

Technology Needs Assessments (TNAs) were strongly emphasized in the Paris Agreement, and they play a central role in the newly agreed UNFCCC Technology Framework, which provides overarching guidance to 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.

TNAs provide information about the potential, ability and scale of climate technologies, and can play a unique role in the formulation and implementation of NDCs. They are a highly practical tool that provides an effective and solid foundation upon which developing countries can both scale-up and implement action on climate technologies. Both pursuing the targets they agreed under the Paris Agreement, as well as 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. Since 2009 close to a hundred developing countries

Ricefields in Chiang Mai, Thailand.
Photo © Dennis Rochel, @dennisrochel, Unsplash

have joined the project, thirty of which are in the Asia Pacific region. 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 Asia Pacific region are the Asian Institute of Technology located in Thailand and the University of the South Pacific located in Fiji.

ADAPTATION TECHNOLOGIES

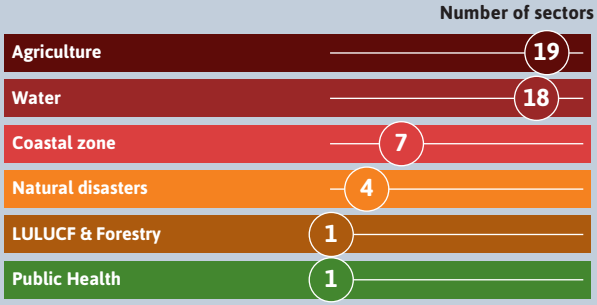
In the Asia Pacific region, like everywhere else in the world, the agriculture and water sectors are strongly impacted by climate change. Crop yield losses, soil degradation and water stresses are increasing phenomena severely affecting food availability and security, prices and trade in the region. Coastal zones and their sand beaches, mangroves, coral reefs and fish varieties are also suffering greatly from the impacts of climate change.

Generally focusing on two adaptation sectors each, 90 percent of countries in the Asia Pacific region prioritized the agriculture sector, 86 percent prioritized the water sector, and 33 percent prioritized the coastal zones sector. Climate change-induced natural disasters such as tsunamis, typhoons and cyclones are also increasing in the region, and 19 percent of its countries identified natural disasters as a priority sector.

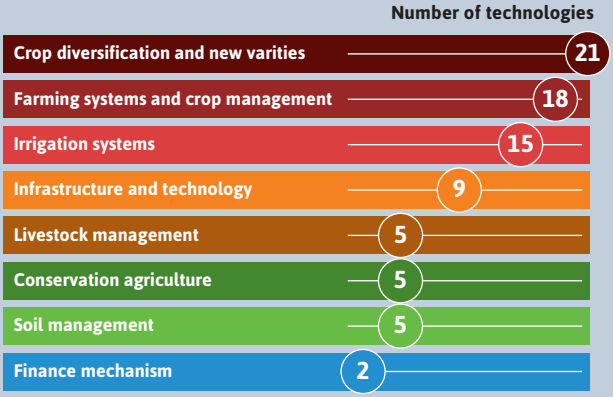
In the agriculture sector, countries often identify technologies for the development of salt-, pest- and drought-tolerant crop varieties, drip irrigation systems, precision farming and windbreaker rehabilitation. An example is Thailand, which prioritized sensor and precision farming technologies to enable farmers to make informed decisions concerning their farming operations. Examples of sensor technologies used for precision farming include weather-station sensors, soil sensors and chemical sensors, which collect data such as soil moisture, temperature, sunshine reception and chemical characteristics.

In the water sector, technologies such as rainwater harvesting, integrated river-basin management, hydropower and the mapping of extreme water events are often prioritized by countries. One of the key priorities identified by Laos was the mapping of flooding hazards and the development of an early warning system, including

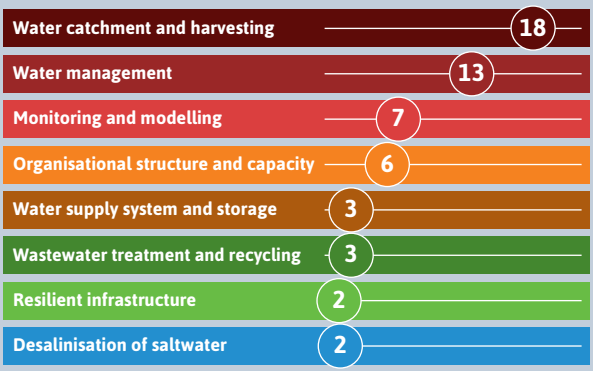
TNA ADAPTATION PRIORITY SECTORS (21 ASIA PACIFIC COUNTRIES)

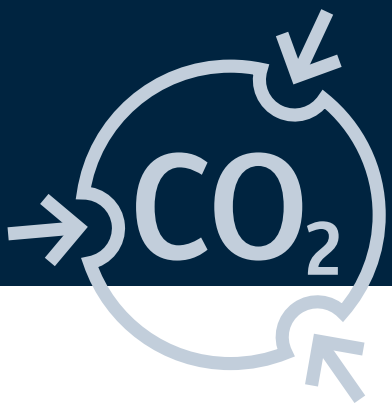


TECHNOLOGIES FOR ADAPTATION IN THE AGRICULTURE SECTOR (21 ASIA PACIFIC COUNTRIES)

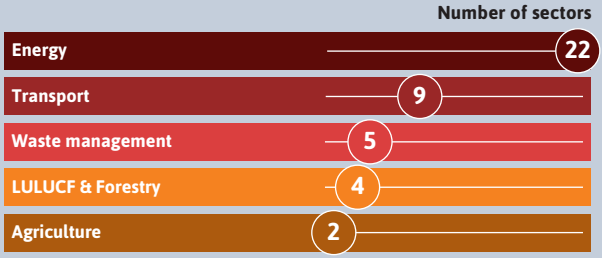


TECHNOLOGIES FOR ADAPATATION IN THE WATER SECTOR (21 ASIA PACIFIC COUNTRIES)

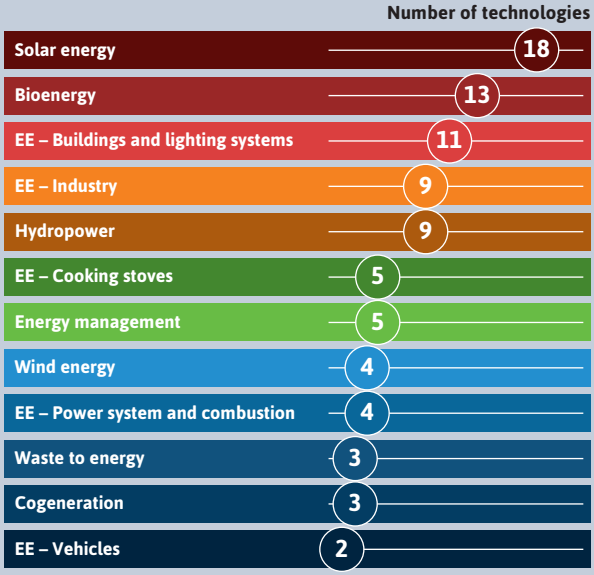




TNA MITIGATION PRIORITY SECTORS (22 ASIA PACIFIC COUNTRIES)

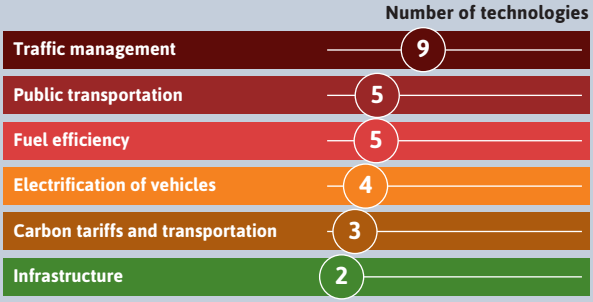


TECHNOLOGIES FOR MITIGATION IN THE ENERGY SECTOR (22 ASIA PACIFIC COUNTRIES)



EE = Energy Efficiency

TECHNOLOGIES FOR MITIGATION IN THE TRANSPORT SECTOR (22 ASIA PACIFIC COUNTRIES)



weather forecasts, discharge modelling systems and water gauges, to prevent flooding. Along with the early warning system, a need was also identified to develop readiness and recovery plans and to minimize the negative impacts that would be caused by extreme flooding events.

MITIGATION TECHNOLOGIES

With the demand for energy rising rapidly in the Asia Pacific region, there is a need to move away from fossil fuels and to increase the share of clean energy sources to counter-balance GHG emissions. Further increasing the share of renewable energy in the region's energy mix would stimulate economic development through the creation of new industries and jobs, and it would significantly reduce air pollution, thus bringing social benefits such as health improvements to regional populations.

Along with GHG emissions, air pollution is a matter of great concern in the Asia Pacific region, which not only constitutes a major health risk, but also has damaging impacts on the environment and on agricultural crop yields. In recent years, air pollution has decreased thanks to the development of regulations and policies targeting reductions in air pollution. Yet, further actions are needed both to reduce GHG emissions and to bring air quality up to safe levels. As a result, great opportunities lie in store in the energy and transport sectors.

Through the TNA process, all participating countries in the Asia Pacific region have so far prioritized the energy sector as a key priority for their mitigation actions. Generally prioritizing two mitigation sectors, 41 percent of the region's countries have also prioritized the transport sector, and 23 percent the waste management sector.

In the energy sector, countries have prioritized technologies related to solar energy, such as solar mini-grids, solar irrigation pumps, solar lanterns and solar water-heating technologies. An example is Fiji, which is prioritizing the uptake of micro-grids with solar PV modules to enhance community-based electrification. The deployment of this technology would have strong social and ecological benefits. It would indeed reduce the need for candles, kerosene, liquid propane gas and/or battery-charging in homes, while at the same time providing

increased convenience and safety, and improving light and indoor air quality.

In the transport sector, traffic management, public transportation, fuel efficiency and the electrification of vehicles are frequently prioritized. Lebanon, for example, has identified a need to modernize its bus mass-transit system, with buses using diesel and natural gas, and to create a market for hybrid electric and fuel-efficient gasoline vehicles.

FINANCIAL NEEDS

Taking their priority climate technologies as a starting point, countries prepare Technology Action Plans (TAPs) as part of their TNA process. These support implementation of the priority tech¬nologies on the desired scale in order to achieve the climate and development benefits already identified in the TNAs.

A TAP consists of several actions, which can take different forms. For example, an action can be a tech¬nology demonstration project with the aim of overcom¬ing public opposition to a specific technology. Another example of an action could be a program 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 barri¬ers to technology transfer and uptake and their associated co-benefits, such as the provision or upgrading of related infra¬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.

Currently, TAPs are available for sixteen countries in the Asia Pacific region: Armenia, Azerbaijan, Bangladesh, Bhutan, Cambodia, Georgia, Indonesia, Jordan, Kazakhstan, Lao DR, Lebanon, Mongolia, Pakistan, Sri Lanka, Thailand and Vietnam. The total estimated budget for implementing the priority climate technologies included in these TAPs amounts to 6.5 billion USD, of which 5.3 billion are estimated for mitigation and 1.2 billion for adaptation. One of the main reasons for the

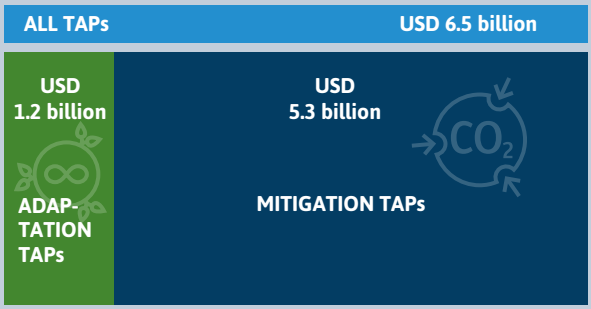
Traffic jams of Asoke-Sukhumvit Intersection, Bangkok, Thailand
Photo © Shutterstock

GREATER DHAKA SUSTAINABLE URBAN TRANSPORT CORRIDOR PROJECT

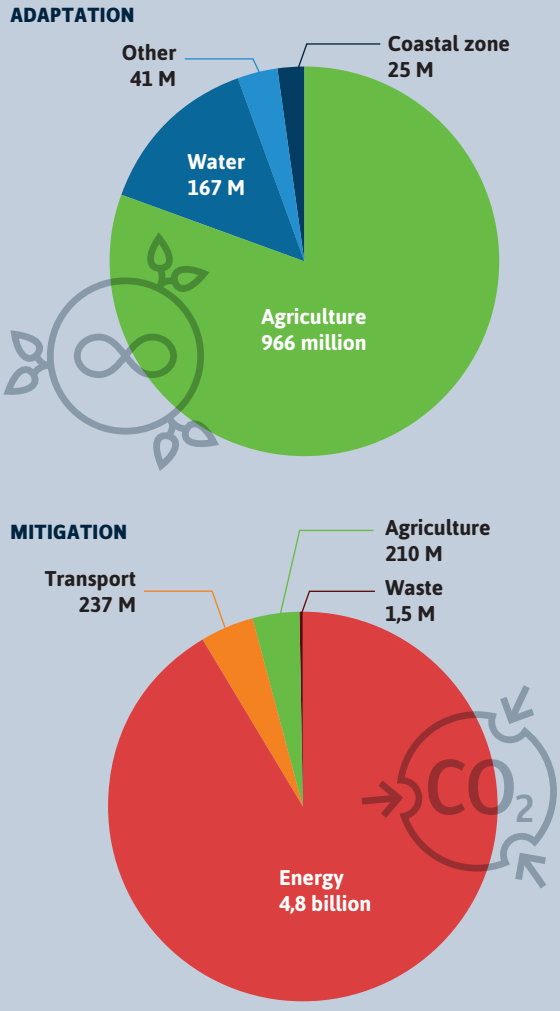
Bangladesh has been at the forefront of developing national policies to increase its resilience to climate change. The country was among the first to complete its TNA in 2012. In its mitigation TNA, it identified the potential for climate change mitigation arising from efficiency improvements from a technological overhauling of the transport sector.

Building on this, Bangladesh has developed a project together with the GEF to promote energy-efficient, low-carbon transport and urban systems in the Gazipur area of northern Greater Dhaka through the delivery of a twenty-kilometer Bus Rapid Transit (BRT) corridor and associated infrastructure, systems and capacity building. This project is an important example with the potential for replication, as no modern mass-transit system existed previously in Bangladesh. The GEF funding will be used to finance the incremental cost gaps of leapfrogging to and demonstrating low-carbon bus and street-lighting technologies.

16 ASIA PACIFIC COUNTRIES' ESTIMATED FINANCE NEEDS (USD) FOR TAP IMPLEMENTATION



DISTRIBUTION OF ESTIMATED FINANCE NEEDS (USD) IN TAPS, ASIA PACIFIC



difference between the total budgets for mitigation and adaptation is the high upfront capital costs of investing in many mitigation technologies.

ADAPTATION FINANCE

The total estimated budget reported in the sixteen Asia Pacific TAPs amounts to 1.2 billion USD, with actions in the agriculture sector making up about 81 percent of this, followed by the water sector with 14 percent.

For example, Jordan estimates a total budget of 4.4 million USD for the implementation of a rainwater-harvesting technology. The budget is allocated to different actions such as conducting a technical assessment and a screening study to identify the most appropriate modalities of the technology, developing new water-efficiency codes and by-laws for buildings to regulate water efficiency, and establishing a regional green building engineering training centre to serve as a training and demonstration site for the technology.

Bangladesh estimates that a budget of 1.2 million USD will be required to introduce drought-tolerant rice varieties. The budget is dedicated to capacity-building actions, such as strengthening the capacity of the seed certification authority, as well as developing laws and strategies for monitoring private-sector businesses involved in seed input services and subsidy mechanisms for the transfer and uptake of drought-tolerant rice varieties.

MITIGATION FINANCE

In order to implement these sixteen countries' key priority mitigation technologies, the finance needed is estimated to a total of 5.3 billion USD. The energy sector takes up the major share of the budget with about 92 percent, while the transport, agriculture and land-use, land-use change and forestry (LULUCF) sectors each make up about 4 percent of the mitigation TAP budgets.

For example, Sri Lanka estimates a total budget of 1.3 million USD for the development of energy-efficient motors in the energy sector. A variety of actions are included in this budget, including reviewing and reforming government tax policy to enable the capital costs of highly energy-efficient and sustainable tech-

nologies to be reduced, low-interest credit schemes for the technology, the strengthening of public-private partnerships, and promotion of the technology through energy associations and other stakeholders.

In Kazakhstan, actions to implement small hydropower energy generating technology have a total estimated budget of 2.5 million USD. This includes, among others, the implementation of market-based financial mechanisms, measures to improve the legal and regulatory frameworks in favour of the new technologies, and the strengthening of institutional capacities by developing specific training programs and workshops for local authorities.

CAPACITY BUILDING NEEDS

Through the TNA process, and as part of their TAPs, countries identify their capacity building needs related to creating enabling environments for the transfer and diffusion of priority tech-nologies. Typically, this refers to institutional and organizational capacity building, as well as the train¬ing of technicians, extension officers, and so on.

For instance, in introducing crop species resistant to climate change, Azerbaijan recognizes the need to organize capacity building programs such as training sessions, seminars and workshops to educate and train local farmers in the new technology and to ensure its sustainable implementation.

To facilitate the transfer and uptake of large-scale hydropower, an important measure identified by Mongolia is to prepare skilled local experts who could develop a project development study including feasibility studies. This will serve to strengthen national capacities, ensuring the availability of specialists trained from national and foreign universities.

These are examples of the capacity building needs that have been identified by countries for purposes of technology transfer and diffusion. More information for each country can be found in the available TNA and TAP reports.

Flooded streets, Jakarta.
Photo © Dani Daniar, Shutterstock

HYDRODYNAMIC MODELLING TO IMPROVE CLIMATE RESILIENCE IN JAKARTA

In Indonesia, which completed its TNA in 2012, coastal zones are greatly impacted by flooding due to a combination of rising sea levels, land subsidence and higher river levels because of extreme weather aggravated by climate change. Subsequently, Indonesia's key technology priorities for climate change adaptation included technologies for coastal protection (seawalls and revetments) and coastal reclamation.

Against this backdrop, Indonesia has received technical assistance from the Climate Technology Centre and Network (CTCN) focusing on flood-hazard mapping and forecasting systems and hydrological modelling in the city of Jakarta. The technical assistance brought technology experts together with government agencies to help reduce flooding risks, increased local capacity in high-resolution hydrodynamic modelling, created a hydrodynamic flood model, and helped shape the design of climate-resilient infrastructure projects, including, but not limited to, the construction of a giant seawall to reduce the risk of flooding and coastal inundation in Jakarta. Finally, it created anticipated financial support to the tune of an additional 5 million USD through bilateral funding to scale up the technological approach to other polder areas in Jakarta city.

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