

Climate Adaptation Technologies

Technology name	Technology description	Key features and benefits	Sectors	Use case (if any)
Early-warning systems ¹	Early-warning systems can warn of “short-term” extreme weather events such as heat waves, flooding, coastal storms, fires, and mudslides	Early-warning systems can consist of local forecasting technologies, systems generating warnings, and communication-oriented technologies. It allows time for appropriate coping measures by giving sufficient warning on imminent threats.	Cross sector	The Climate Risk Early Warning Systems (CREWS) initiative launched during the Conference of Parties 21 (COP21) have supported 44 countries in gaining access to better early warning services. This initiative provided Laos with a two-year license agreement for Medium-range Weather Forecasts products. ²
Geosynthetics ³	Geosynthetics are human-made products used in water separation, diversion, or filtration, land protection, and the reinforcement of existing flood barriers.	Geosynthetics come in different forms (e.g., geotextiles, geogrids, geonets, geomembranes)	Cross sector	Geosynthetics are widely used, with applications in countries such as Thailand, Malaysia, China and India. ⁴

¹ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>

² https://library.wmo.int/doc_num.php?explnum_id=10226

³ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>

⁴ <https://www.grandviewresearch.com/industry-analysis/geosynthetics-market>

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		with each type having their own advantages depending on the situation and requirement.		
Temporary flood barrier ⁵	Temporary flood barriers such as inflatable flood barriers, membrane barriers and modular barriers, are cheaper alternatives to permanent options.	Temporary flood barriers are reusable, easier to deploy and clean-up, do not require site modifications, and	Cross sector	A feasibility study was conducted in Vietnam to use a Nordic mobile flood barrier – large, reusable PVC bags which can easily be connected to each other. ⁶
Emergency shelters ⁷	Shelters can take different forms, but are most often made of concrete, constructed in coastal areas, and elevated above expected flood levels.	Emergency shelters provide temporary shelter for people and livestock in times of emergency, such as during cyclones and flooding. Newer shelter designs also consider the use of the building outside emergency times, as a school, office, or	Cross sector	Permanent emergency shelters already exist in Asia (e.g., Bangladesh), but funding for the construction of such shelters generally come from public, donor, or philanthropic sources.

⁵ <https://sustainablebuildingsinitiative.org/toolkits/climate-resilience-toolkits/flooding-and-sea-level-rise/flood-barriers?toolkit=204>

⁶ <https://www.nordicclimatefacility.com/news/innovative-flood-prevention-in-vietnam>

⁷ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>

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		community gathering space.		
Crop breeding for climate resilience ⁸	Crop breeding can use both traditional techniques and modern biotechnology to identify strains with traits relevant to climate change. It amplifies the potential of existing traits or transfers traits to other plants to enhance climate resilience.	Crop breeding can raise thresholds of tolerance to an increase in average minimum and maximum temperatures, extreme heat events, droughts, flooding, salinity, and other factors. It has been shown to be effective and to increase yield by 60–100 kilograms per hectare.	Agri- culture	More advanced crop breeding technologies such as genetic modification are being used in countries like Thailand, China, and India. Traditional breeding may be useful for SMEs to build a foundation for more advanced genetic modification techniques. Public–private partnerships could support advances in crop breeding in SMEs. In Laos, research and development on flood or drought-tolerant crop varieties has been undertaken and introduced to farmers. ⁹

⁸ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>

⁹ [NDC 2020 of Lao PDR \(English\), 09 April 2021 \(1\).pdf \(unfccc.int\)](#)

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Laser land levelling ¹⁰	Laser land levelling is the use of lasers in combination with a tractor to flatten agriculture land in to reduce runoff and conserve irrigated water.	Much of the water loss in agriculture is a result of unnecessary runoff from fields. Research has found improvements in water efficiency and crop yield in laser-levelled fields (e.g., 20% increase in wheat yield, with 25% water savings).	Agri- culture	In Uttar Pradesh, India, seven years after its introduction, the number of levellers had increased to 925 and 200,000 hectares of land had been levelled with the help of the technology. Subsidies were offered by state-level governments in India to support the acquisition of new laser land levelling equipment equivalent to about 50 Indian Rupees per hour.
Crop monitoring sensors	Using IOT sensors, the cloud-based device monitors weather conditions and irrigate groups while optimising water use.	“Smart farming” helps farmers to manage crops better when meeting with extreme weather conditions and cope with water constraints	Agri- culture	The Vietnamese government has successfully piloted crop monitoring sensors by Mimosatek in Cần Thơ province and is planning to scale the programme across the Mekong Delta. ¹¹

¹⁰ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>

¹¹ <https://kr-asia.com/the-future-of-agrifood-tech-in-southeast-asia-agriculture-in-the-digital-decade>

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Automated irrigation	Automatic irrigation is the use of a device to operate irrigation structures so the change of flow of water from bays can occur in the absence of the irrigator.	Helps to cope with water shortage as automatic irrigation reduces water wastage	Agri- culture	Using the Automated Furrow Irrigation System (AFIS) for sugarcane plantations in the Philippines, water savings was high at 47%, and harvested sugarcane yielded more sugar per tonne-cane than that from conventional furrow irrigation system. ¹²
Cool roofs	Cool roofs are roofing systems that provide protection from solar heat gain in warm climates through high solar reflectance, because the roofs are prepared, covered or coated with materials that have special characteristics such as cool roof coating paint.	Help to better manage rising temperatures. Cool roofs can increase the albedo of the urban environment if widely applied, presenting a relatively high heat island mitigation potential. ¹³	Construct- ion	From 2019 to 2021, cool roofs have been produced and implemented in 8 provinces and 15 cities in Indonesia by Universitas Pendidikan Indonesia ¹⁴ which successfully reduce room temperature of buildings.

¹² <http://www.pcaarrd.dost.gov.ph/home/portal/index.php/quick-information-dispatch/3904-automated-furrow-irrigation-system-helps-save-water-ensures-high-yield>

¹³ <https://www.research-collection.ethz.ch/handle/20.500.11850/258216>

¹⁴ <https://qs-gen.com/universitas-pendidikan-indonesia-cool-roof-team-launches-becool-solution-to-overcome-global-warming/>

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Smart-tinting glass (aka. Switchable glass, smart glass)	The smart-tinting glass shuts out heat from solar radiation and provide daylighting control. ¹⁵	Help to better manage rising temperatures.	Construct- ion	Smart-tinting glass is used in developed ASEAN cities e.g. Manila, Bangkok, Jakarta. ¹⁶
Green roof and facade ¹⁷	Buildings with vegetation on roof and/or the facade of the building.	Vegetation has been used extensively as an Urban Heat Island mitigation strategy. The surface temperature of an individual green roof can be reduced by 15-45°C compared to conventional or non-green roofs, and nearby air temperature can be reduced by 2-5°C.	Construct- ion	Green roof and façade have been used in multiple ASEAN countries. An example in an industrial setting is a rope manufacturing factory with a three-storey green façade in Vietnam. ¹⁸

¹⁵ <https://prismpub.com/smart-glass-options-for-creating-a-sustainable-glare-free-environment/>

¹⁶ <https://www.gauzy.com/smart-glass-locations/>

¹⁷ [Strategies for Cooling Singapore - Research Collection \(ethz.ch\)](#)

¹⁸ <https://livingarchitecturemonitor.com/articles/the-jakob-factory-vietnam-su22>

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Rainwater harvesting ¹⁹	Rainwater harvesting from roofs provides water for multi-purpose usage, and it can also be stored for future use.	The technology is a quick, low-cost, and highly feasible adaptation to improving water supplies.	Construction	Rainwater harvesting has been used extensively in Southeast Asia, South Asia, and the Pacific
Active motion-dampening systems ²⁰	Active motion-dampening systems are automated mooring systems that serve alongside or in place of traditional mooring techniques. They can reduce the amount of tension on lines and minimize the movement of the ship when it is at port. The systems can adjust automatically to tidal changes, swells, or other shifts in the sea level to quay height.	Active motion-dampening systems helps to keep the movement of the ship to a minimum when it is at port. The wear and tear of buoys is reduced, and there is less need for crews to work in high-risk zones, especially during periods of extreme weather.	Transport	These types of systems are already in use in various countries, including the Bayak Port in Indonesia. ²¹ It is predominantly installed in Europe (Norway, Finland, Denmark), but also used in countries such as Australia, New Zealand, Oman and Lebanon. ²²

¹⁹ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>

²⁰ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>

²¹ <https://shoretension.com/#Global>

²² <https://www.cavotec.com/en/your-applications/ports-maritime/automated-mooring>

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Warm-mix asphalt (WMA) ²³	WMA is a relatively new technology that requires a mixing temperature much cooler than that of traditional hot-mix asphalt.	Combinations of different materials in WMA can reduce damage caused by extreme weather conditions and help to extend the life of paved surfaces.	Transport	WMA technologies have been used for a decade in Europe. The use is increasing globally, with multiple trials carried out throughout Asia, including China, India and Korea.

²³ <https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf>