



Ministry of Natural Resources and  
Environmental Conservation



Myanmar  
Climate  
Change  
Alliance

# Resilient and low-carbon energy, transport and industrial systems for sustainable growth

Policy Guidance Brief 3

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The Myanmar Climate Change Strategy & Action Plan (MCCSAP) is a 15-year road map of Myanmar's strategic response to climate-related risks. MCCSAP aims to increase the adaptive capacity of the country and maximise opportunities for low-carbon and climate-resilient development. To achieve this, the Strategy is intended to guide investments in six key development sectors including: (i) agriculture, fisheries and livestock; (ii) environment and natural resources; (iii) energy, transport and industry; (iv) urban development; (v) health and disaster risk reduction; and (vi) education, public awareness and technology.

This Guidance Brief is one of a series produced by the Myanmar Climate Change Alliance (MCCA) to help develop understanding on key sectoral challenges, strategic objectives and specific actions to effectively address climate change in Myanmar. The series aim at providing high-level policy guidance designed for use by the Members of the six sectoral Working Groups on MCCSAP. In addition, the briefs seek to raise awareness of various stakeholders on the national priorities of action in the field of climate change.

## Key Points

- Considering that today only 34 per cent of the population have access to electricity and 70 per cent of the people residing in rural areas remain physically isolated during part or all of the year, climate change poses a clear danger to energy access and connectivity across the country in future.
- Although Myanmar has a high potential to promote renewable energy and secure the growing demand for electricity, the sector is characterised by inadequate power supply infrastructure, high dependence on fuel wood in rural regions, and low electrification rates.
- Enhancing the country's capacity to exploit its full energy potential and develop its transport sector in a climate-resilient and low-carbon manner is a key to its sustainable future. Myanmar will need to upgrade and retrofit existing infrastructure to reduce vulnerabilities, adapt to the changing climate and reduce emissions through greener transport systems.
- Millions of people in Myanmar are employed in the industry sector or rely on small-scale production for their livelihood. Large, medium and small enterprises are facing more frequent and severe hazards such as droughts, floods and tropical storms. Strong policy response is needed to address the high vulnerability of small- and medium-sized enterprises.
- Myanmar will need to proactively implement environmental regulations around the industrial location suitability and protection, and on water and solid waste management and other issues.
- According to the Climate Change Action Plan for the Energy, Transport and Industry sectors, Myanmar should establish climate-resilient and low-carbon energy, transport and industrial systems that support inclusive and sustainable development and economic growth by 2030.
- The expected results to achieve this outcome are: (i) energy security for the country is based on generating a large share of its energy from renewable sources and high energy efficiency in domestic, industrial and other use; (ii) transport systems are adapted to heightened risks of disasters from new climatic conditions and sustainable through to efficiency and low-carbon technologies; (iii) industrial systems are highly productive and competitive due to their climate resilient, sustainable, low-carbon and green characteristics.



## Why are the energy, transport and industry sectors of strategic importance for the sustainable development of Myanmar?

In recent years, Myanmar's economy marks a steady economic growth rate of 6-8 per cent (MoNREC, 2017). The energy sector has a major contribution to export earnings and foreign direct investment, accounting for 55 per cent and 86 per cent, respectively, in 2013 (ADB, 2016a). Considering that natural gas is a major export resource, Myanmar will have to meet its growing domestic demand, while securing foreign revenues in future.

*The country's capacity to unlock its full energy potential and improve energy access in a sustainable manner is key to its future.*

The residential sector is the largest consumer of energy, representing 75 per cent of the total consumption in 2012 (ADB, 2016a). A large segment of the country's population especially in rural areas uses biomass for cooking (81 per cent of the households), mostly fuel wood, which is used by 86 per cent of the rural households, but also charcoal and agricultural residues (Census 2014). Therefore,

*there is an urgent need of promoting new, energy-efficient technologies at the community and household levels to improve the quality of life in rural areas and preserve the natural capital of the*

*country – its forests.*

Myanmar has large offshore gas deposits and a high potential to produce renewable energy including hydropower, wind, solar and tidal energy. Despite that, the country's energy sector has been underdeveloped because of limited financial and technical capacities (ADB, 2016a). In 2016, the total installed capacity for power generation was 4,764 megawatts, out of which 59.2 per cent was hydropower, 38.3 per cent natural gas, and 2.5 per cent coal-based electricity supply capacity. However, the available capacity is only about 50 per cent of the installed potential due to poor maintenance of gas and coal power plants, and water shortages for hydropower generation during the dry season (February – May) (ADB, 2016a).

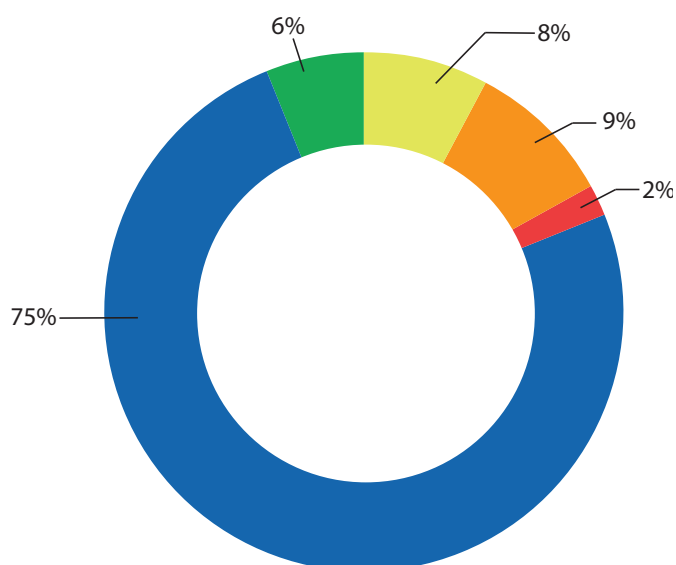
*Inadequate power supply infrastructure remains a major constraint to the socio-economic development of Myanmar.*

In 2011, Myanmar was ranked among the countries with the lowest per capita electricity consumption (110 kilowatt-hours), while only 34 per cent of the population had access to electricity in 2015 (ADB, 2016a). The electrification ratio in rural areas is less than 20 per cent, compared to about 40 per cent in major cities like Mandalay and Nay Pyi Taw, except for Yangon where 78 per cent of the population has electricity access (ADB, 2016a).

As the demand for energy from industries, businesses and households is growing, the energy architecture is currently being subject to a series of development reforms. The National Energy Policy (2014) sets the ambitious target to expand the electricity coverage to 60 per cent by 2025-2026, and hence to connect millions of households to the national electricity grid.



## Total final energy consumption, by sector (2012)



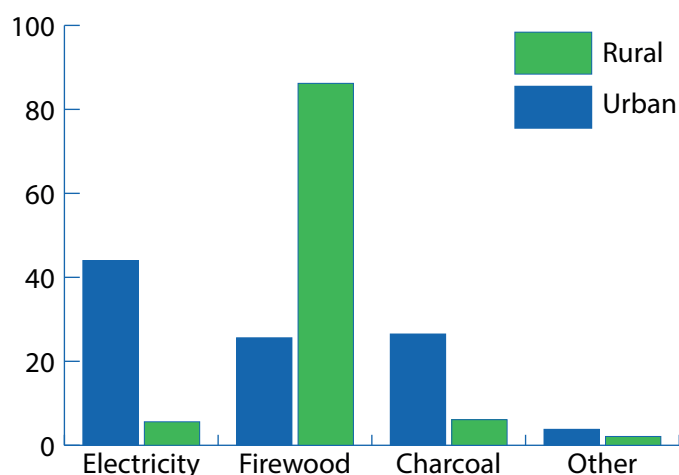
Source: Figures obtained from ADB (2016a)

Like the energy sector, the transport sector faces numerous development challenges. Lack of funds, low effectiveness and efficiency of investments, limited technical capacities and insufficient maintenance of existing transport infrastructure are among the factors that keep Myanmar's transport sector underdeveloped and behind the rest of Southeast Asia (ADB, 2016b).

*Millions of people in Myanmar, particularly in rural areas, live without access to an all-season road, suggesting that about 70 per cent of the rural population is physically isolated during part or all of the year.*

According to figures for 2015, 20 million people in rural Myanmar (about 40 per cent of the population) are without basic road access, while 60 per cent of highways and most rail lines are in poor condition

## Main type of energy used for cooking (%)



Source: Figures obtained from Census 2014

(ADB, 2016b).

Despite little development in mass public transit infrastructure, the vehicle fleet in the country has doubled for the period 2010-2014 – a trend, which is going to continue in future (ADB, 2016b). The number of vehicles in Yangon is increasing most rapidly with the city's growing population and recent economic rise. The transport sector is largely reliant on petroleum products and the energy use for transportation is increasing more rapidly compared to the energy consumption in any other sector (MoNREC, 2012a). In this context,

*Myanmar needs to expand, modernize and rehabilitate its road and rail networks, and limit the fast growing greenhouse gas emissions from the transport sector.*

The country has a large network of rivers to advance its inland water transportation sub-sector as a climate change mitigation option. Myanmar has a good potential to exploit Ayeyawady River channel and improve the Yangon to Mandalay navigation channel (ADB, 2016b). However, various factors such as shifting of channels for navigation, shallow waters during the dry season, and lack of infrastructure, challenge the development of this transport mode. Today, river transport represents merely 6 per cent of inland long-distance freight and 1.5 per cent of passenger transport markets (ADB, 2016b).

In 2015, the industry sector contributed about 34.5 per cent to the national output, the service sector

38.7 per cent and the manufacturing 20.8 per cent (ESCAP Online Statistical Database, 2017). Key manufacturing sectors include textile and garment, food and beverage, and construction materials industries. Garment production contributes substantially to employment and export revenues. Small and medium industrial establishments and enterprises play a pivotal role in Myanmar's private sector, together with micro and family-run businesses.

The manufacturing, tourism, telecommunications and construction sub-sectors are continuously expanding – a tendency conditioned by growing national and foreign investments, societal changes and urbanization (MoNREC, 2017).

*Considering that the energy, transport and industry sectors contributed 68 per cent to the total greenhouse gas emissions in 2000, the ongoing expansion of these sectors has major implications for the extent of climate change mitigation actions required in future.*

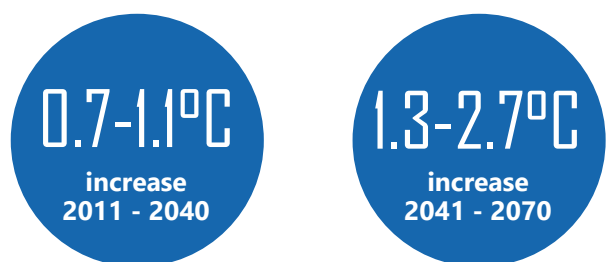
## What are the impacts of climate change on the energy, transport and industry sectors?

*Without climate change adaptation, Myanmar will face significant energy security challenges.*

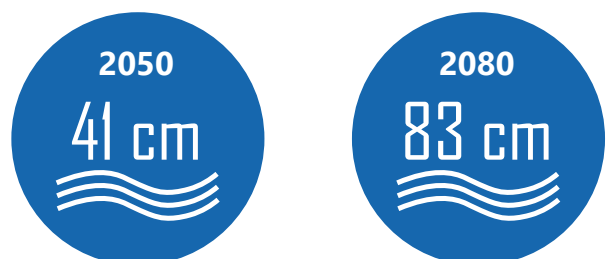
Energy infrastructure and facilities are facing increasing risks of physical damage from storms, floods and other rapid-onset hazards that are growing more frequent and intense. Power networks located in low-lying coastal areas are exposed to sea level rise, storm surges and inundation. Heat waves and increasing number of hot days may lead to an increased energy demand for air conditioning, while prolonged droughts and change in river flows due to erratic rainfall will likely affect the hydropower energy supply, which currently represents 75 per cent of country's electricity consumption. Intense

### FUTURE CLIMATE IN MYANMAR AND IMPACTS ON THE ENERGY, TRANSPORT AND INDUSTRY SECTORS

Increasing average temperatures and heat extremes and higher energy demand for cooling



Sea level rise



Erratic rainfall - periods of heavy and intense rains followed by long-lasting dry spells – leading to frequent river and flash flood events, and droughts.

Damages to infrastructure and high economic losses due to natural disasters that are growing more frequent and intense with the global warming.

Insecure access of households and industries to hydropower energy and water.

Increasing risk of coastal hazards – coastal flooding, storm surges, strong winds and cyclones - and physical isolation of communities living in low-lying coastal areas.

Note: The provided values for increase in temperatures and sea level refer to projections with base period 1980-2005 and 2000-2004, respectively.



rains and increasing number of flood events may trigger large-scale erosion processes, leading to siltation and sedimentation of waterways and dams. This could result in reduced water storage capacity of dams, structural damages, and increased maintenance and operational costs (MoNREC, 2017).

Road, rail and water modes of transport will be negatively affected by climate-related hazards in future. Road and rail infrastructure could be damaged from cyclones, severe storms, floods and landslides. Sea level rise will likely affect connectivity in coastal areas and the Delta Zone (Fee, L. et al., forthcoming, 2017). River transportation may be challenged by more frequent and severe river floods and droughts.

*Reduced energy access and connectivity, especially in rural areas, means persistent poverty and limited access to basic services, education, business opportunities and jobs.*

Impacts of climate change on industries are likely to include damages to infrastructure and other physical assets, higher operational costs, increased risk of secondary disasters such as toxic spillages, reduced availability of and access to raw materials and natural resources, insecure access to energy, as well as disruption of logistics. Climate change and hazards may also interrupt entire supply chains of climate-sensitive industries and lead to an increase in prices of input materials and services. Furthermore, rapid- and slow-onset climate hazards may affect the health of employees and labour productivity.

Millions of people in Myanmar rely on small-scale production for their livelihood, and are already experiencing increasingly intense cycles of droughts, seasonal floods and storms.

*Micro-, small- and medium-sized producers are often more vulnerable to the adverse effects of climate change than large enterprises because they typically lack knowledge, skills and financing options to cope with hazards and invest in adaptation.*

## What is the current response to climate change?

The National Energy Policy (2014) provisions for establishing energy mix of 38 per cent hydropower, 20 per cent of natural gas, 33 per cent of coal and 9 per cent of renewable sources for power generation. The Myanmar Energy Master Plan (2015) provides a long-term outlook on supply mix strategies, which are based on the principles of cost effectiveness, environmental responsibility and security of energy supply.

The country has also made steps in promoting energy efficiency and conservation through the National Energy Efficiency and Conservation Policy, Strategy and Roadmap, which focuses on the industrial, commercial, residential and public sectors.

According to the Policy, the country targets energy consumption reduction of 12 per cent by 2020, 16 per cent by 2025 and 20 per cent by 2030 compared to the values for 2012. Furthermore, the Green Economy Policy and Strategic Framework paves the way towards green growth by setting goals for sustainable use of the country's natural capital and low-carbon production, among others.

Climate-resilient and low-carbon transport and industries can boost the county's economic growth. However, climate change considerations are still to be integrated into the policy and regulatory frameworks for these sectors in order to help Myanmar reach its Nationally Determined Contributions targets and realize its new Climate Change Policy.

## What is the required response?

The ongoing economic development, population growth and rural-urban migration processes will likely lead to a sharp increase of greenhouse gas emissions from the energy, transport and industry sectors in the absence of strong and effective regulations.

The current policy direction in the energy sector

is highly focused on diversification of the energy mix and promotion of innovative renewable energy technologies such as solar and wind power generation. To utilize its full potential for low-carbon development, Myanmar could seek improved access to environment- and climate-friendly technologies in rural areas and green investments in the different modes of transport. Urban transport systems could be adapted to low-carbon and energy efficient standards, and fuel economy and emission standards for cars could be imposed to control the pollution from the rapidly growing vehicle fleet in the country.

Myanmar will have to ensure that along with adopting green solutions within the energy, transport and industry sectors, new policies and regulations create enabling environment for businesses and households to change their consumption behaviour towards sustainability.

The energy and transport sectors are highly vulnerable to rapid-onset hazards such as storms and floods, and slow-onset disasters like droughts. Therefore, Myanmar needs to build resilient infrastructure and public service systems though carrying out risk assessments and undertaking a vast range of structural and non-structural adaptation measures such as climate proofing of infrastructure



and strengthening local level capacities.

Government interventions need to address the high vulnerability of small- and medium-sized enterprises through improved access to climate risk information and financing, building knowledge and skills for adaptation planning or developing special programmes that support the resilience of the private sector.

Finally, climate change adaptation and mitigation policies and measures should target the most vulnerable groups and address gender differentiated vulnerabilities.

## What is the climate change strategy for the energy, transport and industry sectors?

The Government of Myanmar has recently formulated the Myanmar National Climate Change Policy, which is a high-level statement of the country's long-term vision and position on climate change.

*Myanmar's vision is to be a climate-resilient, low-carbon society that is sustainable, prosperous and inclusive,*

*for the well-being of present and future generations.*

The Myanmar Climate Change Strategy and Action Plan (MCCSAP) 2016-2030 is the prime instrument for the implementation of the Climate Change Policy, which defines sectoral objectives and response actions.

The Climate Change Action Plan for the Energy, Transport and Industries Sector aims at:

*Establishing climate-resilient and low-carbon energy, transport and industrial systems that support inclusive, sustainable development and economic growth.*

The sectoral response rests on the following key principles embedded in MCCSAP:

- **Inclusive development** to include poor, landless, marginalised and vulnerable women and men to act as agents of change, and all geographic regions to shape and benefit from opportunities provided by climate-resilient and low-carbon development. The needs of vulnerable groups should be addressed to ensure inclusive development of the energy, transport and industry sectors.
- **Integrated development** to direct government, development partners, civil society, private sector entities and communities to align, harmonise and coordinate policies and programmes to support the strategy's overall objectives.





# How does the Climate Change Action Plan for the Energy, Transport and Industry Sectors address the climate change vulnerability of Myanmar?

Potential impacts of climate change and sector-specific issues	Key vulnerability factors	Action Plan for the Energy, Transport and Industry Sectors (expected results)	Indicators for monitoring progress
<p>Increasing risk of slow- and rapid-onset disasters, and sea level rise</p> <p>Damages to energy and transport infrastructure due to natural disasters</p> <p>Energy insecurity caused by erratic rainfall, seasonal shifts and altered hydrological cycle coupled with higher energy demand for cooling</p> <p>Impacts on industries such as damages to infrastructure and physical assets, higher operational costs, reduced availability of and access to raw materials and natural resources, supply chain disruptions</p> <p>Physical isolation of rural population due to sea level rise and natural hazards</p> <p>Health impacts caused by climate change and hazards, and lowered labour productivity</p>	<p>Poor transport and energy infrastructure and limited access to services</p> <p>Energy and transport infrastructure not resilient to disasters</p> <p>Carbon-intensive transport sector and increasing risk of urban air pollution</p> <p>Low-energy efficiency in the residential, industrial and transport sectors</p> <p>Unsustainable use of forest ecosystems by communities</p> <p>Rural-urban migration, poverty and social inequality</p> <p>Limited capacities of micro-, small- and medium-sized enterprises to respond to the growing climate challenges</p> <p>Low level of private sector's awareness on climate change</p>	<p>Energy security for the country is based on generating a large share of its energy from renewable sources and high energy efficiency in domestic, industrial and other use</p> <p>Transport systems are adapted to heightened risks of disasters from new climatic conditions and sustainable through efficiency and low-carbon technologies</p> <p>Industrial systems are highly productive and competitive due to their climate-resilient, sustainable, low-carbon and green characteristics.</p>	<p># of sectoral laws and norms that are inspired by sustainability concerns</p> <p>% implementation of the Green Growth Framework</p> <p>High share of energy generated from sustainable, renewable sources within the timeframe of the MCCSAP</p> <p>% of existing rules and regulations in industrial and transport sectors enforced, to ensure low-carbon and air quality thresholds are respected at national and urban levels</p> <p># of incentive schemes in place to support the private sector to transition to low-carbon production, investment in renewables and management of production processes</p> <p># of schemes and programmes that incentivise the introduction of solar power energy generation, biomass and other sustainable sources of renewable energy</p> <p># number of businesses that introduce climate change in their business planning to ensure resilience and protect jobs</p> <p># of green jobs created</p>



# Sectoral Action Plan



## *Policies and legislation*

**Objective:** Integrate climate change into energy, transport and industry policies, plans, research and development, and extension services at national, sectoral and local levels.

### **Activities:**

- Integrate climate change within existing energy policies, plans and legal instruments
- Develop a strategic energy plan and investment portfolio that ensures national security and lower greenhouse gas emissions
- Develop climate proofing/screening guidelines, methods and tools to integrate climate change risk into investments
- Integrate climate change into transport sector policies and plans by developing guidelines and regulations for climate proofing transport infrastructure, port facilities, roads, railways and bridges
- Integrate climate change in industrial development planning by developing climate-resilient planning guidelines and tools



## *Institutions*

**Objective:** Establish and reinforce institutional arrangements to plan and implement climate change responses.

### **Activities:**

- Improve institutional mechanisms to better assess and plan climate change investment and interventions
- Integrate climate change within existing institutional mechanisms (the National Energy Management Committee)
- Establish and strengthen climate change cell within the Ministry of Electrical Power and Energy



## *Capacities*

**Objective:** Enhance awareness and capacity to promote and implement climate-resilient and low carbon responses

### **Activities:**

- Carry out studies looking at climate change impact and implications in the energy, industry and transport sectors
- Carry out risk assessment of public infrastructure and develop risk reduction and mitigation plans
- Prepare training guidelines and module on energy efficiency and low-carbon development
- Provide training to government and private sector stakeholders on climate proofing and screening guidelines and methods
- Establish weather and climate information services in cities and towns, including rural areas



## *Financing*

**Objective:** Establish financial mechanisms to mobilise and allocate resources for climate-resilient and low-carbon development

### **Activities:**

- Develop a financial investment plan for the energy sector to finance and implement climate-resilient and low-carbon development activities
- Develop guidelines for including energy efficiency and low-carbon development priorities within the Environmental Management Fund
- Disburse climate change finance for low-carbon and resource-efficient technologies
- Allocate revenue from natural resource extraction to a climate change fund— such as the Environmental Management Fund





## Technology and innovation

**Objective:** Increase access to climate-resilient and low-carbon technologies and practices in the energy, transport and industry sector

**Activities:**

- Introduce and promote innovative technology in renewable energy — for example, solar, wind, tidal and wave)
- Provide training and exposure to stakeholders on improved technology for energy and waste management to reduce greenhouse gas emissions and promote environmental sustainability
- Identify and promote energy-efficient technologies and practices — such as improved cooking stoves, off- and mini-grid energy and access to biomass — with a gender-sensitive approach
- Promote low-emission technologies — such as clean coal — targeting the energy and industry sectors
- Introduce alternative modes of service delivery to improve the energy efficiency system in transport, building and industry sectors



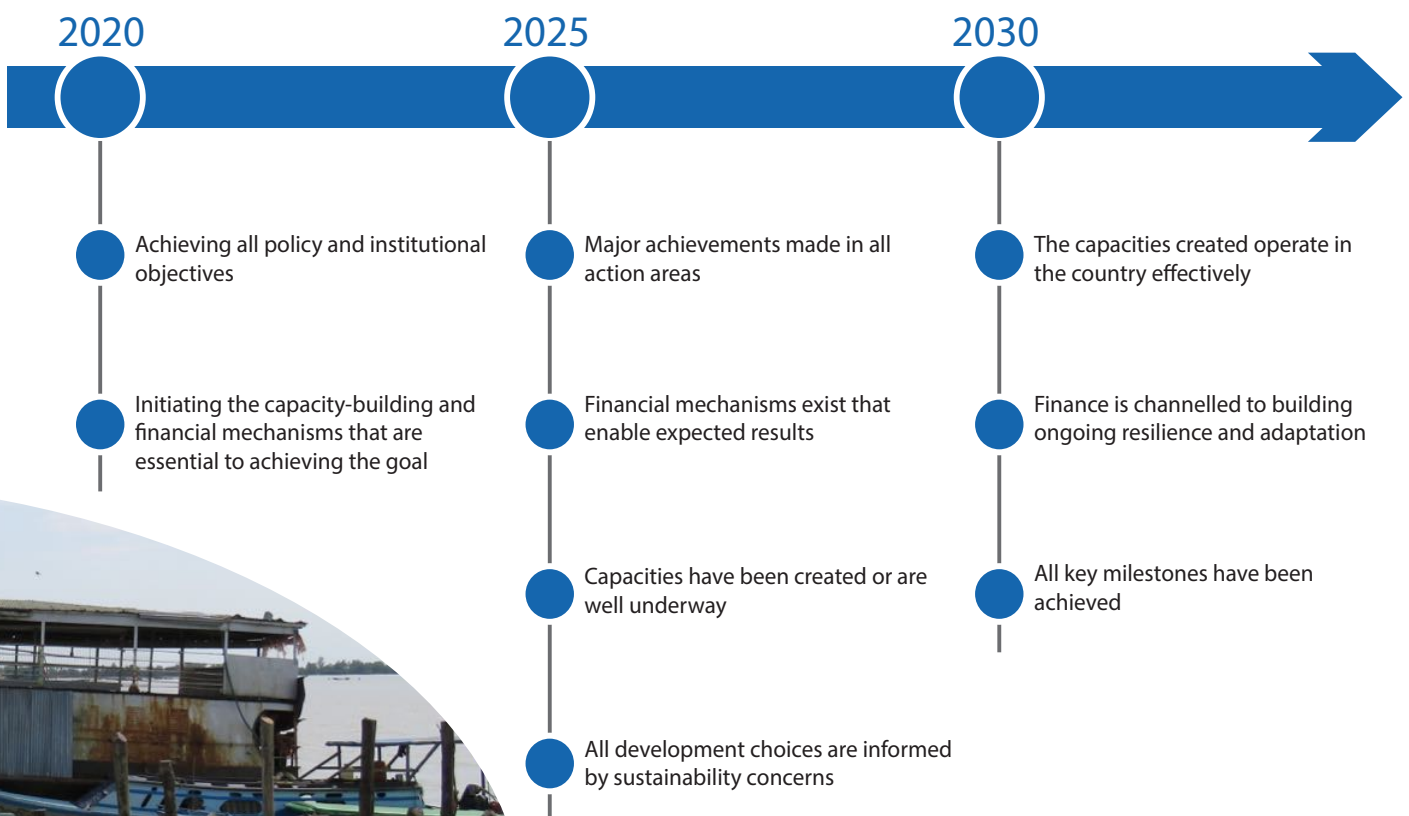
## Partnerships

**Objective:** Promote multi-stakeholder partnerships to support and scale up climate-resilient and low-carbon responses

**Activities:**

- Develop public-private partnership procedures and guidelines for private sector investment in low-carbon energy production and consumption in industrial, construction, mining and other sectors
- Establish linkages and collaboration between local government (city development committees) and international and national actors to increase number of buses, trains, cars that use low-emission technologies
- Develop regulations to promote tax exemptions, loans and grants as incentives for clean energy investment for private sector and international cooperation

### Timeframe to achieve results



## How can the response to climate change within the energy, transport and industry sectors bring sustainable development outcomes?

Building climate-resilient transport and energy infrastructure and services can foster economic growth and social development especially in physically isolated rural areas, and reduce the risk of human and economic losses due to disasters.

Building resilience of the private sector can secure jobs and income in a changing climate, and help alleviate poverty in most at-risk locations across the country.

When the development of the energy, transport and industry sectors lies on the principles of sustainable use of water and forest resources and nature preservation, present and future generations can enjoy the benefits from ecosystem services and



secure food, water and resilient livelihoods.

Improving resource and energy efficiency in the energy, transport and industry sectors, and reducing emissions from the use of fossil fuels through fostering innovation, can attract investments, create new business opportunities, generate tax revenues and form green jobs market. Furthermore, a low-carbon transport in urban areas can improve health and quality of life.

Engaging the private sector to contribute to climate change adaptation and mitigation, and raising public awareness on climate change can ensure sustainable consumption and production patterns. Youth involvement in promoting green and resilient development can build the foundations of social transformation toward a sustainable future.

If sectoral climate change policies address the needs and capacities of the poor, migrants and other vulnerable groups, they can bring social equity outcomes.





## Thailand's Renewable Energy Plan 4.0 – a model for ASEAN

Thailand's Energy 4.0 policy - a set of four master plans that cover energy efficiency, renewable energy, power development, oil and gas - frames the transformation of the country towards resilient and low-carbon development. Under Thailand 4.0, promoting renewable energy in the energy mix is a key priority for innovation that creates vast business opportunities. Nowadays, the country is referred to as the Energy Hub for Southeast Asia and plays a leading role in promoting clean energy in the region through a strategic dialogue, and best-practice and knowledge sharing.

[Learn more:  
www.eppo.go.th](http://www.eppo.go.th)

## Climate-proofing of rural roads: a case from Cambodia

An on-going project implemented by the Ministry of Public Works and Transport of Cambodia could serve as a good example of local level action towards achieving safe, climate-resilient, cost-effective, all-year access road network in rural regions in Southeast Asia. Adaptation activities are focused on improved design of roads based upon vulnerability mapping, use of green engineering and climate-resilient materials, and integration of water capture and storage systems in road construction, among others.

[Learn more:  
www.spcrcambodia.org/en/spcrinvestment.php?id=cpr&sec=brief](http://www.spcrcambodia.org/en/spcrinvestment.php?id=cpr&sec=brief)

## Strengthening the resilience of small- and medium-sized enterprises: insights from ADPC's regional projects

Working with various partners, the Asian Disaster Preparedness Centre (ADPC) has launched a regional project *Strengthening Disaster Resilience of Small and Medium Enterprises (SME) in Asia* and established *iPrepare Business* facility with the objective to engage the private sector in resilience building. Implemented activities in Indonesia, the Philippines, Thailand and Viet Nam include SME resilience surveys and roadmap formulation, launching Resilient SME Champion programme, establishing knowledge sharing platforms and organizing national business forums on resilience.

[Learn more:  
www.adpc.net/igo/contents/publications/publications-Details.asp?pid=1189](http://www.adpc.net/igo/contents/publications/publications-Details.asp?pid=1189)

The Myanmar Climate Change Alliance (MCCA) was launched in 2013 to support the Government of the Union of the Republic of Myanmar in addressing the challenges posed by climate change. MCCA is an initiative of the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MoNREC). It is funded by the European Union as part of the Global Climate Change Alliance (GCCA), and implemented by the United Nations Human Settlements Programme (UN-Habitat) in partnership with the United Nations Environment Programme (UN Environment). For more information: [www.myanmarcalliance.org](http://www.myanmarcalliance.org); Facebook: @myanmarcalliance.



#### Learn more:

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