



ROAD TO
CARBON NEUTRAL

Visions for Colombia 2050

DECARBONISATION

in the Energy and Transport sectors

Colombia



CLIMATE GROUP



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INTRODUCTION

To keep the global temperature below 1.5°C, Colombia has developed its Long Term Climate Strategy (E2050)—a national decarbonisation pathway in line with the Paris Agreement. The Ministry of Environment and Sustainable Development has also updated the Nationally Determined Contribution (**NDC**), which records the country’s efforts to reduce national emissions and adapt to the effects of climate change in the short and medium-term (UNFCC, 2021). To develop the capabilities of departmental governments to implement decarbonisation actions—specifically at the territorial level—three organisations, **OpEPA**, **Climate Group**, and **The Climate Reality Project Latin America**, received funds from **UK Pact Colombia**. In collaboration with the General Attorney’s Office, these organisations worked with five Colombian departments to generate territorial visions under the “**Road to Carbon Neutral: Visions for Colombia 2050**” project. It is based on Climate Group’s pathways methodology. A decarbonisation pathway helps governments plan their road map to reduce greenhouse gas (GHG) emissions in the long term. For more information on decarbonisation pathways, please visit the Climate Group website:

<https://www.theclimategroup.org/pathways-framework>





OVERVIEW

Under Road to Carbon Neutral, Colombian departments and regions will be able to identify priority actions with the most significant potential for transforming their economies, consistent with their long-term vision. Although there is no magic formula for decarbonisation, the combination of decisions and actions from all sectors (a decarbonisation road map) can result in transformative change for the country. Moreover, the type of chosen decarbonisation actions can vary for each department or region.

This *Catalogue of Decarbonisation Actions* aims to provide an educational tool to regions about their actions to reduce emissions in the energy and transport sectors so state and regional governments can adapt them to their context.

This Catalogue includes a complete list of potential actions for each sector that jurisdictions can include in their pathway to reduce greenhouse gas (GHG) emissions or increase GHG removals from the atmosphere compared to their baseline scenario or “Business as Usual” (BAU) scenario. Likewise, the Catalogue shows which actions align with Colombia’s Long-term Climate Strategy (E2050) and Colombia’s Nationally Determined Contribution (NDC).

We encourage decision-makers to use this tool as a starting point for choosing potential actions and envisioning a low-carbon future in the energy and transport sectors. The Catalogue can also inform a prioritisation exercise for decision-makers to develop a decarbonisation pathway. Governments can choose actions from the Catalogue to mitigate climate change and achieve long-term decarbonisation goals.

CATALOGUE USAGE

This Catalogue has a list of actions for the energy and transport sectors, organised into measures and strategies. You can click on the strategies and measures to display a fact sheet of actions. Each measure includes a brief description and details on relevant actions, alignment with national policy, and co-benefits



CATALOGUE OF DECARBONISATION ACTIONS IN THE ENERGY SECTOR

Energy generation and consumption are the most polluting activities in the world. They are responsible for two-thirds of GHG emissions. The energy sector must undergo a profound transformation to achieve decarbonisation according to the Paris Agreement's goals. This transition to net-zero emissions is not only possible but can generate considerable economic, social, and environmental benefits in a region. In Latin America, the Inter-American Development Bank study established that a transition in the energy sector (including transportation) "can generate around one million net jobs by 2030. It can also generate benefits equivalent to several percentage points of GDP sparing the current loss of productivity because of traffic congestion and the health effects from pollution" (IDB, 2019).

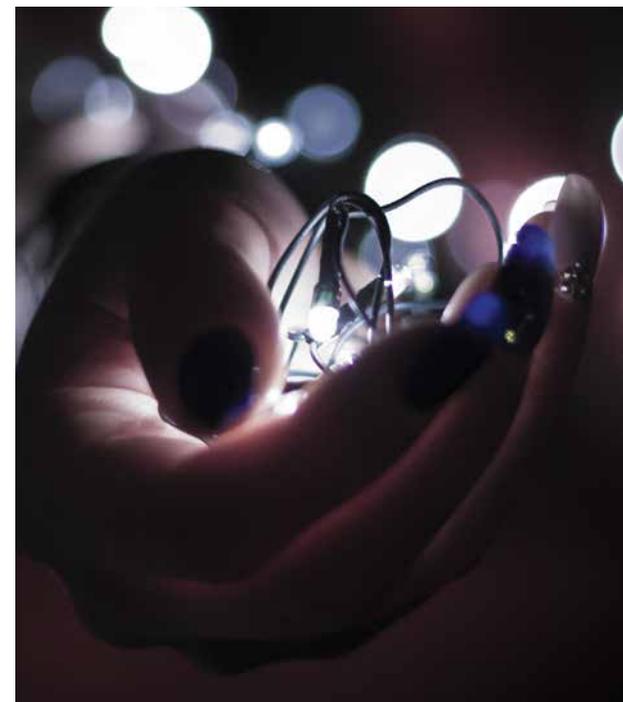
According to the 2014 GHG Emissions Inventory of the Institute of Hydrology, Meteorology, and Environmental Studies (IDEAM), the energy sector accounted for 35% of the country's total emissions. It is the second-highest emitting sector in Colombia. Emissions in this sector have shown an average annual increase of 3% and a steady growth (IDEAM, 2014).

In the energy sector, there is a possibility of reducing emissions on the energy's supply and demand sides. Historically, a high percentage

of Colombia's energy supply comes from hydropower. However, because of decreased rainfalls and increased energy demand, the usage of thermoelectric power plants is growing. Therefore, the consumption of fossil fuels has increased as well.

According to the International Energy Agency (IEA), to reach net-zero emissions by 2050, fossil fuels need to be replaced together with the rise in renewable technologies and energy-efficient solutions. The E2050 has also highlighted those approaches. It emphasises that reaching net-zero emissions by 2050 requires that clean sources generate energy. Besides, energy demand should be reduced as much as possible to increase energy efficiency and change consumption patterns.

Recognising that transport is the energy subsector with the highest emissions, this Catalogue includes a separate section for mitigation actions in this sector.



As noted above, this Catalogue will focus its strategies on two areas of the energy and transport sectors:

1. Demand
2. Generation

Note: For all the actions included in this Catalogue of Decarbonisation actions in the energy sector, reducing greenhouse gas (GHG) emissions must be quantified under the Colombian Guidelines of Resolution 1447 of 2018 and its modifications. This ensures the inclusion of the actions on the National Registry of Greenhouse Gas Emission Reductions platform (RENA-RE). Likewise, this exercise will allow the reader to apply for international and national funding resources to formulate and implement the actions in this Catalogue.

ENERGY

DEMAND

ENERGY EFFICIENCY

POLICIES

GENERATION

NON-CONVENTIONAL RENEWABLE ENERGY SOURCES

SUSTAINABLE, INNOVATIVE, AND EFFICIENT INFRASTRUCTURE

Measure

1. Energy efficiency in lighting
2. Energy efficiency in construction
3. Energy efficiency in air conditioning
4. Energy efficiency in kitchens and water heating
5. Energy efficiency in refrigerators and appliances
6. Energy efficiency in furnaces
7. Energy efficiency in boilers and steam supply
8. Energy efficiency in motors and pumps

9. General policies

10. Wind power

11. Solar energy

12. Hydropower

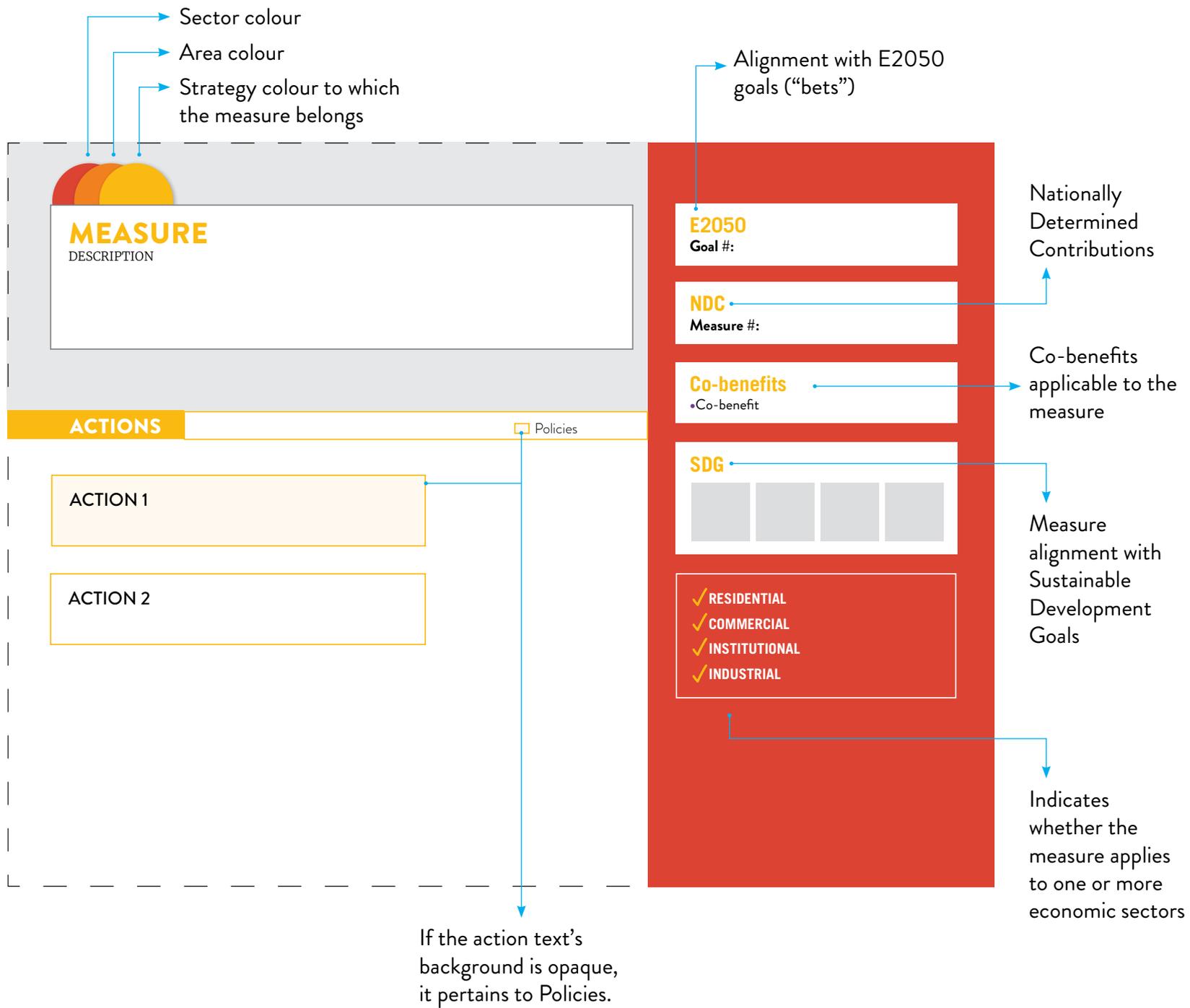
13. Biomass

14. Biogas

15. Electricity infrastructure

Decarbonisation measures in the

ENERGY SECTOR



ENERGY EFFICIENCY IN LIGHTING

This measure aims to reduce GHG emissions through increased efficiency in the use of electricity and fuels in lighting.

ACTIONS

☐ Policies

Incentives for replacing lighting in homes.

Switching sectioning of luminaires in buildings.

Progressive billing of utilities (water, gas, and energy) to reduce excessive consumption.

Change from luminaires to remotely managed LED lights.

E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

Co-Benefits

- Increased public safety
- Green businesses
- Improvement of the inhabitants' quality of life
- Construction processes with environmental and social responsibility

SDG



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ENERGY EFFICIENCY IN CONSTRUCTION

This measure aims to reduce GHG emissions through the reduction of energy demand as a result of the design, operation, and construction criteria of buildings.

ACTIONS

☐ Policies

To encourage minimum criteria for sustainable construction.

Improvements in insulation or radiant barriers in existing and new buildings.

Reduced on-site energy demand by sharing energy installations between buildings (for example, commercial solar energy systems and district heating systems).

Incentives for the modernisation of existing industrial buildings.



Commercial, public, or residential facilities built and/or remodeled with sustainable construction standards.

E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

NDC

Measure 7: Sustainable construction.

Co-Benefits

- Green businesses
- Savings on energy bills
- Construction processes with environmental and social responsibility

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ENERGY EFFICIENCY IN AIR CONDITIONING

This measure aims to reduce GHG emissions through increased efficiency in the use of electricity and fuels in heating, ventilation, and air conditioning activities.

ACTIONS

 Policies

To replace fuels for electricity in the heating or cooling usage (AC).

To eliminate air infiltrations.

To promote replacement programs of old equipment and encourage the acquisition of energy-efficient equipment with energy efficiency class.

To regulate the temperature with appropriate control systems.

To reduce heat sources, for example, solar radiation through external elements such as blinds and external shadows.

To determine that the equipment is adequately sized for the area that requires air conditioning.

E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

Co-Benefits

- Green businesses
- Savings on energy bills
- Increase of productivity

SDG



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POWER EFFICIENCY IN KITCHENS AND WATER HEATING

This measure aims to reduce GHG emissions through increased efficiency in the use of electricity and fuels when using stoves and heating water.

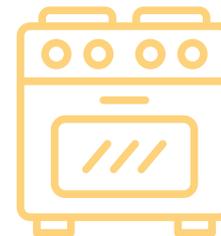
ACTIONS

☐ Policies

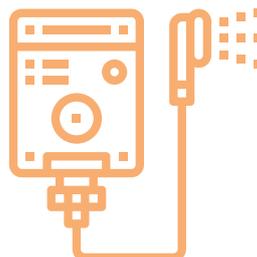
Solar water heaters / heating systems.



To promote programs for efficient stoves replacing their fuels to low-carbon and/or renewable ones.



Implementation of endoergic chambers.



E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

NDC

Measure 27: Replacement of traditional wood stoves with energy-efficient stoves. Good practices and efficient use of resources.

Co-Benefits

- Preservation of natural capital, development of bioeconomy, and increase in quality of life and health

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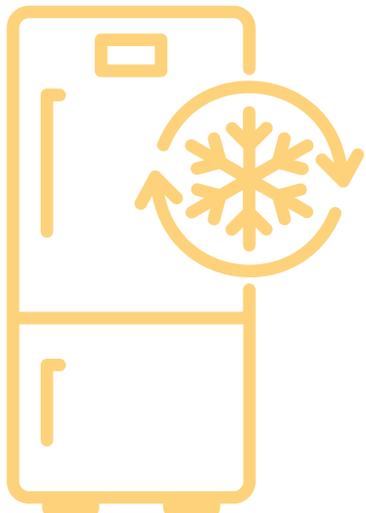
ENERGY EFFICIENCY IN REFRIGERATORS AND APPLIANCES

This measure aims to reduce GHG emissions through increased efficiency in the use of electricity and fuels when using refrigerators and appliances.

ACTIONS

□ Policies

Replacement of old to efficient appliances (including washers, dryers, and televisions).



To promote programs for replacing inefficient refrigerators and using technologies free of HFCs and HCFCs.

E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

Co-Benefits

- Improving quality of life.

SDG



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ENERGY EFFICIENCY IN FURNACES

This measure aims to reduce GHG emissions through increased efficiency in the use of electricity and fuels when using industrial furnaces.

ACTIONS

☐ Policies

Energy efficiency and fuel substitution in industrial furnaces and boilers.



To optimise combustion processes aiming to reduce energy consumption and CO₂ generation.

Replacement by more efficient furnace burners.

To promote the use of zero- and low-emissions fuels for industrial processes.

To promote the techniques and technologies to recover and reuse waste heat and pressure from production furnaces.

E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

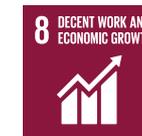
NDC

Measure 14: Promotion of energy management and energy efficiency projects in industry.

Co-Benefits

- Promotion of technological innovation
- Better air quality and reduction of disease incidences
- Social sustainability in strengthening companies
- Increased business productivity

SDG



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ENERGY EFFICIENCY IN BOILERS AND STEAM SUPPLY

This measure aims to reduce GHG emissions through increased efficiency in the use of electricity and fuels when using industrial boilers.

ACTIONS

Policies

Increase the proportion of gas boilers or renewable energy in process heaters or furnaces (including the use of residual biomass or other sustainably produced biomass).

Energy efficiency and fuel substitution in industrial boilers.

E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

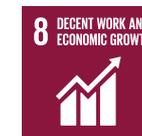
NDC

Measure: Promotion of energy management and energy efficiency projects in industry.

Co-Benefits

- Promotion of technological innovation
- Better air quality and reduction of disease incidences
- Social sustainability in strengthening companies

SDG



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MEASURE

ENERGY EFFICIENCY IN MOTORS AND PUMPS

This measure aims to reduce GHG emissions through increased efficiency in the use of electricity and fuels when using industrial motors and pumps.

ACTIONS

☐ Policies

High-efficiency electric motor systems.

Energy efficiency programs for motors, pumps, and fans.



E2050

Goal 3: Sustainable production and consumption for an innovative and inclusive economy.

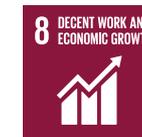
NDC

Measure 14: Promotion of energy management and energy efficiency projects in industry.

Co-Benefits

- Promotion of technological innovation
- Better air quality and reduction of disease incidences
- Social sustainability in strengthening companies
- Improvement in business productivity

SDG



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GENERAL POLICIES

This measure aims to reduce GHG emissions by implementing policies as instruments within the market. This measure includes all industry sectors (RCI).

ACTIONS

□ Policies

Tax on carbon.

To promote energy audits and training programs in energy management for industrial technical staff.



Voluntary carbon markets.



E2050

Goal 6: Cities and regions with a comprehensive urban development for environmental sustainability by promoting diversity, equity, connectivity, and productivity. It must have strong urban governance to manage needs efficiently and participatory citizens with sustainable consumption patterns.

Co-Benefits

- To move financial flows, improve quality of life, and create networks

SDG



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WIND POWER

This measure aims to reduce GHG emissions in the energy supply by implementing wind technologies at higher levels of reference scenarios to displace carbon electricity generation. The measure applies to distributed generation, cogeneration, and self-generation actions for the National Interconnected System.

ACTIONS

Policies

Public utility-scale wind power with a battery or other storage.

Community wind projects, including microgrids.

Renewable wind power production *in situ*.

Small-scale wind projects with battery storage.



E2050

Goal 3: Diversified energy mix to meet the demand through renewable fuels. Additionally, it will provide access to clean resources and more efficient technologies.

NDC

Measure 4: Electricity generation.

Co-Benefits

- Self-generation participation in small-scale
- To promote distributed generation
- Diversification of the energy mix
- Decrease in energy consumption
- Decrease in the electricity price
- Attention to critical situations of scarcity
- Improvement in the performance of electrical networks (power quality and ability to load)
- Increasing energy competitiveness
- Electrical infrastructure optimisation
- Contamination reduction

SDG



SOLAR ENERGY

This measure aims to reduce GHG emissions in the energy supply by implementing solar technologies at higher levels of reference scenarios to displace carbon electricity generation. The measure applies to projects in non-interconnected zones (NIZ) and distributed generation, self-generation, and cogeneration actions in the National Interconnected System.

ACTIONS

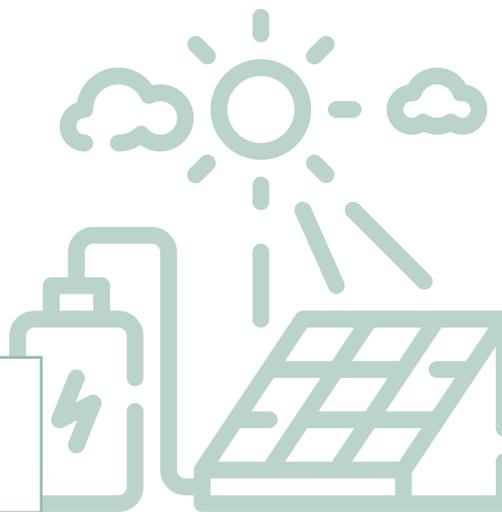
Policies

Public utility-scale solar energy with a battery or other storage.

Renewable solar power production *in situ*.

Community solar projects, including microgrids.

Commercial / institutional / industrial photovoltaic solar energy programs.



E2050

Goal 3: Diversified energy mix to meet the demand through renewable fuels. Additionally, it will provide access to clean resources and more efficient technologies.

NDC

Measure 4: Electricity generation.

Co-Benefits

- Participation in small-scale self-generation
- To promote distributed generation
- Diversification of the energy mix
- Decrease in energy consumption
- Decrease in the electricity price
- Attention to critical situations of scarcity
- Improvement in the performance of electrical networks (power quality and ability to load)
- Increasing energy competitiveness
- Electrical infrastructure optimisation
- Contamination reduction

SDG



HYDROPOWER

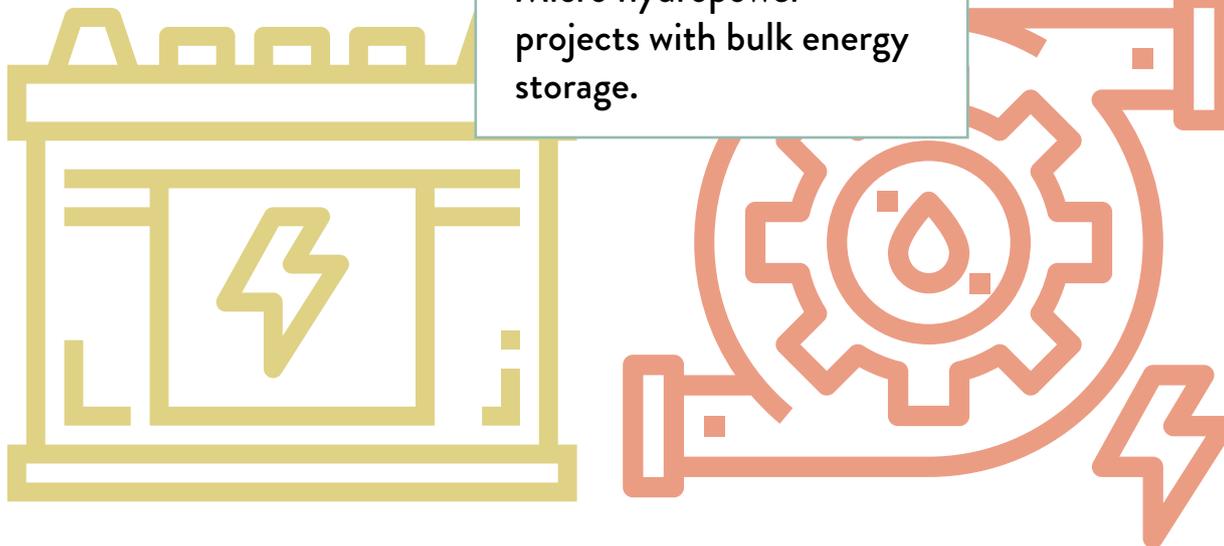
This measure aims to reduce GHG emissions in the energy supply by implementing hydropower technologies at higher levels of reference scenarios to displace carbon electricity generation. The measure applies to projects in non-interconnected zones (NIZ) and distributed generation, self-generation, and cogeneration actions in the National Interconnected System.

ACTIONS

Policies

Micro hydropower projects with or without microgrids.

Micro hydropower projects with bulk energy storage.



E2050

Goal 3: Diversified energy mix to meet the demand through renewable fuels. Additionally, it will provide access to clean resources and more efficient technologies.

NDC

Measure 4: Electricity generation.

Co-Benefits

- Participation in small-scale self-generation
- To promote distributed generation
- Diversification of the energy mix
- Decrease in energy consumption
- Decrease in the electricity price
- Attention to critical situations of scarcity
- Improvement in the performance of electrical networks (power quality and ability to load)
- Increasing energy competitiveness
- Electrical infrastructure optimisation
- Contamination reduction

SDG



BIOMASS

This measure aims to reduce GHG emissions in the energy supply through power generation from different technologies using solid biomass as a primary energy source. The measure applies to projects in non-interconnected zones (NIZ) and distributed generation, self-generation, and cogeneration actions in the National Interconnected System.

ACTIONS

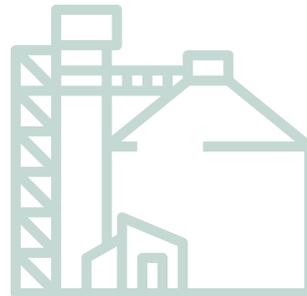
Policies

Conventional biomass boilers and steam turbine plants.

To encourage the use of residual biomass for generating self-consumption of electricity.

Cogeneration projects for combined power grid and helpful thermal output for heating water and building heating systems. It is also used for providing process steam.

Production of steam or heat at the industrial site (including hot water) to reduce or replace the use of fossil fuels.



E2050

Goal 3: Diversified energy mix to meet the demand through renewable fuels. Additionally, it will provide access to clean resources and more efficient technologies.

NDC

Measure 4: Electricity generation.

Co-Benefits

- Participation in small-scale self-generation
- To promote distributed generation
- Diversification of the energy mix
- Decrease in energy consumption
- Decrease in the electricity price
- Attention to critical situations of scarcity
- Improvement in the performance of electrical networks (power quality and ability to load)
- Increasing energy competitiveness
- Electrical infrastructure optimisation
- Contamination reduction

SDG



BIOGAS

This measure aims to reduce GHG emissions in the energy supply through power generation from different technologies using biogas as a primary energy source. The measure applies to projects in non-interconnected zones (NIZ) and distributed generation, self-generation, and cogeneration actions in the National Interconnected System.

ACTIONS

Policies

Biogas power plant for utilities.

To encourage the use of biogas for generating self-consumption of electricity.

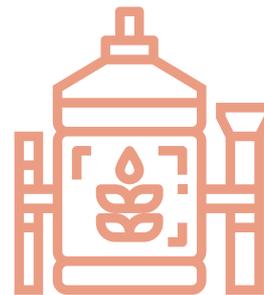
Thermal modernisation programs to combine efficiency and *in situ* renewable energy production.

Cogeneration projects for combined power grid and thermal output useful for heating water and building heating systems. It is also used for providing process steam.

Production of steam or heat at the industrial site (including hot water) to reduce or replace the use of fossil fuels.

Anaerobic digestion of livestock activities produces biogas fed to an electric generator to produce electricity. Waste heat can also be recovered to heat the space or water.

Application of anaerobic digesters in dairies, feedlots, pig farms, or other activities with confined animals. Methane captured from manure is used on-site, or it is compressed and sold as compressed biogas fuel.



E2050

Goal 3: Diversified energy mix to meet the demand through renewable fuels. Additionally, it will provide access to clean resources and more efficient technologies.

NDC

Measure 4: Electricity generation.

Co-Benefits

- Participation in small-scale self-generation
- To promote distributed generation
- Diversification of the energy mix
- Decrease in energy consumption
- Decrease in the electricity price
- Attention to critical situations of scarcity
- Improvement in the performance of electrical networks (power quality and ability to load)
- Increasing energy competitiveness
- Electrical infrastructure optimisation
- Contamination reduction

SDG



ELECTRICITY INFRASTRUCTURE

This measure aims to reduce GHG emissions by implementing best practices or infrastructure to increase the efficiency of the energy transmission and distribution system.

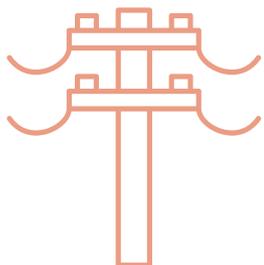
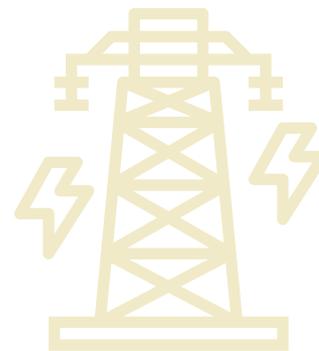
ACTIONS

□ Policies

To manage programs for replacing transformers and electrical infrastructure through power stations.

Distribution grid equipment upgrades.

To manage grid extension projects to bring the energy supply to users in-circuit queues to displace fossil fuels in NIZ.



To centralise the provision of thermal energy service.

Strategic location of the facilities to promote the adoption of district heating systems.

E2050

Goal 3: Diversified energy mix to meet the demand through renewable fuels. Additionally, it will provide access to clean resources and more efficient technologies.

NDC

Measure 4: Electricity generation.

Co-Benefits

- Participation in small-scale self-generation
- To promote distributed generation
- Diversification of the energy mix
- Decrease in energy consumption
- Decrease in the electricity price

SDG



CATALOGUE OF DECARBONISATION ACTIONS IN THE TRANSPORT SECTOR

The transport sector is a significant contributor to climate change accounting for a quarter of global energy-related greenhouse gas (GHG) emissions. Decarbonisation of the transport sector can reduce transport-related air and noise pollution and improve mobility and quality of life. In Latin America, the transport sector is “the fastest-growing source of carbon emissions. The car fleet is multiplying and will triple in the next 25 years,” according to Global Data Energy, 2017. Consequently, it is a sector that requires a profound transformation considering the effects of accidents related to transport, traffic, and health problems due to the high concentration of air pollutants. The solutions in this transformation should benefit the economy and society.

In Colombia, transport represents the highest emitting subsector in the energy sector. Historically, road transport generates the highest emissions with more than 92% of carbon emissions, according to the IDEAM. In recent years, the use of fossil fuels for road transport has increased as a direct result of the growth of the country’s fleet.

The promising news is that the latest Global Climate Action Pathway on Transport (2021) confirms that decarbonisation in this sector is affordable. According to the pathway members, specifically for road transport, “it is estimated that 85% of the reductions in carbon dioxide (CO₂) emissions needed to reach the 1.5°C targets can already be achieved with existing and emerging transport policies and technologies. The other 15% can be achieved with changes in behaviour” (2021). Overall, the goal of net zero emissions in the transport sector will require a shift towards electric vehicles, improvements in transport infrastructure, demand management, and fuel efficiency and operations.

Colombia has already prioritised this sector and has made substantial investments and commitments to transform mobility in its main cities. In July 2019, Colombia set a goal to have 100% of the vehicles purchased for mass transit systems either electric or zero-emissions by 2035 (Colombian congress, 2019). These are great signs of ambition and have also been selected as an approach for its Long-term Climate Strategy (E2050) and its NDC.

This Catalogue organised the actions in 6 modes according to the sustainable mobility pyramid (ITDP,2013):

- 1. Pedestrians**
- 2. Cycling**
- 3. Public transport**
- 4. Freight transport**
- 5. Private vehicles**

Note: For all the actions described in this Catalogue of decarbonisation measures in the transport sector, reducing greenhouse gas (GHG) emissions must be quantified under the guidelines of Resolution 1447 of 2018 and its modifications. This ensures their inclusion on the National Registry of Greenhouse Gas Emission Reductions platform (RENA-RE). Likewise, this exercise will allow asking for international and national cooperation resources to formulate and implement the actions in this Catalogue.

TRANSPORT

ZERO AND
LOW-EMISSION
TECHNOLOGIES

Measure

- 1. Hybrid electric vehicles (HEVs)
- 2. Electrical vehicles with battery
- 3. Hydrogen fuel cell vehicles
- 4. Electric Railway
- 5. Electric Navigation

CHANGES IN
THE MODALITY
AND EFFICIENCY
SYSTEMS

- 6. Aerial tramways
- 7. Road system management
- 8. Energy efficiency in motors and pumps
- 9. Public transport
- 10. Behaviour change facing other sustainable transport alternatives.

STANDARDISATION

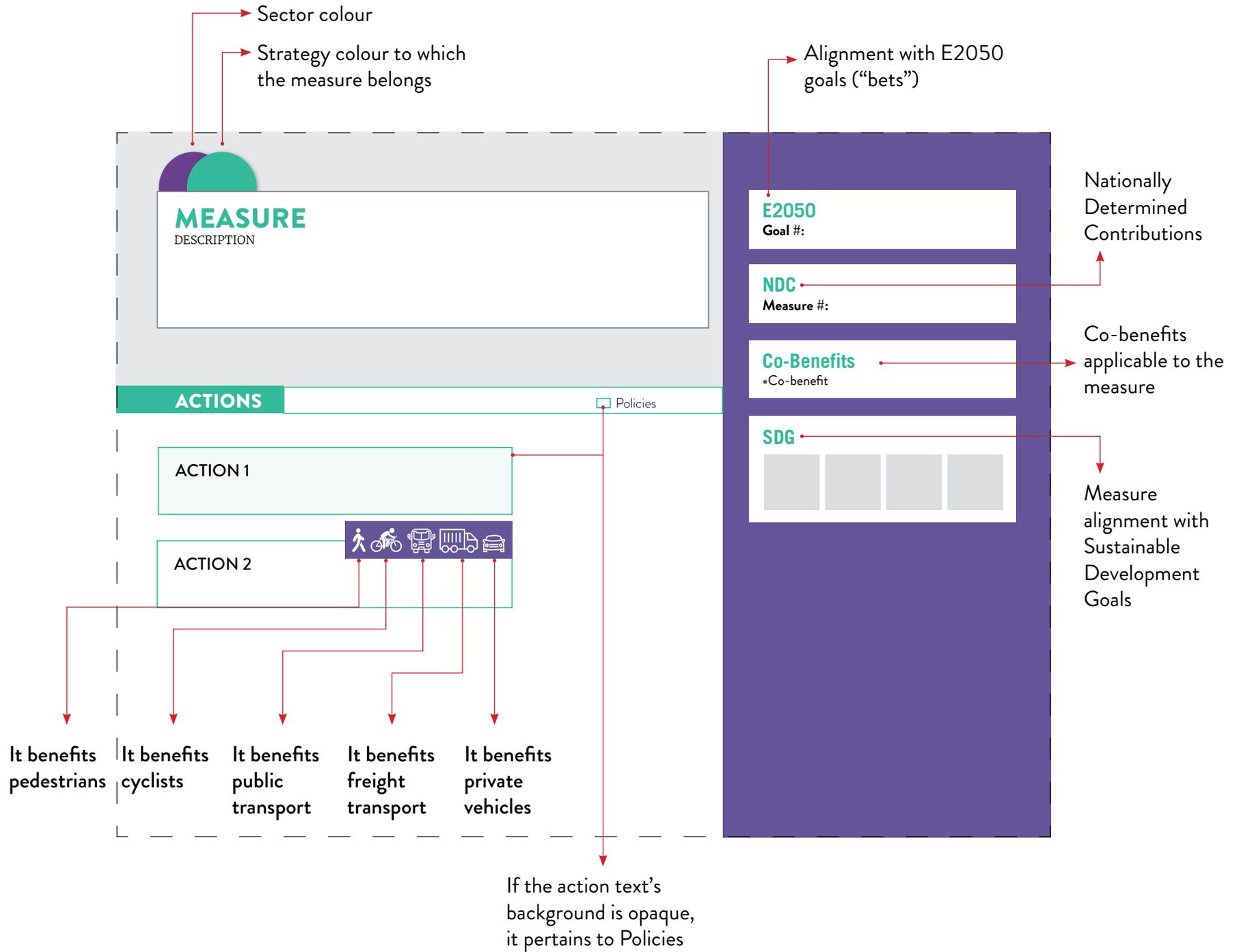
- 11. Urban and interurban vehicles
- 12. Rail Transport
- 13. River Navigation
- 14. Efficient driving

ENERGY SUPPLY
NETWORK

- 15. Fuel supply

Decarbonisation measures in the

TRANSPORT SECTOR



HYBRID ELECTRIC VEHICLES (HEVs)

This measure aims to reduce polluting emissions through the acquisition of hybrid vehicles.

Co-Benefits

- Employment generation.
- Disease incidence reduction / health improvement
- Business productivity
- Green businesses
- Technological innovation promotion
- Better air quality

ACTIONS

Policies

To promote the use of hybrid vehicles in public transport.



Replacement of conventional buses by hybrid buses at the inter-municipal level.



Acquisition programs for low-emission vehicles.



Infrastructure availability for plug-in hybrid vehicles (charging stations, etc.).



ELECTRICAL VEHICLES WITH BATTERY

This measure aims to replace conventional vehicles or increase electric vehicles in public and private transport fleets to eliminate the dependency on fossil fuels, reduce GHG emissions, and take advantage of the region's resources.

ACTIONS

Policies

To establish a replacement subsidy program for the electric vehicle fleet.



Expansion of the electric taxis fleet.



To build infrastructure for electric buses and trucks (charging stations, etc.).



Electric buses going into operation.



To promote transition programs and mass use of technology.



Quantification of the reduction of GHG emissions associated with the electric buses going into operation in the fleet of the public transport system.



E2050

Goal 8: Sustainable mobility and infrastructure lead to optimal economic costs in all physical transactions.

NDC

Measure 19: Electric Mobility

Co-Benefits

- Employment generation
- Disease incidence reduction / improvement in health
- Employment generation
- Business productivity
- Green businesses
- Technological innovation promotion
- Better air quality

SDG



HYDROGEN FUEL CELL VEHICLES

This measure aims to increase the implementation of vehicles with hydrogen fuel cells in the light duty vehicle fleet.

ACTIONS

Policies



To provide incentives for fuel cell vehicle purchases.



To build infrastructure for hydrogen-powered light-duty vehicles, buses, and trucks. It should include hydrogen filling stations and the hydrogen fuel supply chain.



To promote the development of pilot projects for vehicles, buses, and trucks that use hydrogen.



E2050

Goal 8: Sustainable mobility and infrastructure lead to optimal economic costs in all physical transactions.

Co-Benefits

- Employment generation
- Disease incidence reduction / improvement in health
- Business productivity
- Green businesses
- Technological innovation promotion
- Better air quality

SDG



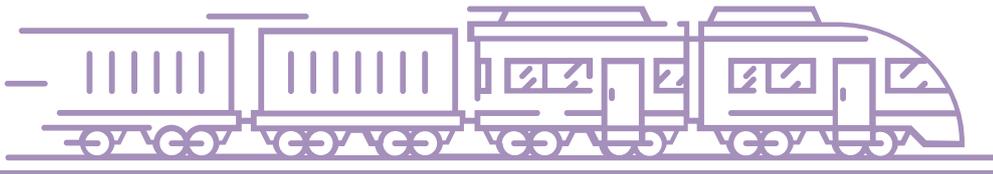
ELECTRIC RAILWAY

This measure aims to reduce emissions through the electrification of rail transport services.

ACTIONS

□ Policies

Construction of electric railway lines.



To replace road freight transport for rail transport.



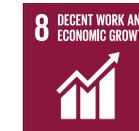
E2050

Goal 4: A fair workforce transition that improves the quality of life and the social and economic inclusion of the population ensuring that no one is left behind.

Co-Benefits

- Employment generation
- Disease incidence reduction / improvement in health
- Green businesses
- Promotion of technological innovation
- Better air quality
- Improvement of the inhabitants' quality of life
- Preservation of natural capital
- Biodiversity recovery and sustainability
- Reduction in environmental pollution
- Reduction in transit time

SDG



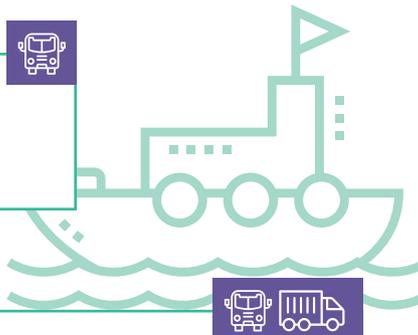
RIVER NAVIGATION

This measure aims to reduce emissions through the electrification of river and maritime transportation systems.

ACTIONS

□ Policies

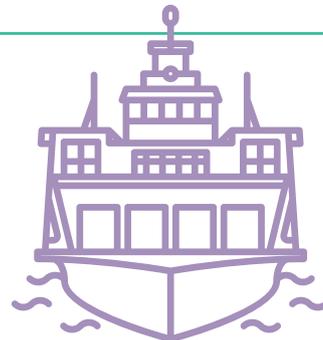
Electric propulsion ferries and short-distance vessels.



Technological and operational solutions to increase efficiency (improved engine and hull design, improved programming, and slowing ships down).



To replace road freight transport for inland waterway transport.



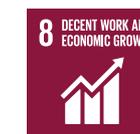
E2050

Goal 6: Cities and regions with a comprehensive urban development for environmental sustainability. This development promotes diversity, equity, connectivity, and productivity. It has strong urban governance to efficiently manage needs and participatory citizens with sustainable consumption patterns.

Co-Benefits

- Reduction in environmental pollution
- Reduction in noise pollution
- Reduction in transit time
- Energy efficiency
- Natural capital preservation
- Biodiversity recovery and sustainability

SDG



AERIAL TRAMWAYS

This measure aims to reduce emissions by increasing the continuous rapid transit of cable cars for the urban passengers' movement.

ACTIONS

Policies



To promote and incentivise aerial tramways to replace road transport in urban mountain areas with high population density and scant public space.



Co-Benefits

- Better air quality
- Improvement of the inhabitants' quality of life
- Natural capital preservation
- Biodiversity recovery and sustainability
- Reduction in environmental pollution
- Reduction in noise pollution
- Reduction in transit time
- Social inclusion and equity

ROAD SYSTEM MANAGEMENT

This measure aims to improve the efficiency of the road transport system through the technological improvement.

ACTIONS

Policies



Enforce speed limits using speed cameras and speed bumps.



To promote walking, the use of bicycles, and other means of transport through the extension of bike lanes and the expansion of sidewalks.



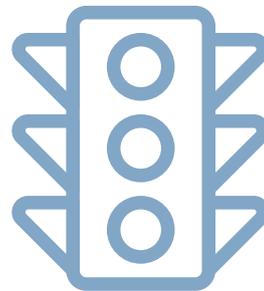
Smart traffic signals.



To establish high occupancy vehicle (HOV) lanes to incentivise carpooling.



To implement lower speed limits.



To promote the operation of freight vehicles in the city at night for suppliers and carriers. Also, implement differentiated tolls for the day and night freight vehicles transport.



To establish safe driving measures to protect scooters, bicycles, and pedestrians.

E2050

Goal 8: Sustainable mobility and infrastructure lead to optimal economic costs in all physical transactions.

NDC

Measure 23: Active transport and demand management.

Co-Benefits

- Disease incidence reduction / improvement in health
- Technological innovation promotion
- Better air quality
- Reduction in environmental pollution
- Reduction in transit time

SDG



MEASURE

PUBLIC TRANSPORT

This measure aims to improve the quality of public transport services to reduce the use of private vehicles through infrastructure and logistics improvements.

ACTIONS

Policies



To implement intelligent transportation systems, including signal timing, variable message signs, and real-time driver information.



To implement the reduction of one lane on the road, speed controls, and alternating one-way traffic.



To improve the public transport service by increasing capacity, frequency, and ensuring comfort and quality.



To promote and build exclusive lanes for public transport.



Exclusive lanes for public transport.



Incentives and subsidies for interurban buses (public transit).



Transit pricing incentives such as reduced fares and discounts.



o establish restricted or exclusive access zones in town centres.



Financial compensation and stabilisation of public service prices for collective passenger transport.



To issue free bus passes for workers in zones of high traffic like downtown or student zones.

E2050

Goal 6: Cities and regions with a comprehensive urban development for environmental sustainability. This development promotes diversity, equity, connectivity, and productivity. It has strong urban governance to efficiently manage needs and participatory citizens with sustainable consumption patterns.

NDC

Measure 24: Development focused on transport.

Co-Benefits

- Disease incidence reduction / improvement in health
- Technological innovation promotion
- Better air quality
- Reduction in environmental pollution
- Reduction in transit time

SDG



BEHAVIOUR CHANGE FACING OTHER SUSTAINABLE TRANSPORT ALTERNATIVES

This measure aims to discourage individual driving and encourage alternative means of transport. In addition, it aims to reduce the demand through changes in travel and freight management behaviour.

ACTIONS

Policies

Land use reform, zoning, taxation, and building codes that favor a lower carbon footprint.

Incentives and support. Telecommuting programs, living close to work, and tele-education.

Low urban density areas: To balance economic development with agriculture, protection of natural resources, and preservation of rural character.

To establish limits of urban and industrial growth.



Low emission zones
/ air protection zones.



To encourage technologies of zero and low-emissions energy.



To promote the creation and use of transport exchange centers, where there is a convergence of different means of transport that encourages the use of public services and discourages the use of private vehicles.

To improve transit efficiency, coverage, and comfort through integrated rail, bus, and ferry networks.



To expand facilities at public mass transit stations to promote intermodal transport.



To increase safety measures for bicycles, scooters, and pedestrians to allow the change from cars to another means of transport.

Elimination/reduction of parking minimums for commercial buildings, multi-family housing, and restrictions on private or street car parking.



To promote an increase in the tax on fossil fuels and the rolling tax as a support for urban transport and technological advancement.



Preventive maintenance and repair of existing roads. Efficient road location.



Freight logistics improvements (Shift it to night working hours for reducing light-duty vehicles traffic).



Redesign of public space and implementation of multimodal infrastructure to promote pedestrian mobility.



E2050

Goal 6: Cities and regions with a comprehensive urban development for environmental sustainability. This development promotes diversity, equity, connectivity, and productivity. It has strong urban governance to efficiently manage needs and participatory citizens with sustainable consumption patterns.

NDC

Measure 23: Active transport and demand management.

Co-Benefits

- Disease incidence reduction / improvement in health
- Better air quality
- Improvement of the inhabitants' quality of life
- Preservation of natural capital
- Biodiversity recovery and sustainability
- Reduction in environmental pollution
- Reduction in noise pollution
- Reduction in transit time

SDG



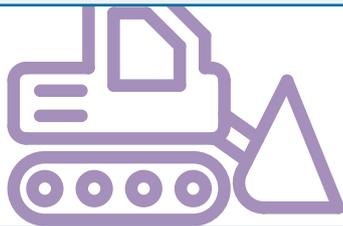
HEAVY EQUIPMENT

This measure aims to reduce emissions from heavy equipment vehicles through technological improvements to increase fuel efficiency.

ACTIONS

Policies

To fix standards for emissions from construction equipment



To implement more efficient harvesting equipment (tractors with variable speed transmissions that reduce fuel consumption).

Conversion of agricultural diesel equipment to liquefied natural gas, compressed natural gas, or hybrid technology.



E2050

Goal 6: Cities and regions with a comprehensive urban development for environmental sustainability. This development promotes diversity, equity, connectivity, and productivity. It has strong urban governance to efficiently manage needs and participatory citizens with sustainable consumption patterns.

NDC

New equipment with Tier 4I emissions standard for construction and industrial sectors.

Co-Benefits

- Business productivity
- Technological innovation promotion
- Energy Access
- Reduction in environmental pollution

SDG



URBAN AND INTERURBAN VEHICLES

This measure aims to reduce black carbon emissions from the tailpipe of light diesel vehicles.

ACTIONS

Policies



To promote the use of biodiesel in medium- and heavy-duty vehicles



NDC

Black carbon policies and measures.

Co-Beneficios

- Business productivity
- Technological innovation promotion
- Better air quality
- Disease incidence reduction / improvement in health
- Impact on black carbon mitigation

RAIL TRANSPORT

This measure aims to reduce emissions from rail transport through railway technological improvements and fuel changes.

ACTIONS

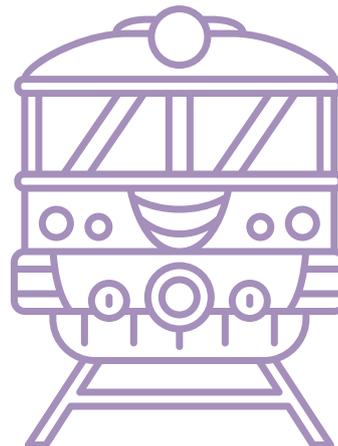
Policies



To raise the minimum quality requirements for the fuel used in trains.



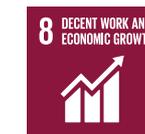
To adjust the standards for the fuel consumption of train engines.



Co-Benefits

- Reduced transportation costs
- Transit time saving of the goods transported by the train
- To achieve greater energy efficiency for the country through fuel savings
- To minimise the environmental impact of future expansions in the road network
- To reduce air pollution, noise, and the occupation of rural space

SDG



MEASURE

RIVER NAVIGATION

This measure aims to reduce emissions through the electrification of river and maritime transportation systems.

ACTIONS

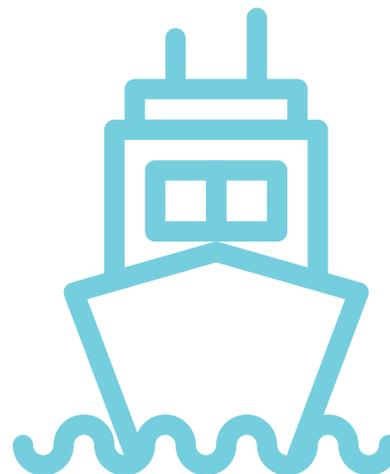
□ Policies



To raise the minimum quality requirements for the fuel used in vessels.



Technological and operational solutions to increase efficiency. For example, improved engine and hull design, shore power, improved programming, and slowing ships down.



E2050

Goal 6: Cities and regions with a comprehensive urban development for environmental sustainability. This development promotes diversity, equity, connectivity, and productivity. It has strong urban governance to efficiently manage needs and participatory citizens with sustainable consumption patterns.

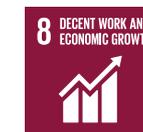
NDC

Measure 22: Change from road freight transport to inland waterway transport through the Magdalena river.

Co-Beneficios

- Reduction in environmental pollution
- Reduction in noise pollution
- Reduction in transit time
- Energy efficiency
- Natural capital preservation
- Biodiversity recovery and sustainability

SDG



EFFICIENT DRIVING

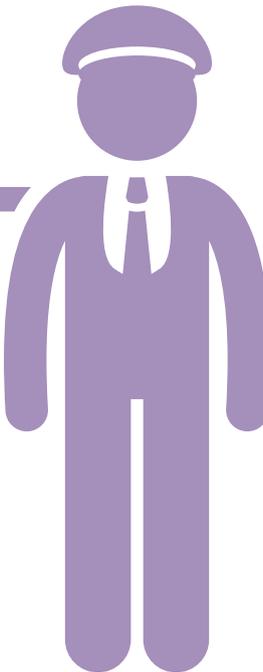
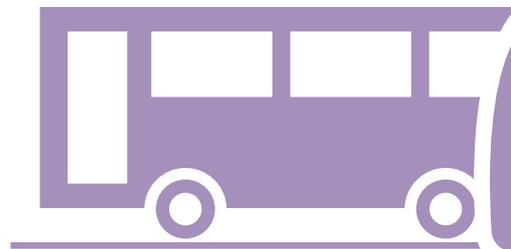
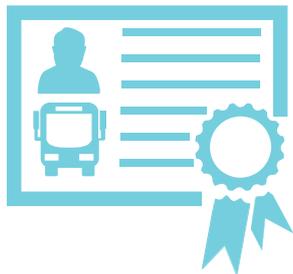
This measure aims to reduce emissions through changes in driver behaviour.

ACTIONS

Policies



Driver training in efficient driving.



E2050

Goal 8: Sustainable mobility and infrastructure lead to optimal economic costs in all physical transactions.

NDC

Measure 23: Active transport and demand management.

Co-Benefits

- Reduction in environmental pollution
- Disease incidence reduction / improvement in health
- It improves air quality
- Reduction in transit time
- Reduction in environmental pollution

SDG



MEASURE

FUEL SUPPLY



This measure aims to encourage the delivery and use of alternative fuels to reduce emissions from the fuel supply.

ACTIONS

Policies



To encourage biodiesel for agricultural machinery.



Infrastructure development of alternative fuel sources.



To improve transmission efficiency. To change fuel transportation from trucks to pipelines.



To promote energy supply through renewable sources.



Infrastructure availability for low-emission vehicles such as electrical infrastructure and hydrogen supply.

E2050

Goal 8: Sustainable mobility and infrastructure lead to optimal economic costs in all physical transactions.

Co-Benefits

- Technological innovation promotion
- Disease incidence reduction / improvement in health
- It improves air quality
- Reduction in transit time
- Reduction in environmental pollution
- To mobilise financial flows for climate change management

SDG





SUSTAINABLE DEVELOPMENT GOALS (SDG)

On September 25, 2015, world leaders adopted a set of global goals to end poverty, protect the planet, and ensure prosperity for all people as part of a new sustainable development agenda. Each objective has specific targets to be achieved in the next 15 years.



CLIMATE CHANGE POLICIES AT THE NATIONAL LEVEL

The decarbonisation measures and actions in the energy and transport sectors within the Catalogue are aligned with the NDC and E2050 policies. Links and guides are described below.

NATIONALLY DETERMINED CONTRIBUTION (NDC)

The relationship between measures and actions established in this Catalogue with the mitigation measures of the NDC was identified through technical analysis. This will allow departments to find options to contribute to national measures and goals.

For more information, please visit: “Portafolio de Medidas Sectoriales de Mitigación de la Contribución Determinada a Nivel Nacional (NDC) de Colombia 2020”. Documentos Oficiales | Ministerio de Ambiente y Desarrollo Sostenible (minambiente.gov.co)

COLOMBIA’S LONG-TERM CLIMATE STRATEGY (E2050)

The relationship of the measures and actions established in this Catalogue with the goals of Colombia’s 2050 Long-Term Strategy was identified through technical analysis. (E2050)

For more information, please visit: <https://e2050colombia.com/>

ABOUT THE PARTNERS OF “ROAD TO CARBON NEUTRAL: VISIONS FOR COLOMBIA 2050”

This Catalogue was prepared under the framework of the Road to carbon neutral: visions for Colombia 2050 project thanks to the support of UK PACT with the following consortium:



OpEPA is the Organisation for Environmental Education and Protection. It has worked for more than 20 years reconnecting young people with the Earth to act in an environmentally sustainable way. It has trained more than 100,000 children, 5,000 teachers and educators, and 1,000 community leaders.

CLIMATE GROUP

Climate Group is a non-profit organisation founded in 2003 to convene powerful networks of companies and governments that transform global markets and policies to ensure a net-zero emissions world by 2050 and greater prosperity for all people. Climate Group is the Secretariat of the Under2 Coalition, the largest global network of states and regions committed to emissions reductions in alignment with the Paris Agreement.



The Climate Reality Project is a project founded in 2006 by former US Vice President and Nobel Peace Prize laureate Al Gore. Currently, this project leads a global movement of more than 31,000 climate leaders in 168 countries.



The **General Attorney's Office** is the entity in Colombia representing citizens before the State. The highest body of the Public Ministry is in charge of investigating, sanctioning, intervening, and preventing irregularities committed by public officials, government officials, and individuals who exercise public functions.



UKPACT UK Partnering for Accelerated Climate Transitions is a program funded by the UK government. UK PACT supports countries that strive to overcome barriers to clean growth and have high emissions reduction potential to accelerate their climate change mitigation efforts. www.ukpact.co.uk

FOR MORE INFORMATION ABOUT DECARBONISATION IN THE ENERGY SECTOR, PLEASE VISIT:

Programa de uso racional y eficiente de la energía -
PROURE: [www1.upme.gov.co/DemandayEficiencia/
Paginas/PROURE.aspx](http://www1.upme.gov.co/DemandayEficiencia/Paginas/PROURE.aspx)

Plan integral de gestión del cambio climático del sector
minero energético 2050:
[www.minenergia.gov.co/
documents/10192/24309752/21261021_Plan_Modifica
+el+Plan+Integral+de+Gesti%C3%B3n+del+Cambio+Cl
im%C3%A1tico+-+Sector+Minero+Energ%C3%A9tico.
pdf/dbb68213-3ac3-48fb-9638-08ab42e74e83](http://www.minenergia.gov.co/documents/10192/24309752/21261021_Plan_Modifica+el+Plan+Integral+de+Gesti%C3%B3n+del+Cambio+Clim%C3%A1tico+-+Sector+Minero+Energ%C3%A9tico.pdf/dbb68213-3ac3-48fb-9638-08ab42e74e83)

Hoja de ruta net cero en edificaciones:
www.cccs.org.co/wp/

Alumbrado público exterior por la Unidad de
Planeación Minero-Energética - UPME:
www.upme.gov.co/Docs/Alumbrado_Publico.pdf

Construcción Sostenible - Consejo Colombiano de
Construcción Sostenible:
[www.cccs.org.co/wp/download/caso-de-negocio-
lead-latinoamerica/?wpdmdl=24728&refresh=618349
4b47eec1635993931](http://www.cccs.org.co/wp/download/caso-de-negocio-lead-latinoamerica/?wpdmdl=24728&refresh=6183494b47eec1635993931)

FOR MORE INFORMATION ABOUT DECARBONISATION IN THE TRANSPORT SECTOR, PLEASE VISIT:

Estrategia nacional de movilidad eléctrica:
www1.upme.gov.co/DemandaEnergetica/ENME.pdf

Plan maestro ferroviario: [colaboracion.dnp.gov.co/
CDT/Prensa/Plan-Maestro-Ferroviano.pdf](http://colaboracion.dnp.gov.co/CDT/Prensa/Plan-Maestro-Ferroviano.pdf)

Plan maestro de transporte intermodal:
[www.ani.gov.co/sites/default/files/u233/pmti_
entregable_1_final_nov11.pdf](http://www.ani.gov.co/sites/default/files/u233/pmti_entregable_1_final_nov11.pdf)

Política nacional de movilidad urbana y regional:
[colaboracion.dnp.gov.co/CDT/Conpes/
Econ%C3%B3micos/3991.pdf](http://colaboracion.dnp.gov.co/CDT/Conpes/Econ%C3%B3micos/3991.pdf)

Política nacional Logística:
[plc.mintransporte.gov.co/Portals/0/News/
CONPES3547pln.pdf?ver=2018-12-20-142303-463](http://plc.mintransporte.gov.co/Portals/0/News/CONPES3547pln.pdf?ver=2018-12-20-142303-463)

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www.climaterealityproject.org/

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Ministry of Environment and Sustainable Development

General Attorney's Office

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