Urban Pathways

NATIONAL LOW CARBON URBAN ACTION PLAN

VIETNAM

Wuppertal Institut

UN HABITAT
FOR A BETTER URBAN FUTURE

UN environment programme

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The Urban Pathways project helps delivering on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. It has established a facility in close cooperation with other organisations and networks active in this area to support national and local governments to develop action plans and concrete implementation measures to boost low-carbon urban development. This builds on UN-Habitat's role as "a focal point on sustainable urbanisation and human settlements including in the implementation and follow-up and review of the New Urban Agenda". The project develops national action plans and local implementation concepts in key emerging economies with a high mitigation potential. The local implementation concepts are being developed into bankable projects, focusing on the access to urban basic services to create a direct link between climate change mitigation and sustainable development goals.

Project concept

The project follows a structured approach to boost Low Carbon Plans for urban mobility, energy and waste management services that deliver on the Paris Agreement and the New Urban Agenda. The project works on concrete steps towards a maximum impact with regards to the contribution of urban basic services (mobility, energy and waste management) in cities to global climate change mitigation efforts and sustainable and inclusive urban development. This project makes an active contribution to achieve global climate change targets to a 1.5°C stabilisation pathway by unlocking the global emission reduction potential of urban energy, transport and resource sectors. The project will contribute to a direct emission reduction in the pilot and outreach countries, which will trigger a longer term emission reduction with the aim to replicate this regionally and globally to make a substantial contribution to the overall emission reduction potential.

Project aims

This project implements integrated urban services solutions as proposed in the New Urban Agenda providing access to jobs and public services in urban areas, contributing to equality and social coherence and deliver on the Paris Agreement and the Sustainable Development Goals.This is the first dedicated implementation action oriented project, led by UN-Habitat to deliver on inclusive, low-carbon urban services. Securing sustainability and multiplier effect, the project aims to leverage domestic and international funding for the implementation projects that will follow from this initiative

Urban Pathways

Urban Pathways Project and Replication Cities

DOCUMENT INFORMATION

The Urban Pathways project embarked on a four-year programme which started in October 2017. It helped deliver on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. Its aim is to make a direct contribution to sustainable urban development by focusing on implementation projects in the areas of mobility, energy, and resource management.

Initially, the Urban Pathways project focused on India, Brazil, Kenya and VietNam as four pilot countries for the implementation of the programme's identified work agenda. Over the years, it stretched its activities far beyond those countries, being active with pilot projects in 9 cities with replication activities in many more.

The Urban Pathways project had developed and helped to implement a variety of pilot projects for each of the partner cities. During this intense period of cooperation and interaction the team has gained understanding of some of the obstacles and gaps of the regulative framework and / or (lack of) capacities of the partner cities and countries. This report summarizes the lessons learnt, but with a focus on the national level and how the national authorities can help to support low-carbon action in cities.

The Urban Pathways approach starts with rather small-scale, bottom-up activities, believing in the potential of replicating and upscaling such pilot projects. Our experiences highlighted the fact that - while material sites and infrastructure of course play an important role - a mindset change is a pivotal precondition for transitioning to sustainable urban development. Thus, small, low-cost projects, such as the EcoZone or Tactical Urbanism, focusing on neighbourhoods as the geographical scale can play an important role in speeding up low-carbon urban action. Also, at the neighbourhood level an intersectoral approach is easier applicable, addressing simultaneously different sectors, such as mobility and waste, through a series of activities that include tactical urbanism, awareness-raising, community participation and impact assessment.

This report shall shed light on how the Urban Pathways pilot project can be scaled up, while making recommendations that focus on how the national level governments can help to initiate, strengthen and spread such action.

TRENDS, DRIVERS AND POLICY ENVIRONMENT

Since its economic 'Doi Moi', or revolution, in 1986, Viet Nam has achieved enviably rapid and consistent growth in its economy. From 2002 to 2018, GDP per capita increased by 2.7 times, exceeding US$2,700 per annum in 2019 and lifting more than 45 million people out of poverty. Poverty rates consequently fell from over 70% to under 6% of the population (World Bank, 2021).

An accumulation of negative environmental impacts accompanied this growth, however, given the country's reliance upon natural resource exploitation to support its expanding industrial sector, and an increasing dependence on imported fossil fuel-based sources of energy (CREM, 2018). Viet Nam is now among the 10 countries most-affected by air pollution, consequently losing about 5% of potential GDP in 2013 alone (World Bank, 2016). It is similarly affected by water supply deficits and water pollution that, unless addressed, may cost it up to 3.5% of GDP annually by 2035 (World Bank, 2019). Climate change further exacerbates the threat to Viet Nam's population and economy (Reed, 2020).

Viet Nam is among the world's most vulnerable countries to unmitigated climate change. With a long, low-lying coastline in the "typhoon belt" of Southeast Asia, the country has been ranked eighth highest globally in terms of climate vulnerability over the 1996-2015 period (Kreft et al. 2016). Historically, Viet Nam has not been a major contributor to climate change. However, the country's rapid economic growth, in the context of an increasingly carbon intensive energy system, is changing this situation. Over the last 2 decades, Viet Nam doubled its gross domestic product (GDP) per capita with an average GDP growth rate of about 7%.

Total net GHG emissions in 2016 were 316,734.96 $ktCO_2e$. Of which, 205,832.20 $ktCO_2e$ came from the energy sector, accounting for the largest proportion of 65%. It was followed by the IPPU sector, 46,094.64 $ktCO_2e$, or 14.6%. The AFOLU sector had net emissions of 44,069.74 $ktCO_2e$, after removing -39,491.24 $ktCO_2e$ by soil absorption, becoming the third largest emitting sector, accounting for 13.9%. The smallest share went to the waste sector, 20,738.38 $ktCO_2e$, accounting for only 6.5% (National GHG inventory, 2016). Vietnam's emissions could nearly quadruple by 2050 if the country's industries continue to grow at planned rates without technological change, industrial-base changes, and successful implementation of policy changes, as shown in Figure 1.

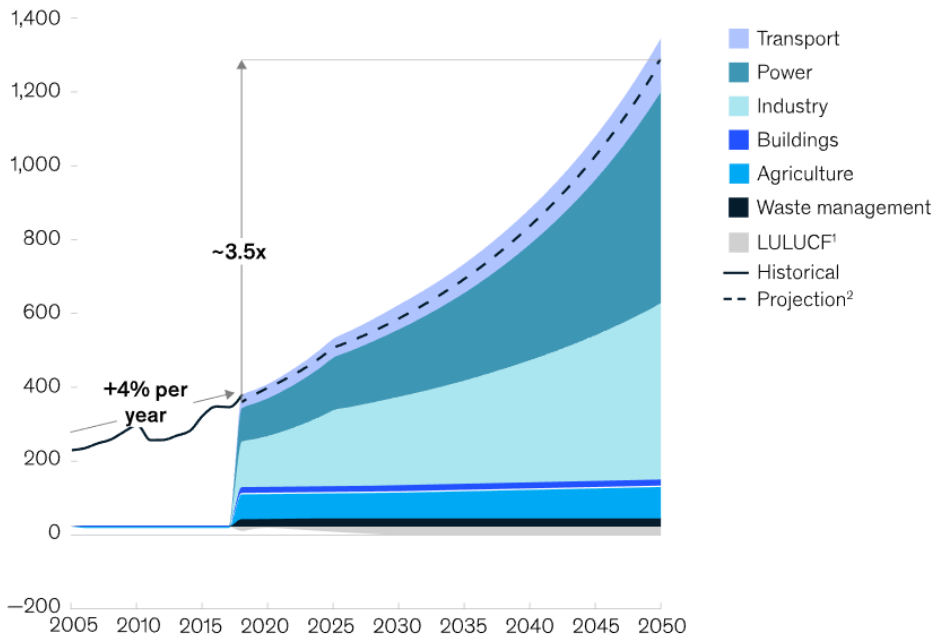

Figure 1. Vietnam Greenhouse-gas Emissions Trend ($GtCO_2e$). Source: Climatewatch, 2018

Vietnam faces high disaster risk levels, ranked 91 out of 191 countries by the 2019 INFORM Risk Index, driven particularly by its exposure to hazards. The country has extremely high exposure to flooding (ranked joint 1st with Bangladesh), including, riverine, flash, and coastal flooding. Vietnam also has high exposure to tropical cyclones and their associated hazards (ranked 8th). Drought exposure is slightly lower (ranked 82nd) but is still significant as highlighted by the severe drought of 2015–2017. Vietnam's overall ranking on the INFORM Risk Index is somewhat mitigated by its better scores in terms of vulnerability and coping capacity.

In Vietnam flooding represents a major threat to urban areas, particularly to urban infrastructure critical to national productivity, but also to exposed communities, often the poorest and marginalized. Research suggests that average annual losses in Ho Chi Minh City associated with 40cm of sea-level rise reach 1%–5% of the city's GDP dependent on the success of adaptation, while Hai Phòng has the potential to lose 0.5%–20% of its GDP also dependent on the success of adaptation (Hallegatte, S., Green, C., Nicholls, R. J., & Corfee-Morlot, J., 2013).

The effects of temperature rise and heat stress in urban areas are increasingly compounded by the phenomenon of the Urban Heat Island (UHI), which has been documented in urban conurbations around the world. Hard surfaces, residential and industrial sources of heat, and

air pollution can push temperatures higher than those of the rural surroundings, commonly anywhere in the range of 0.1°C–3°C in global mega-cities. Studies suggest Ho Chi Minh City experiences around 0.5°C–0.8°C of UHI. As well as impacting on human health (see Impacts on Communities) the temperature peaks that will result from combined UHI and climate change, as well as future urban expansion, are likely to damage the productivity of the service sector economy, both through direct impacts on labor productivity, but also through the additional costs of adaptation. Research suggests that on average a one degree increase in ambient temperature can result in a 0.5%–8.5% increase in electricity demand. Notably this serves business and residential air cooling systems. This increase in demand places strain on energy generation systems which is compounded by the heat stress on the energy generation system itself, commonly due to its own cooling requirements, which can reduce its efficiency.

Viet Nam has experienced a number of challenges in its energy sector in recent years. Total final energy consumption has grown 147% from 2010 to 2019 (IEA, 2021). Viet Nam achieved universal electrification in 2015 and, with an increasing population and economic growth, it is not surprising there is mounting pressure for a secure energy supply (World Bank, 2019a). The energy sector represented 68% of emissions in 2019 (Gütschow et al., 2021). Phasing out coal and gas and ramping up renewable energy would decrease national emissions levels considerably.

The recent draft PDP8 would lower the level of installed coal electricity generation capacity by nearly 15 GW compared to the current plan for 2030. Still, the draft doubles the current coal capacity to around 40 GW by 2030. The draft also foresees an additional 10 GW of coal electricity capacity added by 2045.

In February 2020, the Politburo issued Resolution No. 55 on the orientation of the National Energy Development Strategy of Viet Nam to 2030, with a vision to 2045 (Viet Nam Government, 2020c). The Resolution sets several targets for primary energy levels, total capacity of electricity generation, the total primary energy share of renewables, total final energy consumption, primary energy intensity, energy efficiency in the total final energy consumption and GHG emissions for the energy sector compared to business-as-usual (BAU). The Resolution supports the uptake of renewables, yet it also continues the development of coal, and also building the capacity for scaling up gas imports.

Viet Nam has the third largest coal power plant pipeline globally, behind China and India (Global Energy Monitor 2021). There is currently 19 GW of capacity in the pipeline in terms of announced, pre-permitted and permitted and an additional 8.6 GW under construction and 21 GW in operation (Global Energy Monitor 2021).The pipeline for coal is extensive and needs to be revised to avoid the risk of stranded assets, particularly given the need to phase out coal globally and in non-OECD Asia as a region by 2040 (Climate Analytics, 2019c, 2019b). Viet Nam's coal plans are also not compatible with Sustainable Development Goals (Fujii, 2018).

Resolution 55 supports policies to promote clean energy, such as increasing the share of wind and solar in the total primary energy supply, encouraging investment in waste-to-energy plants; development of renewable energy centres; supporting studies for geothermal, wave, tidal, ocean current energy; and supporting pilot projects for hydrogen (Viet Nam Government, 2020c). Resolution 55 includes a new renewable energy target for renewables to represent 15-20% in 2030 and 25-30% in 2045 in the total primary energy supply (TPES) (Viet Nam Government, 2020c). Viet Nam is leading the ASEAN region with floating solar plans, with 47 MW installed and 330 MW planned, whereas other ASEAN countries have less than 150 MW planned, and in 2019 most ASEAN countries had less than 1 MW of floating solar (Ahmed & Hamdi, 2020).

Viet Nam has a Development Strategy on Renewable Energy, with plans to 2030 and a vision to 2050 (MNRE, 2019). The potential for renewables is evidenced by a McKinsey and Company study, modelling a renewables-led pathway with five times more wind and solar than in the "Current Plan" (current policy pathway) (Breu et al., 2019). The renewables-led pathway includes gas and battery storage. The renewables-led pathway shows renewables representing over 50% renewable generation by 2030 compared to just 25% following current policy. Teske et al model renewable energy scenario with 50% renewable generation in 2030 and up to 90% by 2050 in Viet Nam (Teske et al., 2019). Another study finds that following a 1.5˚C pathway, renewable energy in Viet Nam can represent 100% of the power sector by 2040 and 100% of the total primary energy supply by 2050 (Climate Analytics, 2021).

The transport sector accounted for 20% of the total final energy consumption in Viet Nam in 2017 (IEA, 2019). In APERC's (2019b) Outlook, domestic transport demand has a sharp

increase with a compound annual growth rate of 3.7% (from 2015-2050). Road transport accounts for 97% of domestic transport energy demand in the same period (APERC, 2019b).

In Viet Nam, the transport sector plays a critical role in the socio-economic development with its GDP contribution reaching about 2.78% in 2019. The country's vehicle fleet has been rapidly growing at an annual growth rate of about 13.7% and 9% for automobiles and motorbikes, respectively. With these growth rates, Viet Nam has a high traffic density with more than 3.2 million automobiles and 36.6 million motorbikes in circulation in 2018. Motorcycles are the main means of transport in Viet Nam, reaching about 92% of the total vehicle fleet in circulation. The fast growth rate of road vehicles has exerted negative impacts on the environment and life quality. In fact, the transport sector has been identified as one of the main emissions sources causing air pollution with a CO2 emissions annual growth rate of 6 to 7%. Therefore, the transport sector is one of the key sectors targeted to achieve the climate change mitigation goals.

In Viet Nam, around 60,000 deaths each year are related to air pollution. According to the Ministry of Natural Resources and Environment (MONRE), most of Viet Nam's major cities are facing increasing air pollution. Particulate matter (PM) pollution is at a high level in large cities, especially in areas near major traffic routes. Recently, Hanoi and Ho Chi Minh City have risen in the rankings for PM2.5 levels for major cities in the world. With the current air pollution situation, Viet Nam has suffered economic losses estimated at between USD 10.8-13.2 billion associated with ambient air pollution each year, equivalent to about 5% of the country's GDP (IQAir, 2019).

In 2011, the Prime Minister approved a project to control transport pollution aiming to reduce GHG emissions (MNRE, 2019). In 2016, the Minister of Transport approved an Action Plan (2016-2020) relating to green growth in transport, and in 2016 he approved an action plan to reduce CO2 in civil aviation for 2016-2020 (MNRE, 2019). The government has a roadmap to mix A92 gasoline with at least 5% bioethanol, and compulsory energy labelling for LDVs and motorcycles, which is projected to encourage some renewables (4.6%) and electricity (minor levels) by 2050 (APERC, 2019b).

Viet Nam is trying to limit the number of motorcycles and cars to 36 million and 2 million,

respectively, but this is not deemed feasible in the APERC (2019b) Energy Outlook as two or three wheel vehicles already reached 60 million in 2016. APERC's BAU scenario (that includes current policies, see assumptions) projects that road transport will be dominated by fossil fuels to 2050 with 95% (APERC, 2019b). The VNEEP3 (2019-2030) aims to develop and implement energy conservation practice standards for all transport vehicles (MOIT, 2019). This is not quantified in the current policy pathway.

Viet Nam can reduce its carbon emissions in the transport sector by up to 9% by 2030 using domestic resources, and by as much as 15-20% with international support and private sector participation. Of this figure, the CO2 emissions reduction level of 15-20% can be achieved when electric vehicles (EVs) are brought into use at different levels.

In Viet Nam, mobility demand is high and increasing, with 206,673 million passenger-kilometres and 273,097 million ton-kilometres transported in 2018, reaching an annual average growth rate of 10.4% and 5.2% for passenger and freight performance demand in the period of 2014-2018. The high mobility demand and motorisation rate means that reducing GHG emissions and air pollution in the transport sector is a great challenge. Therefore, the Vietnamese Government has been applying a number of solutions to promote sustainable development through four focus areas: sustainable development, green growth, climate change, and environmental protection laws. As mentioned above, EVs have the potential to reduce GHG emissions in the transport sector. Viet Nam can achieve a 20% reduction of CO2 emissions in the transport sector in 2030 compared to BAU by setting up a clear roadmap for EV adoption in the period from 2020 to 2030. Specifically, Viet Nam would have to reach 30% of E2Ws in the motorbike fleet by 2030; 5% sales share for EVs in 2025 and a 30% share in 2030; and a 10% sales share for EV buses in the period from 2020 to 2030.

The e-mobility market in Viet Nam is at a very early stage. Until now, only e-bikes and e-motorcycles are frequently used and locally produced. According to the Vietnam Automobile Manufacturers Association (VAMA), nearly 500,000 E2Ws were sold in 2018, a 30% increase compared to 2017.

In transport, the prime minister has encouraged electric-vehicle (EV) adoption, EV-charging infrastructure, and the electrifi cation of public transit. Public stakeholders havetaken action

accordingly. The Ministry of Finance has reduced EV registration fees.Hanoi, HCMC, and Da Nang all have metro projects under way, which may reduce thepassenger share of personal vehicles. Hanoi and other cities have also talked aboutbanning two- and three-wheel vehicles with internal-combustion engines (ICEs) andhave already pedestrianized some neighborhoods on certain days. The Ministry of Transport is also planning high-speed rail, which could reduce the number of fl ightswithin the country (McKinsey, 2022).

Vietnam's GDP has increased by an average of 6-8% per year for many years. Along with this growth represents a substantial increase of population in urban areas. The generated amount of solid waste doubled in less than 15 years. The total amount of solid waste in 2015 was estimated at over 27 million tons. The total amount of solid waste across the country is predicted to increase to 54 million tons by 2030 (World Bank, 2018). If solid waste is increased rapidly in number with increasingly complex components, it absolutely puts enormous pressure on waste collection and treatment.

Vietnam has grown so rapidly and waste generation has increased so much, that the collection, transport, disposal and treatment systems and the financing for these systems, has been unable to keep up with the increased volumes of waste being produced. In 2014, the waste sector represented 7% of emissions (excluding LULUCF) (MNRE, 2019). In 2018 the Prime Minister approved the National Strategy for General Management of Solid Waste to 2025 with a 2050 vision, which included energy recover and GHG reduction (MNRE, 2019).

There is low public awareness and insufficient access to a formal waste collection and recycling system, which leads to substantial illegal littering of wastes by households in the canals, lakes and paddy fields and on the beaches and in oceans. The presence of plastics in coastal areas, beaches and other key natural tourism destinations, such as Halong Bay, causes substantial economic damage to Vietnam's tourism industry.

There are 660 landfills in Vietnam receiving some 20,200 tons of waste daily. Out of these 660 waste disposal sites across the country, only 30% can be classified as engineered landfills with daily coverage of waste. The cities of Hanoi and Ho Chi Minh City (HCMC) have mega landfills covering areas of 85 ha and 130 ha respectively. Most of landifills have no compactor, landfill gas collection, leachate treatment or environmental monitoring system and are poorly managed, mostly due to lack of funding. This is causing multiple environmental and health

problems and risks particularly in areas with high waste generation levels and population density.

Of the MSW generated, currently only 10-15% is reused or recycled (Jäger and Münchau, 2020). Much of that recycling takes place in 'craft villages', where the low technology processing techniques utilized create significant pollution of the surrounding environment, particularly from water run-off. Nationally, the absence of waste separation at source prior to collection is rife. The most common form of managed disposal is landfilling, although several provinces and municipalities are exploring incineration technologies (including waste-to-energy applications) as a waste management solution (Rucopero, 2019).

Environmental protection has been strengthened, especially in waste collection and treatment. Specifically, the total amount of solid waste collected and treated meeting appropriate technical requirements increased swiftly in the period of 2014-2018 (see Figure 2).

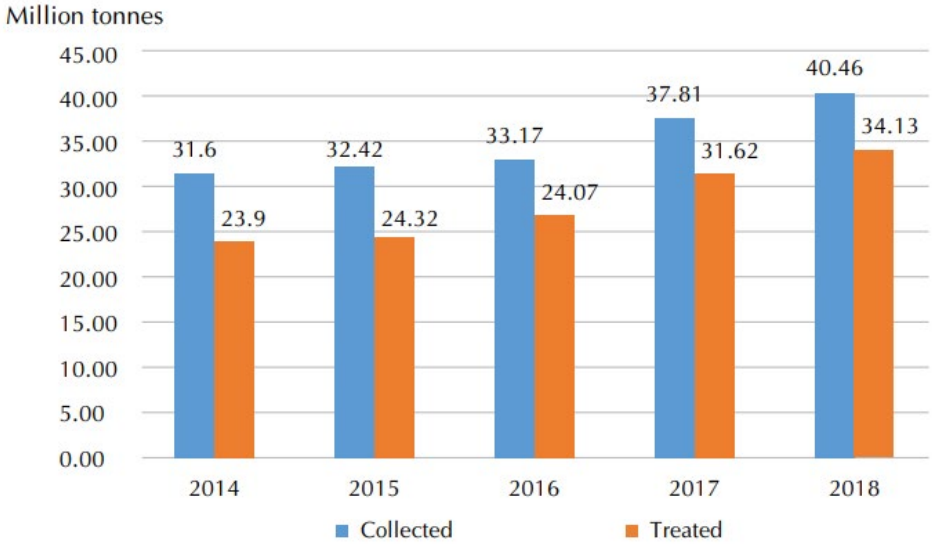

Figure 2. Amount of solid waste collected and treated. Source: GSO (2019), Statistical Yearbook 2018.

Vietnam has committed itself to move towards collecting, transporting and treating 100% of non-household waste by 2025 and 85% of waste discharged by households by 2025 in urban areas through its recently approved revised National Strategy on Solid Waste Management. Priority is envisaged to be given to large-scale treatment facilities using modern technologies with a substantial focus on recycling and upgrading landfills to prevent environmental and health impacts. Municipalities, regional and central governments, however, are currently

struggling with the collection, transport, treatment and disposal of the growing waste streams. Vietnam has grown so rapidly and waste generation has increased so much, that the collection, transport, disposal and treatment systems and the financing for these systems, has been unable to keep up with the increased volumes of waste being produced.

On June 7, 2022, the Prime Minister signed the Decision approving the project of developing circular economy in Viet Nam. The objective of the Circular Economy Development Project is to create a driving force for innovation and improve labor productivity, contributing to promoting green growth associated with restructuring the economy, renewing the growth model according to towards enhancing efficiency, circular cohesion between businesses and economic sectors, improving competitiveness and resilience of enterprises and supply chains to external shocks, in order to contribute to achieving be economically prosperous, environmentally sustainable and socially just; towards a green economy and contribute to the goal of limiting global temperature rise.

Accordingly, the plan aims to decrease greenhouse gas emissions per GDP by at least 15 percent compared to 2014. In addition, the plan sets goals to reuse, recycle and treat 85 percent of plastic waste and reduce 50 percent of plastic waste in the sea and ocean.

By 2030, circular economy models will help raise the rate of urban solid waste collection and treatment to 50 percent, recycling 100 percent of organic waste in the urban areas and 70 percent of organic waste in the rural areas. By 2025, circular economy projects are expected to contribute to recovering renewable resources, reducing energy consumption, and increasing the rate of renewable energy, rate of forest coverage, and waste recycling.

Particularly, the plan highlights the importance of increasing the awareness and investment of domestic and foreign enterprises and investors in the circular economy as an approach to successfully adopting a circular economy model.

Viet Nam has promulgated and implemented many important policies related to climate change responses at all levels. Viet Nam has completed and submitted its updated nationally determined contribution (NDC) to the UNFCCC Secretariat on September 11, 2020. In particular, Viet Nam has increased its climate change response contributions. Accordingly, by 2030, Viet Nam, with its domestic resources, will have reduced its total GHG emissions by 9% compared

to the business as usual (BAU) scenario. This contribution can be increased to 27% when the nation can receive international support through bilateral and multilateral cooperation, and implementation of the new mechanisms under the Paris Agreement. The NDC mentions the following strategies which reflect the elements relevant to the Urban Pathways project: changing the fuel and energy structure in industry and transportation; shifting passenger and cargo transportation models; promoting efficient exploitation of renewable energy sources; and waste management.

In Viet Nam, sustainable transport policies are guided by law, national strategies and action plans of four key categories (see Figure 3), including: 1) sustainable development, 2) green growth, 3) climate change and 4) environmental protection.

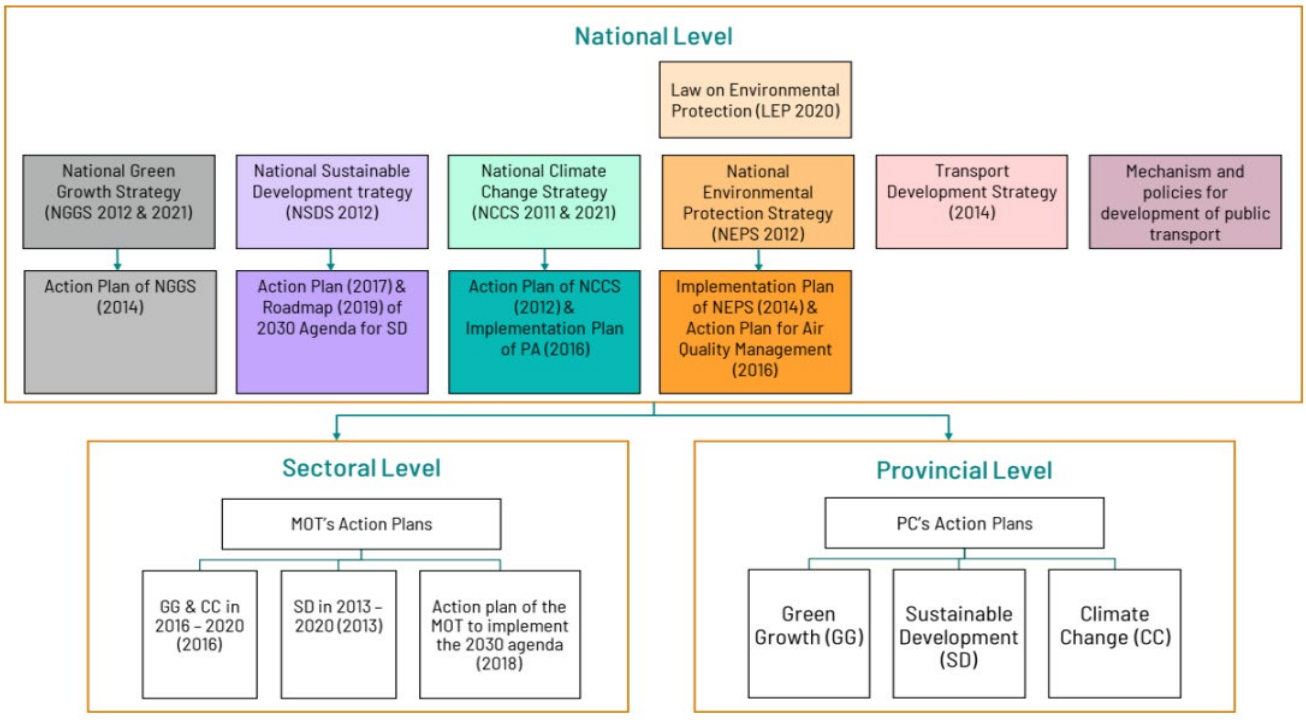

Figure 2.14. Overview of sustainable transport policies in Viet Nam

(Source: Consultant team)

Figure 3. Overivew of sustainable transport policies in Viet Nam. Source: GIZ, 2021 (NDC Transport Initiative for Asia - Viet Nam Component)

To meet these international commitments, the GOVN has endeavoured to implement a co-ordinated policy and organizational system to respond to climate change. The most important orientation documents are the Party Central Committee's Resolution 24-NQ/TW on active response to climate change, the National Strategy on Climate Change and the National Strategy on Green Growth, and the Government's Resolution 120/NQ-CP on sustainable development of the Mekong Delta in adaptation to climate change. These policies are supported by key climate change programs such as the Plan for the Implementation of the Paris Agreement on Climate Change, and the scheme for managing GHG emissions and carbon credit trading in the world market. These policies identify overarching goals with a focus on adaptation objectives, and have been made concrete through important projects, programs and a variety of resources for implementation up to next years. Climate change adaptation issues have been also codified through various legal documents such as the Law on Natural Disaster Prevention and Control, the Law on Irrigation, the Law on Water Resources, the Law on Economical and Efficient Use of Energy and the Law on Environmental Protection. Some guiding documents issued at ministerial level (including action plans to respond to climate change issued by MARD, MONRE, MOTC and MOC) have harmonized contents of the national strategies and action plans with the mandates and tasks of these Ministries and sectors.

Many objectives of the National strategy on climate change have been achieved, spanning in such important sectors as energy, construction, transport, industrial production, agriculture and waste management. In the framework of the National green growth strategy, many important policies have been promulgated to promote the development of renewable energy (RE), improve energy efficiency, and reduce GHG emissions intensity in the key sectors of energy, construction, transport and industrial production. In addition, two major national programmes, namely the Target programme for climate change response and green growth for the period of 2016-2020, and the 2030 Sustainable development agenda, have also been implemented synchronously in most of the provinces and centrally-run cities.

Vietnam's National Green Growth Strategy (2011-2020 with a vision to 2050) puts forward targets for GHG (and energy) reduction, improving energy efficiency, and put forth conditional commitments for 2020, 2030 and 2050 (2020: 8%-10% reduction against 2010 levels; reduce annual GHG emissions by 1.5% to 2% annually in the period 2030 to 2050). The said strategy

contains 17 action plans, including those that focus on transport systems and technologies. It also states a goal of reducing GHG emissions from energy activities (between 10%-20% reduction compared to the baseline). Other relevant strategies relate to energy infrastructure, sustainable urbanization and promotion of sustainable consumption and building green lifestyles.

The National Power Development Plan 2021-2030 was announced and lays down the strategies to achieve renewable energy targets set for 2030 (15-20% of total energy share) and 2045 (2030-2045). On energy efficiency, Vietnam has a comprehensive "Energy Efficiency and Conservation Law" (No. 50/2010/QH12) which took effect from 2011. It governs the issuance of a building energy benchmark system, and a building code - including stipulations on design, construction, and materials – towards energy savings and efficiency.

Vietnam's Transport Development Strategy (Decision No. 355/QD-TTg) aims to achieve "modern and high-quality transport systems with reasonable cost, safety, reducing environmental pollution and energy saving by the application of advanced transport technology, especially multi-modal transportation and logistics." It also underlines the goal of restricting the growth of private motorized vehicles to 4 million cars, and 40 million motorcycles (2020). Such targets are aligned with locally relevant master plans, such as the Hanoi Region Urban Transport Master Plan 2020 which sets out the strategic development framework for the region, and focuses on the development of a mass transit network (metro and BRT) which is envisaged to be fully operational by 2030. Vietnam's National Climate Change Strategy targets that 20% of buses and taxis would utilize compressed natural gas (CNG) and liquified petroleum gas (LPG) by 2020, and 80% by 2050.

Along with national policies, sectoral policies have also been actively and effectively implemented, specifically in the following sectors:

- In the energy sector, the implementation of the Viet Nam RE development strategy by 2030 with a vision to 2050 has reached and exceeded the development targets for RE with solar power (4,696MW), wind power (377MW), biomass power (325MW) and small-sized hydropower (3,647MW).
- In the construction sector, the Action plan on GHG emission reduction in the cement industry by 2020 with a vision to 2030 was approved and 24 of 59 urban areas have pro-

mulgated documents to direct and implement the development of green growth urban areas.

- In the transport sector, E5 gasoline consumption has increased and accounted for about 40% of the total gasoline consumption. Viet Nam has also applied a tax policy based on engine capacity and fuel use, and incentives of lowering tax on electric vehicles.
- In the agriculture sector, three important laws, including the Law on Irrigation, Law on Fisheries, and Law on Forestry, have been enacted within the framework of the Green growth action plan of the agriculture and rural development sector by 2020; the system of rice intensification (SRI) has been implemented in 29 provinces with a total cultivated area of 394,894 ha.

At the local level, mitigation actions have been implemented in several main forms such as participating in regional/national GHG emission reduction projects, implementing small-scale local pilots and performing investments for public and private projects. The implementation of GHG emission reduction actions and projects also creates co-benefits and brings certain benefits to the process of climate change adaptation and the achievement of the sustainable development goals (SDGs).

On the reduction of GHG emission intensity and increase of the use of renewable energy, so far, GHG emission reduction measures have been implemented extensively across all sectors. In the 2011-2015 period, the energy conservation rate of Viet Nam reached 5.65%, equivalent to the total energy saving of 11.3 tonnes of oil equivalent (TOE), of which, the energy intensity of industries that consume a large amount of energy has gradually decreased, e.g. by 8.09% for the steel industry, 6.33% for the cement industry, and 7.32% for the textile industry.

Last, but not least, waste management is increasingly becoming a priority for many developing regions, including Vietnam. According to the Prime Minister's Decision 491/QD-TTg (2018) that approves the adjustments to the National Strategy for the General Management of Solid Waste until 2025 with a Vision Towards 2050, Vietnam commits towards achieving targets relating to the collection, transport and treatment of waste by 2025 (100% of non-household waste; 85% of household waste). In Hanoi, domestic solid waste generation is expected to increase proportionally to the population growth (4.75% annual growth rate from 2016 up to 2030), translating to a 54% increase in per capita solid waste generation in this period (from

1.03 kg/day to 1.59 kg/day) (Berg and Thuy, 2018).

The National strategy on climate change, approved under the Decision No.2139/QD-TTg dated December 05, 2011, of the Prime Minister, has so far achieved following important results:

- Energy: by October 2020, Viet Nam had had 11 wind power plants operating with a total capacity of 500 MW, put 106 solar power plants with 6,000 MW of capacity into operation; had 325 MW of biomass power capacity grid-connected and had 10MW of solid waste power capacity; the proportion of renewable energy (RE) had reached about 11.2% of the total primary commercial energy with total output having reached 4.4%; about 700,000 solar-run water heaters had been installed. The energy conservation were estimated to have reached 5.65% in the 2011-2015 period and will reach 1.0% per year of the total national energy demand in the upcoming years.
- Transport: tax policies based on engine capacity and fuel type has been applied while taxes have been lowered for electric vehicles (5-15%). In 2018, passenger transportation by bus reached 13.7% and 9.38% in Ha Noi and Ho Chi Minh City, respectively. The consumption proportion of biofuel (E5 gasoline) increased to about 40% of the total gasoline consumption. 100% of newly-manufactured, assembled and imported cars have complied with applicable emission standards;
- Waste: all 63 provinces and centrally-managed cities have approved solid waste management planning. 71% of bio-solid waste has been landfilled, 16% of waste has been composted and 13%, incinerated without energy recovery. 86.5% of urban domestic solid waste and 63.5% of rural solid waste were collected and treated in 2019. 8-12% of urban domestic solid waste has been recycled. 89% of industrial zones have installed wastewater treatment systems. Investments have made to generate 10 MW of power from solid waste.

On the development of action plans on green growth, the institution development and the implementation of the National green growth strategy have been carried out with the development and issuance of action plans on green growth of ministries and localities. By December 2020, three ministries and 35 localities had approved their action plans on climate change response in the 2016-2020 period with a vision to 2050; five ministries and 55 localities had approved their action plans on implementing the Paris Agreement; 25 localities had published their local

climate assessments; the National action plan on climate change response for the 2016-2020 period with a vision to 2050 and the national climate assessment had been completed; the Climate change and sea-level rise scenarios had been updated for Viet Nam; the database on climate change in Viet Nam had been developed; communication activities had been conducted to disseminate knowledge in localities and areas heavily affected by climate change.

Viet Nam announced a target to achieve net zero by 2050 target during the COP26 World Leaders' Summit in 2021. In July 2022, Viet Nam enshrined its net zero target in law, and also developed a National Climate Change Strategy to guide its planning to achieve this target. Viet Nam's net zero target is conditional on the receipt of international financial support.

In the National Climate Change Strategy, the government of Viet Nam sets a cap on total emissions of 185 MtCO2e in 2050. The emissions cap is divided between the energy (101 MtCO2e), industry (20 MtCO2e), agriculture (56 MtCO2e), and waste (8 MtCO2e) sectors. The strategy aims at compensating for the remaining emissions with removals from the land use, land-use change and forestry (LULUCF) sector, as well as an increase in carbon sequestration in the LULUCF sector. It is expected that the combination of these actions will allow Viet Nam to achieve net zero in 2050 (Climate Actio Tracker, 2022).

In January 2022, the revised Law on Environmental Protection (LEP) 2020 came into effect (replacing an older law from 2014) (Viet Nam Government, 2020b). The law introduces a domestic carbon market with an emissions trading scheme, where businesses will have an emissions quota that can be traded. The law also allows for a carbon tax. The effectiveness of the carbon market depends on the carbon price, and the cap on emissions. A high cap on emissions would undermine the effectiveness of a carbon price; monitoring and enforcement would be critical (Do & Burke, 2021). The Ministry of Natural Resources and Environment (MORE) is developing a decree related to carbon pricing (Thi Khanh et al., 2021).

SUMMARY OF URBAN PILOT AND DEMONSTRATION ACTION

In the city of Hanoi, Urban Pathways has been engaged above all in the promotion of sustainable mobility. Public transport in Hanoi is only estimated to account for 10% of the trips as passenger transport demand is met primarily by private motorized two-wheelers. Therefore, the project concept on E-mobility (shared e-2 wheelers) was developed together with a local partner – University of Transport Technology. The project tried to find synergies with an on-going IKI project on e-2 wheelers named 'Integrating electric 2&3 Wheelers into Existing Urban Transport modes in Developing and Transitional Countries', led by UNEP. The feasibility study, technical assessment, standards and policy support for e-2 wheelers from the on-going IKI project will be considered in the shared e-2 wheeler demonstration project. Moreover, Urban Pathways also plans to support Hanoi on waste reduction activities and promote active mobility.

The City of Hanoi is the capital of Vietnam, and is home to approximately 7.7 million residents and is the second most populated city in the country (around 8% of the total population of Vietnam). It features an urban area roughly 320 sq. km in size.1 The city is also the cultural, commercial and educational centre of Northern Vietnam. Its economy is primarily based on tertiary sector industries, and has robustly grown in the last years (7.6% growth in 2018; 21.6% export growth in 2018) (Voice of Vietnam, 2019). The Hanoi Capital Region (or the Hanoi Metropolitan Area) is composed of the City of Hanoi and its adjacent municipalities, and is home to 16.1 million inhabitants (24 thousand sq.km). It is estimated that 11.5 million trips are conducted each day in the city. Public transport is only estimated to account for 10% of the trips as passenger transport demand is met primarily by private motorized two-wheelers (Ahn, 2019). This mode share has essentially stayed at 10% since 2010 (Molt, 2010 as quoted in Allaire, 2012).

Hanoi currently has 91 bus lines, 1,500 buses and 1 BRT line. The City also has 18,000 taxies that serves 120 million passenger trips per year (Ahn, 2019). Approximately 5 million motorcycles are plying in Hanoi's streets (Blain, 2019). In the 1980s, non-motorised and public transport modes – primarily bicycles and trams - dominated the streets of Hanoi. The country underwent a period of economic liberalisation in 1986 which led to the rise of the use of

motorcycles which provided affordable, fast and reliable (suited for the urban environment) transportation services. The estimated motorcycle ownership rate in 2009 in the city was 600 per 1,000 inhabitants. Using the known current figures, the motorcycle ownership rate stands at 640 per 1,000 inhabitants.

A recent decision (September 2019) by the Hanoi People's Committee puts on further plans to develop the public transport network in the city and reduce the number of individuallyoccupied vehicles to 25% by 2020 and encourage the use of public transport and bicycles. The city will be expanding the bus network by adding 45 new routes by 2020, some of which will be incorporating priority lanes for buses. The city is also planning to develop park-and-ride facilities near major public transport stations in order to encourage multimodal journeys (Intelligent Transport, 2019).

The City of Hanoi intends to ban the use of motorcycles in the inner city by 2030. It also intends to introduce bike and e-bike sharing systems in order to improve last mile connectivity to the mass transit systems. A roadmap for phasing out conventional motorcycles is also being developed. Bike lanes are also being developed in several parts of the city. Recent discussions have been conducted regarding implementing congestion charging in the downtown areas of the City (Intelligent Transport, 2019).

E-mobility for last-mile connectivity: The demonstration project in Hanoi focuses on boosting the ridership and effectiveness of the currently running BRT and the forthcoming metro rail with shared e-2 wheelers as last-mile connectivity. The shared E-scooter/E-mopeds system, which is being implemented, will be equipped with state-of-the-art docking-cum-charging stations and contactless payment that provides a hassle-free experience of e-mobility and clubbing it with longer trips on public transport. The project aims at being a win-win for both public transport and e-mobility. As the city of Hanoi intends to ban the use of motorcycles in the inner city by 2030 responding to vehicle emission, this project will support the plan to phase out conventional ICE 2-wheelers. The demonstration also supports promotional activities to raise awareness on EVs, strengthen local capacity on EV manufacture, develop appropriate business models and enhance vehicle integration (Figure 4). The demonstration project will have a high potential to not only make e-mobility attractive but also reduce the GHG emissions from transport and increase the share of public transport use.

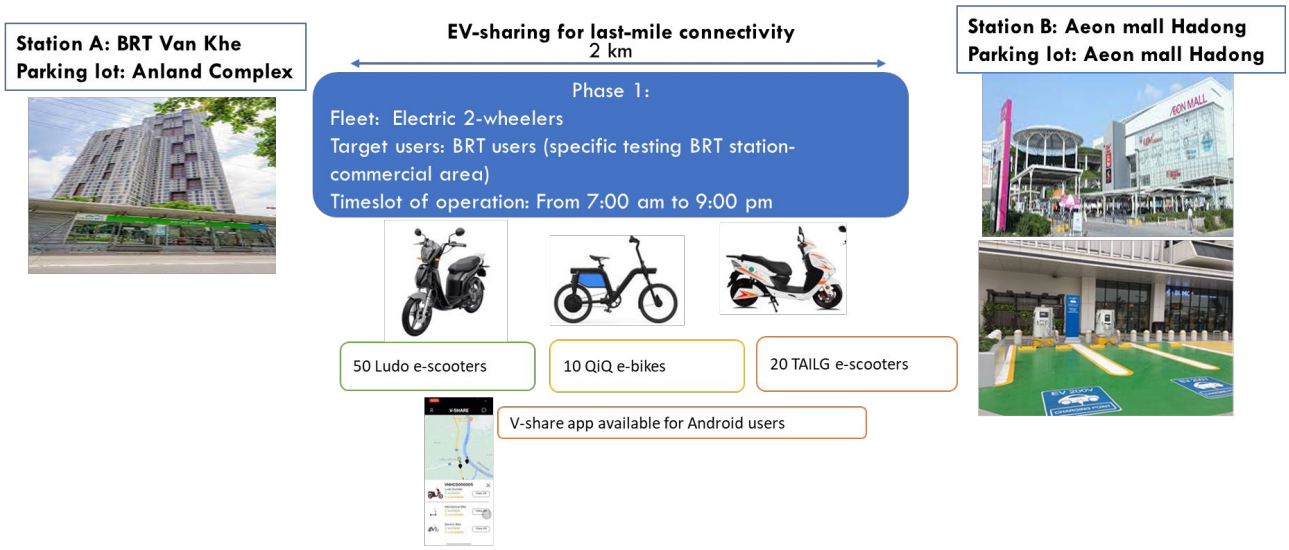

Figure 4. Overview of demonstration project in Hanoi (Source: Clean Air Asia, SOLUTIONSPlus)

The demonstration project concept developed under Urban Pathways was submitted on 25 April 2019 as a part of EC H2020 proposal for funding. It is being implemented by the SOLUTIONSplus project (project duration 01/2020 – 12/2023) together with the local partner University of Transport Technology (UTT) in Hanoi.

User needs assessments were conducted in November 2020 to gain further insights into elements that should be considered in the further definition of the demonstration components, as well as potential scale-up programs. The user needs assessment guide developed by DLR was customized to fit the context of Hanoi. Overall, 07 interviews have been conducted as part of the exercise. The interviews covered stakeholder representatives from potential end users, local and national decision makers, as well as other relevant stakeholders operating within the realm of e-mobility in Hanoi and Vietnam. They are representatives from the Department of Environment - Ministry of Transport, Hanoi Department of Transport, Hanoi Department of Natural Resources and Environment, Hanoi Transport Service Company (TRANSERCO), Honda Vietnam, Vietnam National Traffic Safety Committee, and the GIZ Vietnam.

Furthermore, the Hanoi City team consolidated their insights on the proposed weighted key performance indicators (KPIs) and casted their votes on which ones to include in the final list of weighted indicators that are to be adopted across the different demonstration cities with-

in the SOLUTIONSPlus project. The team also identified the following as key topics that it would be included in the capacity building package: charging infrastructure network planning (from the perspective of Local government units); charging: Public transport and Intermediate Public Transport (3 wheelers); technical specifications and standards: charging equipment; technical specifications and standards : e-vehicles ; managing evehicle registration and usage: best practices; mobility-as-a-service: setup and implementation.

Discussions with the relevant decision makers (e.g. Department of Transport, and the mall operator) in regard to the location of the parking/docking areas for the scooter sharing system have been conducted, and full support has been garnered. Moreover, initial discussions towards exploring opportunities towards the integration of the scooter sharing system into the electric bus routes to be selected within the e-bus pilot of Vinfast have taken place.

POLICY RECOMMENDATIONS

As Vietnam gears further towards increasing levels of urbanisation and development, the importance of implementing locally appropriate, synergistic solutions is becoming increasingly important. Enabling and mobilising local communities in the process of co-ideation, testing, evaluation, and refinement of such solutions is a key strategy towards accelerating the attainment of the sustainability-related goals as set forth by the relevant national and sub-national authorities.

Based on the insights arising from the Urban Pathways work in Vietnam, the following suggestions for the national level authorities to accelerate sustainable transformation at the urban level are put forth:

- Setting up an urban living lab financing mechanism that would support bottom-up initiatives exhibiting significant potential towards addressing multidimensional urban challenges (e.g. urban transport, energy, waste management, among others) could accelerate the engagement and cooperation of local stakeholders in the pursuit of Vietnam's sustainability goals.
- The aforementioned proposed financing mechanism can be complemented by the creation of a national network that can help facilitate the scaling up of local innovations by providing assistance in terms of finding potential opportunities for private-private partnerships for scaling up, lowering potential barriers for scaling-up (e.g. regulatory, legal, among others), facilitating the integration of learnings into wider planning and policymaking processes.
- A national program should be developed that aims to improve the capabilities of urban authorities towards the realisation of the NDC, SDGs and the New Urban Agenda. In the immediate term, the program could focus on the creation of guidelines that would aid in consolidating highly-relevant information needed by local authorities to contribute effectively and efficiently in the wider sustainability goals. The program can also facilitate targeted training programs for authorities involved in urban planning and management that would ultimately enhance the synergistic cohesion of local sustainability measures.

- The creation of sector specific programs and plans, focusing on urban sustainability issues, such as the National Urban Mobility Plan to set nationally defined urban transportation guidelines, can be facilitated through the national program mentioned above. While focussing on one sector, they also need to take other sectors into account, e.g. including energy and waste aspects in the National Urban Mobility Plan. Regarding the Circular Economy Strategy, that is currently being worked on (see above), it should include mechanisms, such as extended producer responsibility (EPR) schemes, product-based approaches and creation of "circular economy spaces" (connecting business and production activities into circular economic cycles in a certain economic space, which can be implemented at different levels such as industrial parks, cities, provinces).
- Development of an awareness raising and educational program which targets wider sets of stakeholders at the local level regarding sustainability issues and the relevant processes Addressing such a need is highlighted in Vietnam's voluntary national review on the implementation of the SDGs (Government of Vietnam, 2018). The awareness campaign could promote the importance of local actions towards addressing the wider sustainability goals, and how these goals would translate at the local level.
- Support towards the generation of open data at the urban level would be beneficial in accelerating the knowledge building on urban issues and facilitate the engagement of support from different stakeholders in aiding urban planning and management (e.g. research institutions, civil society, funding organisations, among others). This would contribute significantly to the open data initiatives that have been launched in the recent past (i.e. national open data portal). This should also include developing a national inventory on emissions, by sector. At the national level, the following actions can be considered: formation of guidelines for the prioritisation and standardisation of urban-relevant data; incentivising the contribution of data by relevant stakeholders private sector; establishment of policies for data sharing relevant to the provision of urban services (e.g. as a requirement for service providers such as mobility services); ensuring that the infrastructure (open data portal) reflects urban level data; provision of capacity building programs for local governments to stimulate open data generation at the local level.

- Build a mechanism of information and data sharing among ministries, agencies, and localities.
- Raise the awareness of ministries, sectors, localities, and businesses on benefits of GHG emission reduction.
- Develop a system for reporting quantitative GHG emission reductions of projects with mitigation potential.
- Conduct capacity building programmes and activities for ministries, sectors, and localities in integrating climate change issues into policy making and mitigation impact assessment for developed policies.
- Prioritize renewable energy in national power planning. There are alternative scenarios where renewables (excluding hydropower) could account for up to 30% of capacity by 2030. These alternative scenarios, which are aligned with Vietnam's Nationally Determined Contribution (NDC) commitments, require regulatory support and incentives to leverage private sector investment now seeking opportunities to invest in Vietnam.
- Construct a regulatory and permitting environment that attracts private sector and smaller scale off-grid investments in clean energy generation and energy efficiency.
- Invest in grid infrastructure to improve stability and capacity: as renewable energy sources grow in contribution to the grid, there are challenges associated with incorporating more decentralized power plants that provide intermittent power supply. Given the surging increase in solar and wind generation, especially in the southern region, there is an urgent need for investment to strengthen and expand the transmission and distribution network.
- There is still a lack of pioneer legislation in solid waste management such as the regulation on the market of solid waste. Economic tools for solid waste management and decentralization in solid waste management are still unclear. Up to now, the control and restriction of pollution sources are facing many difficulties due to weak resources. Therefore, it is necessary to develop a roadmap for solid waste sources control and treatment. Determining the priority order in each phase for each type of solid waste is also a specific need.

- Institutionalize market principles as well as the "polluter pays principle" or "externality cost" so that environmental cost is incorporated into pricing for environmental pollution remedy, environmental rehabilitation, and habitat restoration, especially waste treatment (e.g. solid waste treatment should be charged at market prices).

- At the local level, the main agency responsible to the provincial People's Committee for solid waste management is the Department of Natural Resources and Environment. Therefore, it is necessary to revise the legal documents related to the functions and tasks of State management of solid waste of ministries, branches and localities to improve the effectiveness and efficiency of state management.
- Community-based waste collection and classification efforts should be encouraged. Role of the local community should be promoted to become a contributor to local solid waste management policies as well as a conductor, inspector and supervisor for local solid waste management.
- To successfully attract the participation of the public sector, the legal system on solid waste management must stipulate provisions in details, including the identification of obligations and responsibilities of all stakeholders, i.e. State management agencies on solid waste and emission owners (residents, households, businesses, etc), terms, articles on how to treat waste at its source during collection, transportation and disposal. Relevant regulations must be enforced, which means that the authorities have to control waste management at different stages from the time of waste generation to the final disposal.
- Formulate the linkages between regions in management and use of natural resources and environmental protection, focusing on the effective use of inter-provincial and inter-regional resources (such as water resources and natural habitats); as well as prevention and minimization of inter-provincial and inter-regional environmental issues and conflicts (wastewater, ocean plastic waste).

- Organize training courses to improve the capacity of environmental protection and management, particularly solid waste management for specialized government officials at the central and local levels.
- Vietnam will therefore need to envision a phased-approach of gradual improvements to its solid waste management to move towards a modern, integrated and sustainable solid waste management system at affordable costs and this will require changes across all levels and dimensions in addition to new technology and infrastructure to reach the targets as foreseen in its National Strategy.
- The current landfills without landfill gas collection, adequate leachate treatment or bottom liner and absence of sufficient compaction and daily covering of waste, needs urgent improvement to reduce the environmental impacts of landfills.
- Optimizing collection, transport and landfill disposal is also important in order to focus on the affordability of the system which aims for cost-recovery levels not requiring fee levels of more than 1.5 percent of household income and reducing the amount of state subsidies required.
- Plastic reduction, recycling and alternative policies should be considered as an issue of priority, as they can reduce the generated waste and "leakage" of such waste into the environment, rivers and ocean.
- Preparation of a national plan for management of industrial (hazardous) waste, distinguishing between the different types of industrial (hazardous) waste streams.
- Need for the enforcement of the National Strategy on Integrated Solid Waste Management of up to 2025, vision towards 2050 and an assessment of the accomplaishments, considering the first targets established, whchc should be reached by 2020.
- In the current context of Viet Nam, HEVs should be considered an interim step and intermediate vehicle before transitioning all internal combustion engine-based vehicles to EVs.

- For cities with large populations and land scarcity for infrastructure, small-sized EVs should be widely used because they have been proven to save energy and parking space. In addition, it is essential to develop a specific strategy to manage and control the smart grid when demand for EVs is increasing.
- Based on the experience of leading countries, policies aiming to create a steady foothold for EVs in the market should not only concentrate on consumers. Instead, these policies should aim at niche markets such as the car-sharing market and postal fleets, and/or focus on green consumers.
- For cities, it is necessary to have clear steps for developing and expanding the e-mobility market. The development of transportation infrastructure should be the priority, followed closely by technology and EV standards.
- In addition to promoting the development of the EV market, the government also needs to manage waste batteries closely in order to guarantee that e-mobility is an eco-friendly choice. Recall and recycling of EV waste batteries will not only avoid a huge burden on landfills, but it will also help manufacturers secure the supply of critical materials, such as cobalt and lithium. This plays an important role in maintaining a sustainable automotive industry.

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