



General Project Information	<p><u>Project title:</u> Promoting green electric mobility (e-mobility) solutions for urban transport in Bhutan and the wider Hindukush-Himalaya region</p> <p><u>Project number:</u> to be implemented as subcomponent of the project 140277 “Start-up and first operational phase of the Renewable Energy and Energy Efficiency Capability for the Hindu Kush Himalaya” Link: https://open.unido.org/projects/M3/projects/140277</p> <p><u>Geographical area:</u> Thimphu, Bhutan, and the wider Hindukush-Himalaya region</p> <p><u>Donor:</u> Austrian Federal Ministry for Europe, Integration and Foreign Affairs (MFA) <u>Implementing partner:</u> UNIDO <u>Executing partner(s):</u> Ministry of Information & Communications/Thimphu and the International Centre for Integrated Mountain Development (ICIMOD)</p> <p><u>Project duration:</u> September 2019 to November 2022 (aligned with the project 140277)</p> <p><u>Project costs:</u> 442,478 Euro / 57,522 Euro UNIDO support costs (13%) <u>UN coordination levy:</u> 5,000 Euro (1% of 500,000 Euro) <u>Total project costs:</u> 505.000 Euro (provided by MFA) <u>Committed co-funding to the project:</u> Ministry of Information and Communication (MoIC): Euro 2,2 million (through GEF-UNDP project), and Euro 800.000 Austrian Development Agency (ADA) for the REEECH project, Euro 1,2 million (WB-GCF grant)</p>
Introduction/ short summary	<p>The following project is being implemented as sub-component of the project 140277 “Start-up and first operational phase of the Renewable Energy and Energy Efficiency Capability for the Hindu Kush Himalaya (REEECH)”. REEECH is currently under establishment and will be hosted by the International Centre for Integrated Mountain Development (ICIMOD) in Kathmandu, Nepal. UNIDO is supporting the centre under the umbrella of the Global Network of Regional Sustainable Energy Centres Programme (GN-SEC).¹ REEECH will act as a regional hub and think-tank for sustainable energy mountain issues particularly focusing on the up-scaling and replication of national efforts in the areas of policy and regulation, capacity development, knowledge management and awareness raising, as well as investment and business promotion.</p> <p>The project is fully demand driven and in line with the national and city priorities. The project document was prepared in a consultative process between the UNIDO project manager and senior planning officers of the Ministry of Information and Communications (MoIC). H.E. Karma Donnen Wangdi, Minister for MoICC, Royal Government of Bhutan (RGoB) has endorsed the project already. The project is also well aligned with the starting GEF-UNDP Project “Bhutan Sustainable Low-emission Urban Transport Systems” and the World Bank (WB) preparatory project “Green Transport City Programme for Thimphu”, funded by the</p>

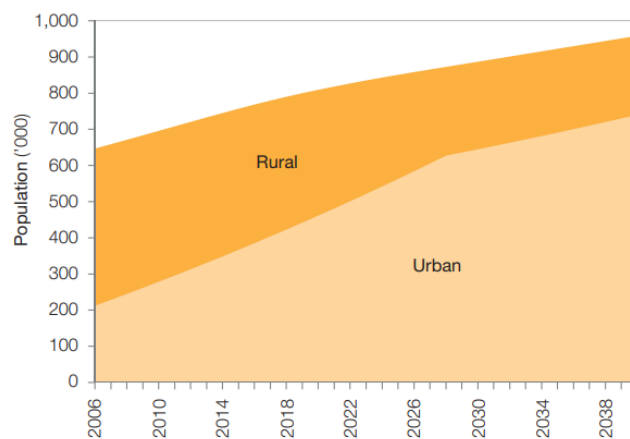
¹ www.gen-sec.net

Green Climate Fund (GCF). Coordination will be ensured by MoIC which is the main counterpart and national execution entity for all three projects. It is intended to establish a joint Steering Committee involving UNDP, UNIDO and the WB (incl. the Green Technology Center Korea (GTCK) as WB executing partner).

The primary focus of the Austrian funded e-mobility project will be on Bhutan. The UNIDO assistance is expected to supplement the efforts of the Royal Government of Bhutan to introduce urban e-mobility solutions in Thimphu, the capital city of Bhutan. The availability of low-cost hydropower base-load capacities makes Bhutan an ideal place to pioneer low-carbon e-mobility. This effort of UNIDO will complement the on-going e-mobility initiative in Thimphu under the GEF-assisted “Bhutan Sustainable Low-emission Urban Transport Systems” that is intended to create the required policy, regulatory and institutional framework, and to establish charging infrastructure to replace about 300 conventional taxis by electric taxis on a pilot basis. The project is fully aligned with the e-mobility policies and strategies of Bhutan and is also consistent with the Sustainable Development Goals 11 and 13, in particular. The project is a concrete contribution to the implementation of the *Bhutan Transport 2040 Integrated Strategic Vision*. It is also in line with the *Bhutan Vehicle Emissions Roadmap* which was adopted in 2017 and which deals particularly with fuel standards.

Bhutan’s new focus on e-mobility is based on recent urbanisation trends. Around 37.8 percent of Bhutan’s population resided in urban areas in 2017, compared with 30 percent in 2005. Thimphu has the largest population of 138,736 residents accounting for 19.1% of total population. Rapid urbanisation has led to alarming growth of private vehicles (passenger cars and two wheelers). The number of passenger cars including taxis were increasing between 12-13% per annum tripling from slightly less than 25,000 in 2000, to over 51,673 in 2015 and reaching up to 71,369 in June 2019. Of this number, about 64% of the country’s passenger cars are registered and operate in the capital region. Public transport buses is less than 1 percent.

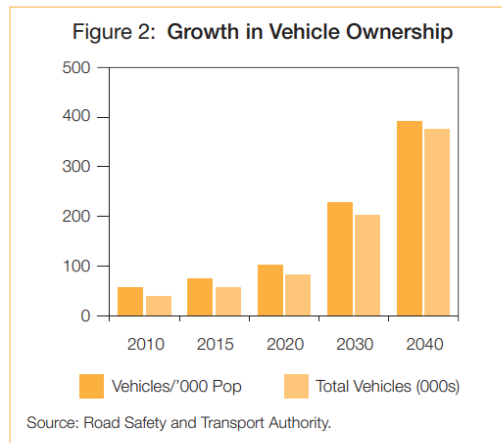
Figure 1: The Changing Share of the Rural and Urban Population in Bhutan, 2006–2040



Source: Strategy for Gross National Happiness to 2028.

A direct consequence of this growth in vehicle number is the rapid increase of local air pollution and related health impacts, changes in land-use, congestion, noise pollution, road safety and greenhouse gas emissions. Transport is a major source of GHG emission in Bhutan

[288,000 tCO₂ in 2015), responsible for over 45% of all energy related emission. It is estimated to reach 660,000 tons of CO₂ by 2030 if no counter-measures are taken. Heavy duty vehicles are the major source of pollutants (60%) at the national level, and passenger cars contribute to around 50% of emissions in urban areas or about 31% nationally. Social, economic and environmental costs due to vehicle emissions were estimated at 12 million USD in 2015, and is likely to increase by 3 times by 2030. Bhutan imported 144,620 kl of diesel and 39,120 kl of petrol, worth Nu. 8.618 billion in 2017.



Despite these challenges, Bhutan has re-iterated its commitment in 2015 to remain carbon neutral as part of the Nationally Determined Contribution process. Considering the changing policy environment for Internal Combustion Engine Vehicles (ICEVs) and the pace of EV cost reductions (CAPEX) due to dropping lithium battery prices; switch to e-bus offers a real opportunity to address air quality, reduce noise pollution and GHG emissions, reduce congestion and other urban problems. Therefore, the UNIDO project aims to mitigate some of the existing barriers to promote e-mobility.

The piloting of e-buses for urban transport in Thimphu is expected to reduce traffic congestion by discouraging usage of personal cars and lead to associated positive impacts in terms of lower emission, improved quality of air, reduced import of fossil fuel and improved public health situation. Efforts would be made to implement this pilot project under public-private partnership arrangement, following a detailed assessment.

The promotion of knowledge exchange between the HKH countries and within the GN-SEC will be an important additional feature of the project. The lessons learned and the envisaged policy work in Bhutan are of high relevance for the other HKH countries. Moreover, some of the HKH countries (e.g. India, China) are already very advanced when it comes to promotion and manufacturing of urban e-mobility solutions. Other countries, such as Nepal have taken first steps regarding the electrification of transport (e.g. 2 and 3-wheelers). UNIDO will contribute with concrete lessons learned from its *Global Sustainable Cities Program* and individual e-mobility projects in Malaysia, China and South Africa. Moreover, UNIDO will facilitate knowledge exchange between Bhutanese and Viennese key stakeholders (e.g. University of Technology, Austrian Institute of Technology) within the scope of the Vienna Smart City Programs. The proposed project is fully in line with the past support of the Austrian Development Cooperation (ADC) with focus on hydropower development, electrification and sustainable eco-tourism.

General context and challenges (problem tree/analysis)

At present, the City Bus Service (CBS) under the Bhutan Postal Corporation in Thimphu operates 49 buses to meet the requirement of Thimphu's urban residents. The passenger carrying capacity of these buses range from 19 to 50. The operating deficiency is subsidized by the RGoB. The buses operate at frequencies of 15 minutes during peak hours while during off-peak hours, the frequency drops to once every half an hour or an hour. Use of the Intelligent Transport System (ITS) is almost non-existent and therefore, passengers end up waiting for a long time at a bus stop. This is one of the causes for reduced ridership in buses. The buses operate on trunk routes and the travel times vary depending on traffic conditions. Long travel times and limited last-mile connectivity options were quoted by passengers² as factors detracting people from using buses.

Another issue is that many of the bus stops do not have shelter for passengers. As a result, waiting for a bus is usually an uncomfortable experience during winter months and rainy seasons or when it is snowing. The CBS had conducted a pilot for cashless, smart-card based payment system in one bus. This system was well accepted and appreciated by the passengers. This system needs to be scaled up and integrated across all buses in operation, which has not occurred due to paucity of funds. City bus infrastructure such as bus sheds, bus bays and bus information system are grossly inadequate. The need to enhance the organizational capabilities of the staff through appropriate training programs and automated processes to improve the efficiency of services obviously remains a major issue.

Already in 2011 the RGoB obtained support from the International Finance Corporation (IFC) for a feasibility study on Bus Rapid Transport in the city of Thimphu. This work assessed the viability of different transport solutions and identified a Bus Rapid Transit (BRT) corridor that would run from Babesa (Thimphu's southern extreme) to Taba and possibly Dechencholing / Kabesa (near Thimphu's northern extreme). In 2015, The RGoB conducted the pre-feasibility study on Intelligent Transport Systems. This recommended three phases of action (short, medium, and long term). Some of the important recommendations are as follows: (i) establishing an appropriate institutional framework; (ii) raising of community awareness on ITS; (iii) training in traffic engineering and ITS; (iv) development and operationalization of a bus information system; (v) establishment of bus bays and bus stop shelters; and (vi) introducing Transit Signal Priority (TSP) to increase the operating speed and reliability of bus services.

Currently, UNDP, WB and UNIDO are joining efforts to make the BRT a reality. In this context, the GCF funded World Bank (WB) preparatory project "Green Transport City Programme for Thimphu" aims to develop a master plan for low emission transport in Thimphu, including public and private vehicles. It will also develop an investment program, which will include the establishment of a BRT system, bus information System, e-ticketing technology, pedestrianization works, an upgraded city bus depot, an upgraded city bus terminal, non-motorized transport infrastructure, a signal control system, a parking management system, and an integrated traffic control centre. Therefore, the Austrian funded UNIDO project is well embedded and the envisaged bus pilots are an important showcase and baseline project for the future GCF investment program.

In parallel, UNDP and RGoB are working on a pilot project for a fleet of 300 EV taxis that could possibly share charging infrastructure with proposed e-bus service as well as serve as last mile connectivity solutions to this bus service. Thus, there is certainly scope for launching e-buses in Thimphu, to supplement the existing limited fleet of conventional buses, increasing

² Report on Gender Analysis for Bhutan Sustainable Low-emission Transport Service, December 2017

the frequency of services, and integrate it as part of a holistic, multi-modal green public transport. The critical challenges and opportunities foreseen in the current scenario are as follows:

Challenges: A. High upfront costs (vehicles and infrastructure) • Challenging operation • New ways to procure (requirements on vehicles, equipment, operation services) • Standardization and interoperability • Reinforcing cooperation with energy provider

Opportunities: Higher energy efficiency • Less running and maintenance costs • Renewal of operation systems can lead to more efficiency (e.g. routes, frequency) • Attractive vehicles might attract more people to public transport • Less GHG emissions, air pollutants and noise

Challenges: B. Development of charging infrastructure (location finding, technical, economical and legal requirements) • Increasing electricity demand • Uncontrolled charging can lead to problems in distribution grids • Dependency on charging behaviour of the user (difference between desire and reality) • Billing of charging current

Opportunities: Use of EVs for grid integration and storage of renewable energy (reducing load peaks, alternative to network expansion) • Decentralised production, control and storage is becoming cheaper and smarter • Energy security/ reduction of oil import dependency (price stability) • Re-use of mobile batteries for stationary operations • New business models.

**Project
relevance
and
justification**

The project is highly relevant and will reinforce the renewable energy and climate leadership of the country. Bhutan is one of the few countries in the world today that has negative net greenhouse gas (GHG) emissions. Bhutan has further distinguished itself on the world stage through its international commitment to remain carbon neutral for all times to come. However, as a rapidly growing economy, Bhutan is also experiencing some negative social, economic and environmental consequences of this rapid growth.

Rapid urbanisation has led to urban sprawl, inadequate urban transport and increased ownership of private vehicles. The transport sector contributes to around 45% of the total annual GHG emissions from the energy sector, largely due to the rapid (12% - 13%) annual growth rate of motor vehicle import.

Since the transport sector is almost entirely operating on fossil fuels, the rapid growth in this sector could potentially threaten Bhutan’s commitment to stay carbon neutral. This is also leading to other negative consequences such as traffic congestion and increasing need for land for wider roads and public parking, which is quite a challenge for a city surrounded by high mountains.

Bhutan has excellent renewable sources of electricity in the form of hydropower, thereby creating unique opportunity for Bhutan to migrate its transport sector to use clean, renewable and indigenous source of energy by adopting electric vehicles, especially for public transportation. Thimphu is currently served by a urban transport fleet of 49 buses operated by a State Owned Enterprise (Bhutan Postal Corporation Limited) and three private operators with a combined fleet of five buses. This is grossly inadequate leading to inefficient and unreliable services operating services at long interval. As a result, people have no choice but to resort to using their personal cars to meet all transportation requirements.

The main goal of the project is to facilitate an electro-mobility transformation in urban Thimphu which face key problems related to urbanisation and transportation, including climate change, energy security and local air pollution. Electric vehicles are acknowledged as market ready solution to the problems outlined above, but large-scale deployment is, at present, limited. Barriers (e.g. financial, political, technological and social) limit uptake and the extent to which they limit uptake is highly dependent on regional characteristics.

<p>Description of main project rationale, objectives, outcomes, outputs, beneficiaries and impacts</p>	<p>Description of the project rationale:</p> <p>This project aims to create an enabling environment for the uptake of e-bus technology markets in public transport in Bhutan. The project follows a holistic approach and combines interventions in the areas of technology demonstration, policy and regulation, capacity building and knowledge management smartly together. The project will create spill-over effects to other countries in the HKH region. Through the implementation of a concrete pilot project, the feasibility, viability and sustainability of e-bus solutions will be demonstrated.</p> <p>Therefore, the UNIDO project is contributing to the joint effort with UNDP and the World Bank to establish a functional BRT and ITS system. The established pilot system will be monitored and managed through an ITS platform connecting, vehicles, infrastructure, passengers, utilities and other stakeholders. This e-bus service shall form an integral part of a holistic, multi-modal public transport service. The pilots are an important contribution to the formulation of the GCF Investment Program for efficient transport.</p> <p>Context and detailed description:</p> <p>The proposed project is in consonance with several policy priorities and mandates of the Royal Government of Bhutan. The Nationally Determined Contributions of Bhutan makes a commitment to the UNFCCC³ to “Promote low carbon transport systems” by, among other measures, “improving mass transit” and promoting “non-fossil fuel powered transport such as electric vehicles”.</p> <p>In line with the above, Bhutan’s 12th Five Year Plan (2018-2023) emphasises “Safe, Reliable, Eco-friendly and Sustainable Surface Transport” (Programme 3.1 of the 12th Five Year Plan document). This Programme lists several initiatives to meet these objectives such as:</p> <ol style="list-style-type: none"> a) Provision of public transport, including creating wheelchair ramps at bus shelters. b) Bhutan Sustainable Low Emission Transport Systems, including – <ul style="list-style-type: none"> • Policy support for low-emission transport, • Awareness and capacity development, • Investment in low-emission transport systems and support services c) Bhutan Green Transport Program (BRT), including – <ul style="list-style-type: none"> • Master plan for low emissions transport • Sustainable Public Transport Services (BRT & complementary infrastructure) • Green Transport Systems (Intelligent Transport Systems & Bus Information System) d) Traffic congestion management <p>In line with the above goals of the RGoB, the draft Surface Transport Policy lays out the following objectives:</p> <ol style="list-style-type: none"> a) Enhance the public transport service delivery standards to make it reliable, affordable and accessible. b) Improvement in transport system to be supplemented with appropriate supporting infrastructure. c) Systematically reduce pollution from transport sector to contribute to maintain pristine environment for safeguarding human health and reduce carbon footprint. d) Create holistic urban transport and mobility system that is efficient, environment friendly, and responsive to the need.
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³ <http://www.nec.gov.bt/nec1/wp-content/uploads/2015/09/Bhutan-INDC-20150930.pdf>

Within the framework of these policies and initiatives, the proposed project aims to enhance urban transport in Thimphu and discourage people from using their personal cars by improving the infrastructure in the form of better bus shelters, enhance EV charging infrastructure, improve the passenger experience of public transport through the use of digital technologies, improve the overall efficiency of operations of the public transport system and lastly, reduce the country's dependence on imported fossil fuels

The proposed piloting phase would comprise three broad components:

- a) A minimum of two (2) e-buses to be used for public transport in the city of Thimphu. The buses would be equipped with GPS, telematics based remote monitoring and diagnostics capabilities, wheelchair ramps and securing mechanisms for wheelchairs, safety bars, stop bells, cabin heating, CCTV cameras, etc.
- b) Charging infrastructure at bus terminals/depots that is supplied with electricity from 100% renewable energy (hydro power generated in Bhutan). These charging systems will also include remote monitoring and control features of their own.
- c) An Intelligent Transport System that connects the above two elements as well as links all stakeholders into an integrated mobility solutions management platform.

Project Objectives

Amongst the nations in the world, Bhutan stands to maximally utilize the inherent benefits of electro-mobility. Bhutan is electrical energy surplus with all its electricity generated from renewable sources (hydro power). As a result, Bhutan could potentially migrate its entire transport sector to be run from 100% carbon-free energy.

In the long-term e-mobility can represent a paradigm shift for Bhutan, if the technical characteristics and regulatory frameworks of the transport and power sectors are smartly integrated. This requires strong cooperation between and capacities of the key stakeholders in the power and transport sectors. Combined with the latest digital innovations (e.g. internet of things devices) and the shift of vehicle ownership to shared modalities, e-mobility concepts open up opportunities for new business models, such as vehicle-to-grid (V2G) and grid-to-vehicle (G2V) services.

Furthermore, when this energy is being used to power public transport in the form of buses, additional positive benefits accrue to society in the form of lower traffic congestion, lower noise, reduced pressure on land, etc. The objectives of the project are to:

- i) Promote electrification as a viable alternative to internal combustion engine vehicles in urban areas
 - a) *Sub-objective 1a:* Assess the environmental impact (air quality, noise pollution and carbon emissions) of the proposed electro-mobility solution and consider the wider potential of applying to larger and more complex urban areas (scalability and transferability).
 - b) *Sub-objective 1b:* Assess the impact of the demonstrations upon public views of alternative technologies in order to inform a workable strategy for public engagement and promotion.
 - c) *Sub-objective 1c:* Explore the issues of social justice to examine how electrification of mobility may impact on access to services for selected groups (elderly, disabled, low waged, unemployed)

- ii) Objective 2: Facilitate the switch to car-independent lifestyles in urban areas.
 - a) *Sub-objective 2a*: Understand the impact of the demonstration projects on public transport in terms of local authority provision and wider public usage.
 - b) *Sub-objective 2b*: Understanding the impact of the demonstration projects on safety and security for non-motorised transport such as cycling and walking.
 - c) *Sub-objective 2c*: Examine the political viability of the demonstration projects and its acceptance compared to other alternatives considering the wider socio-economic impacts.
- iii) Objective 3: Develop innovative demand management strategies to optimise road space utilisation.
 - a) *Sub-objective 3a*: Test the relative merits of the demonstration projects compared to alternative options for management of urban mobility to encourage sustainable mobility for urban areas
 - b) *Sub-objective 3b*: Assess the impact of various incentives for electrification including wider roll-out of EV charging infrastructure.
 - c) *Sub-objective 3c*: Develop a programme of measures that can be rolled out in part or in full to improve local traffic management to promote broader take-up of electrification.
- iv) Objective 4: Explore new avenues to integrated planning to ensure that urban land usage facilitates a shift towards sustainable mobility.
 - a) *Sub-objective 4a*: Understand what are the relevant criteria to make an area suitable for electrification
 - b) *Sub-objective 4b*: Examine the impact of electrification on personal ownership vs public sector or private fleets.
 - c) *Sub-objective 4c*: Describe and analyse how electrification might impact differently on various groups including those of different gender, age, ethnicity or religion and how different groups can be best targeted in sustainable travel planning.
- v) Objective 5: Implement effective mobility management strategies that change attitudes to urban mobility.
 - a) *Sub-objective 5a*: Assess the impact of electrification solutions on congestion and devising measures to reduce single occupancy.
 - b) *Sub-objective 5b*: Develop best practice for communication to maximise understanding and acceptance amongst the general public for electrification solutions.
 - c) *Sub-objective 5c*: Understand how to best manage the complex mix of stakeholders, including local business, government agencies and communities to ensure the success

Project Outcomes and Outputs:

The project applies a holistic approach, which includes policy and regulatory support, the installation of demonstration projects and capacity building for the key stakeholder. The hardware component includes not only the purchase of e-buses but also the installation of charging points and other infrastructure. It includes also the development and application of a robust PPP business model, which can be, applied in future cases. Most of the activities will be implemented in close coordination and/or with co-funding of UNDP and the World Bank.

Outcome 1: will directly address the policy support for e-mobility for public transport system by addressing the regulatory barriers hampering growth of LEV in Bhutan. It will put in place conducive policy and regulatory framework for LEVs which combines a range of fiscal and

other economic incentives with enabling technical regulation. The project will assist in identification of, adopt and enforce a range of policy measures enabling operation of EVs, in particular E-Buses. The development and implementation of Intelligent Transport System and charging infrastructure will be explored to ensure its sustainability, reliability and further growth. It shall enable several benefits to accrue to the stakeholders.

Output 1.1: Gender-sensitive proposals to improve the policy and regulatory framework for e-buses and charging infrastructure are proposed (based on a comprehensive gap analysis)

Output 1.2: Report on feasible scenarios for e-mobility routes and parking bays

Output 1.3: Study on a feasible Intelligent Transport System (ICS) available

Outcome 2: “Awareness and capacity development” aims at addressing awareness, misperception and capacity gaps and constraints among wide range of transport market stakeholders. The project will conduct awareness raising campaign at various levels highlighting the economic and other benefits of low-emission vehicles. It will also develop and disseminate EV user information guide to clarify concerns regarding EVs (limited mileage, safety issue, gender-related concerns, including women. In order to strengthen institutional knowledge on ridership for e-mobility, the project will conduct survey on ridership for e-mobility to guide policy makers and relevant stakeholders.

Output 2.1: Awareness campaign targeting key market enablers and consumers of e-bus solutions

Output 2.2: Training materials developed and at least 50 key experts on the planning, installation, financing and operation of e-bus systems trained

Output 2.3: Survey conducted on ridership for e-mobility

Outcome 3: “*Investment in E-Bus services*” will address barriers related to affordability of and access to finance for LEVs, as well as investment in EVSE. It will, in partnership with the local business partners will design and implement an innovative financial support mechanism, in which the local partner will have to contribute equivalent amount of budget to procure an E-Bus and facilitate PPP operation modality for the sustainability. The purchase of equipment (e.g. e-buses, charging points, terminals) co-financed by UNIDO are subject to an open international competition. To ensure long-term sustainability an O&M plan (incl. waste management) will be established. With regard to the environmental concerns, the bus project will benefit from the results of the GEF funded “mother project”. It includes already the development of policy guidelines and regulations developed to address e-waste disposal and management.

Output 3.1: At least two (2) e-buses purchased and charging points in the selected bus routes installed

Output 3.2: Bus sheds and terminal, signages and POS established

Output 3.3: Development of a robust and viable PPP model for the operation of the centre

Output 3.4: E-bus system fully integrated and operates in line with an operation and management plan (incl. e-waste management)

Outcome 4: “South-south knowledge sharing and exchange” aims to share experiences and lessons learned on e-mobility between the HKH countries and within the wider GN-SEC “maker-space”. This component will be handled directly by UNIDO. The lessons learned and the envisaged policy work in Bhutan are of high relevance for the other HKH countries. Moreover, some of the HKH countries (e.g. India, China) are already very advanced when it comes to promotion and manufacturing of urban e-mobility solutions. UNIDO will contribute with concrete lessons learned from its *Global Sustainable Cities Program* and individual e-mobility projects in Malaysia, China and South Africa. Moreover, UNIDO will facilitate knowledge exchange between Bhutanese and Viennese key stakeholders (e.g. University of Technology, Austrian Institute of Technology) within the scope of the Vienna Smart City Programs. The project will contribute to the formulation of a wider GCF transport investment program, which might open up possibilities for technology and knowledge transfer. UNIDO will develop policy guidelines on how developing countries can participate in the value chains of growing e-mobility manufacturing and servicing markets:

Output 4.1: At least one (1) knowledge workshop and one (1) study tour organised and information material disseminated

Output 4.2: Policy guidelines on opportunities to participate in e-mobility manufacturing and servicing value chains developed

Beneficiary and Impact

The switch toward e-buses will have positive social and economic impacts due to the fuel cost-savings along the life-time of the vehicles. The Bus Operator will gain experience in operating electric buses and generate employment for drivers, service technicians for buses and charging infrastructure, etc. In the mid-term passenger can expect a reduction of transport prices.

The project will benefit the city of Thimphu directly through improving public transport services with zero GHG emissions. During the project inception phase the detailed GHG emission reductions will be calculated as part of the monitoring and evaluation plan tracking project progress.

Night time charging of buses will slightly improve grid utilization for the electric utility, Bhutan Power Corporation. Assuming a fuel efficiency of 5 km/liter of diesel for an equivalent diesel bus, the nation will save fossil fuel imports to the tune of 21,000 liters/year, saving approximately USD 19,500 (Nu. 1.365 Million/year) in foreign exchange.

Project Execution strategy (incl. execution partners)

The project will be implemented in accordance with agreement between the Royal Government of Bhutan (RGoB) and UNIDO. It implies that all execution aspects for the project components 1 to 3 (outcomes) are the responsibility of the national authority. The national authority remains accountable to the UNIDO for production of the outputs, achievement of objectives, use of resources provided by UNIDO, and financial / technical progress reporting.

UNIDO ensures overall supervision of the project and is accountable for reporting to the donor. RGoB will establish a Steering Committee to review progress on an annual basis. The SC will include the participation of UNDP and the World Bank. Moreover, UNIDO has the full responsibility for the execution of outcome 4 focusing on knowledge exchange within the HKH region and the GN-SEC. In this context, UNIDO will work closely with ICIMOD within the REEECH context.

The national execution of the pilot project will be led by the Policy & Planning Division of the Ministry of Information & Communications in close consultation with the Road Safety & Transport Authority. It will be responsible and accountable for managing this project, including the monitoring and evaluation of project interventions, achieving project outcomes, and for the effective use of UNIDO resources. The Implementing Partner is responsible for:

- a. Approving and signing the multiyear work plan;
- b. Approving and signing the combined delivery report at the end of the year; and,
- c. Signing the financial report or the funding authorization and certificate of expenditures.

The Ministry of Information and Communications will select local partner that will be identified through a transparent bidding process, and operate in the PPP model. Other organisations which will be involved directly or indirectly in this project would include the following:

- a) Ministry of Finance: is RGoB's designated counterparty for all foreign loan / credit assistance and also manages the national budget system, the pool of government vehicles, and the development of revenue generating policies and vehicle taxation regimes including administration of PPP projects.
- b) The Gross National Happiness Commission, Royal Government of Bhutan (RGoB): National Planning Agency which is also responsible for mobilization of donor funding.
- c) Thimphu Thromde: Local government responsible for development of Thimphu city. It has responsibility to manage land use in Thimphu and to develop urban transport services.
- d) City Bus Service: Currently operating the city bus services, which may not necessarily continue to operate the e-buses. Management of city buses has been rather controversial and more discussion will be undertaken on this issue in consultation with relevant stakeholders, so ensure sustainability of the e-buses.
- e) E-Bus supplier: To be identified through a transparent bidding process.
- f) Charging infrastructure solution provider(s).
- g) Bhutan Power Corporation: Supply of electrical power to the charging stations.
- h) Digital solutions developers: software developers who can develop and integrate the proposed digital platform.
- i) Web hosting services and software license providers such as database software, etc.

Results framework and indicative Budget⁴

Outcome 1: Improved policy, regulatory and planning framework for e-mobility solutions in the public urban transport system		Budget in EUR
Outputs	Deliverables	Costs
Output 1.1: Gender-sensitive proposals to improve the policy and regulatory framework for e-buses and charging infrastructure are proposed (based on a comprehensive gap analysis)	Gap analysis and list of policy recommendations	<u>Budget lines</u> BL 21.00: Euro 55.000

⁴ The provided MFA grant is flexible and will allow shifts between budget lines within the four outcome areas without approval by the donor. Budget shifts between the output areas still require approval by the donor. In the UNIDO SAP based project cycle management system the described four "outcomes" are classified as "outputs".

Output 1.2: Report on feasible scenarios for e-mobility routes and parking bays	Report on e-mobility routes and parking bays	BL 16.00: Euro 5.000
Output 1.3: Study on a feasible Intelligent Transport System (ICS)	Study on a feasible Intelligent Transport System (ICS)	
SUBTOTAL 1		60,000
Outcome 2: Improved awareness and capacities of key market enablers regarding e-mobility solutions in public transport		
Outputs	Deliverables	Costs
Output 2.1: Awareness campaign targeting key market enablers and consumers of e-bus solutions (incl. the particular transport service needs of women and vulnerable groups)	Materials of awareness campaign incl. analysis of impact	<u>Budget lines</u> BL 21.00: Euro 55.000
Output 2.2: Training materials developed and at least 50 key experts on the planning, installation, financing and operation of e-bus systems trained (at least 25% female)	Training materials and workshop documents (e.g. list of participants)	BL 16.00: Euro 5.000
Output 2.3: Survey conducted on ridership for e-mobility is available (with particular attention to the transport service needs of women and vulnerable groups)	Survey results	
SUBTOTAL 2		60,000
Outcome 3: The feasibility and viability of e-bus solutions in urban public transport sector are demonstrated		
Outputs	Deliverables	Costs
Output 3.1: At least two (2) e-buses purchased and charging points in the selected bus routes installed	Functional 2 buses and charging points	<u>Budget lines</u> BL 21.00: Euro 200.000
Output 3.2: Bus sheds and terminal, signages and POS established	Bus sheds and terminal	
Output 3.3: Development of a robust and viable PPP model for the operation of the centres	Documentation on selection	
Output 3.4: E-bus system fully integrated E-bus system fully integrated and operates in line with an operation and management plan (incl. e-waste management)	Signed MOU	
SUBTOTAL 3		200,000
Outcome 4: Replication of South-south knowledge sharing and exchange facilitated (executed by UNIDO)		
Outputs	Deliverables	Costs

	Output 4.1: At least one (1) knowledge workshop and one (1) study tour organised and information material disseminated	Documents of workshop / Information material	<u>Budget lines</u> BL 11.00: Euro 80.000 BL 15.00: Euro 10.000
	Output 4.2: Policy guidelines on opportunities to participate in e-mobility manufacturing and servicing value chains developed	Policy guidelines	BL 35.00: Euro 20.000 51.00: Euro 12.478
	SUBTOTAL 4		122,478
	UNIDO support costs (13%)		57,522
	SUBTOTAL 5		500,000
	1% UN coordination levy (1%)		5.000
	TOTAL		505,000
Project Contact(s)	Mr. Martin Lugmayr, Department of Energy, UNIDO, m.lugmayr@unido.org Ministry of Information & Communications/Thimphu, to be confirmed		