

# Policy and Investment Projects for Electric Mobility

An Overview of the 'Electric Mobility Program' 2017-2020

June 26<sup>th</sup> 2019, Hotel Himalaya



## Overview

# Global Green Growth Institute

- An inter-governmental, international treaty-based organization
- Managed by governments for governments
- President and Chair Ban Ki-Moon
- Seoul: Operations in 33 countries globally
- Embedded within Ministry of Forests and Environment

# Overview

## Services and Themes



Policy Advisory



Investment Services



Cities



Landscapes



Water and Sanitation



Energy

## Overview

# Programs in Nepal



Electric Mobility



Green Cities



Sanitation Technologies

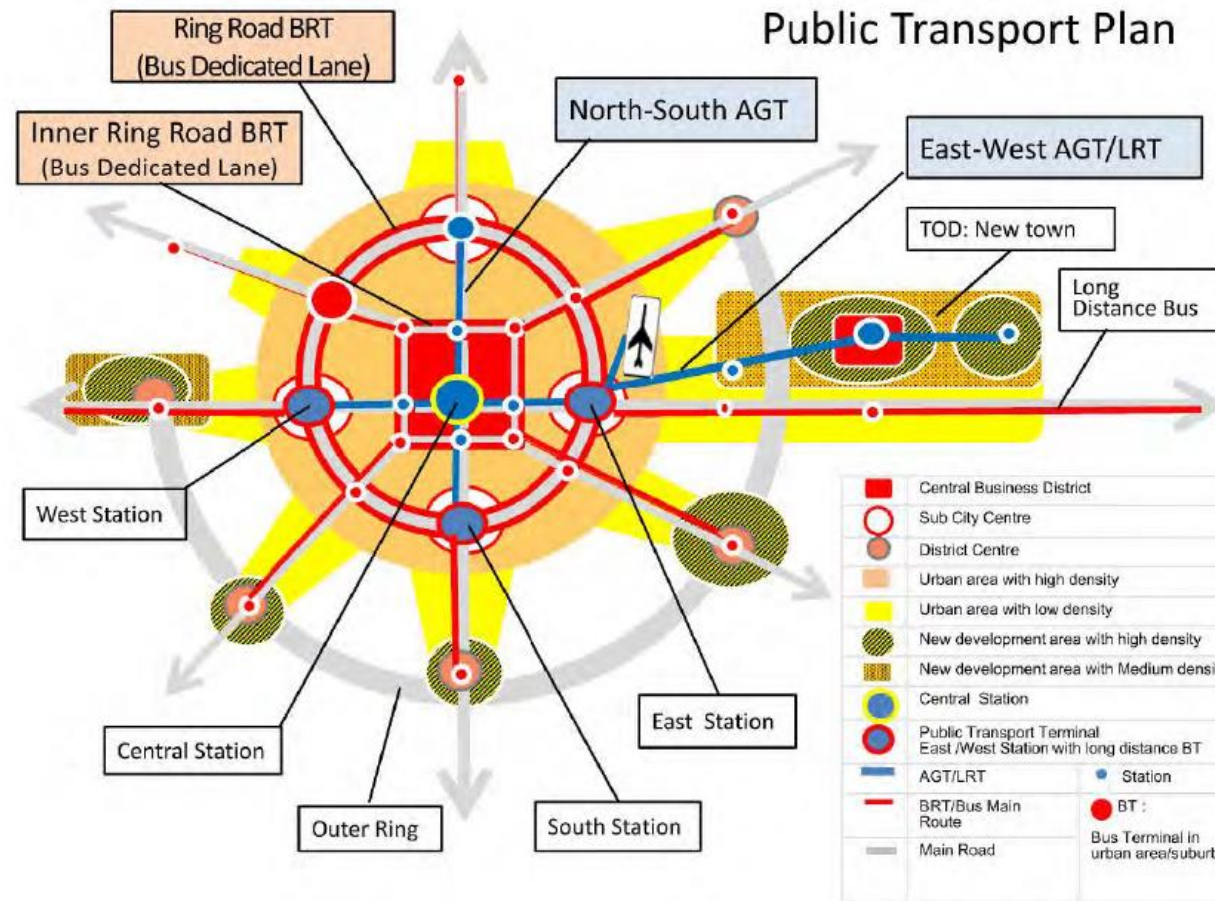
Electric Mobility

## Transport Context

- Environmentally Friendly Transport Policy (2014) → NDC (2015)
- JICA and ADB (2017) – Bus focused
- Fiscal incentives (2017-pres.)

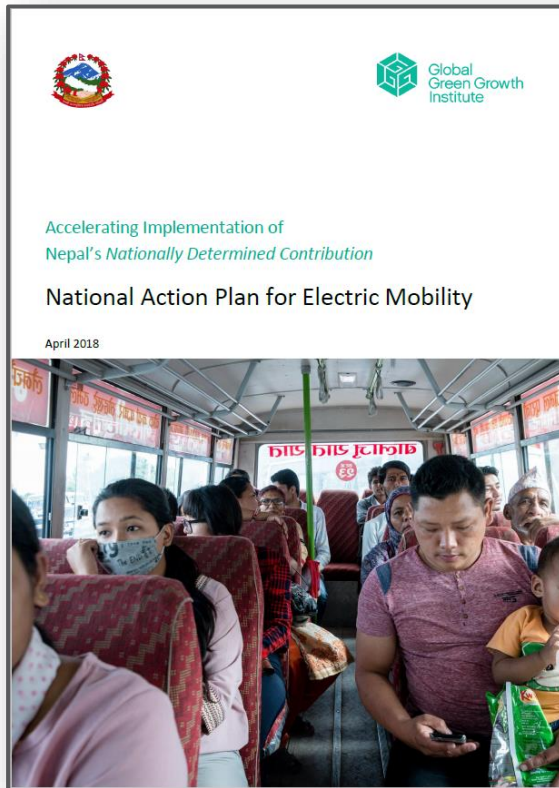
STRATEGIC  
COMPLEMENTARITY

# Electric Mobility Transport Context



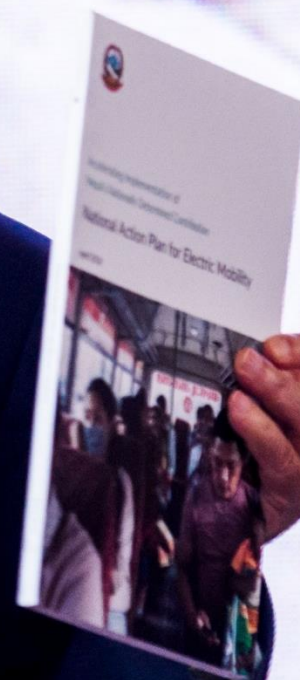
EMP Phase I

# National Action Plan for Electric Mobility



- Client: MOFE, MOPIT
- Barriers
- Priorities: Program | NFV | Unit
- Uptick in commitment

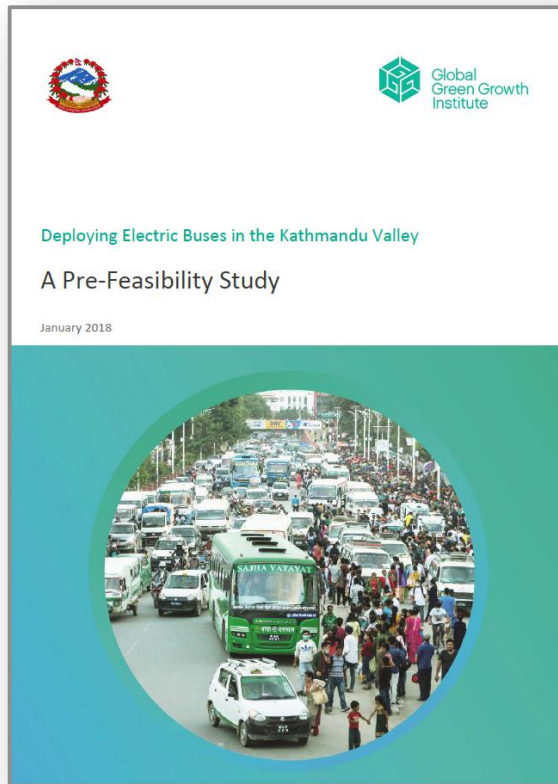






# EMP Phase I

## Electric Bus Pre-Feasibility Study



- Client: Sajha Yatayat
- Lagankhel to Budhanilkantha
- Cost and benefits
- Electrifying the entire fleet

EMP Phase I

# Electric Bus Pre-Feasibility Study

Cost component (NPR)	Bus models			
	Diesel (Viking)	Electric (K7)**	Electric (K9)**	Electric (Circuit)**
Acquisition cost***	3,198,345	23,104,100	30,618,500	42,738,500
Lifetime fuel cost	13,087,901	2,861,036	2,861,036	2,861,036
Lifetime maint. cost	6,576,587	3,288,293	3,288,293	3,288,293
Economic cost	10,393,303	-	-	-
Social cost	11,723,683	-	-	-
Environmental cost	3,338,927	-	-	-
<b>Total (NPR)</b>	<b>48,318,746</b>	<b>29,253,429</b>	<b>36,767,829</b>	<b>48,887,829</b>
<b>Total (USD)*</b>	<b>470,027</b>	<b>284,566</b>	<b>357,664</b>	<b>475,563</b>
<b>% cheaper than diesel</b>	<b>-</b>	<b>39%</b>	<b>24%</b>	<b>-1%</b>

Source: GGGI

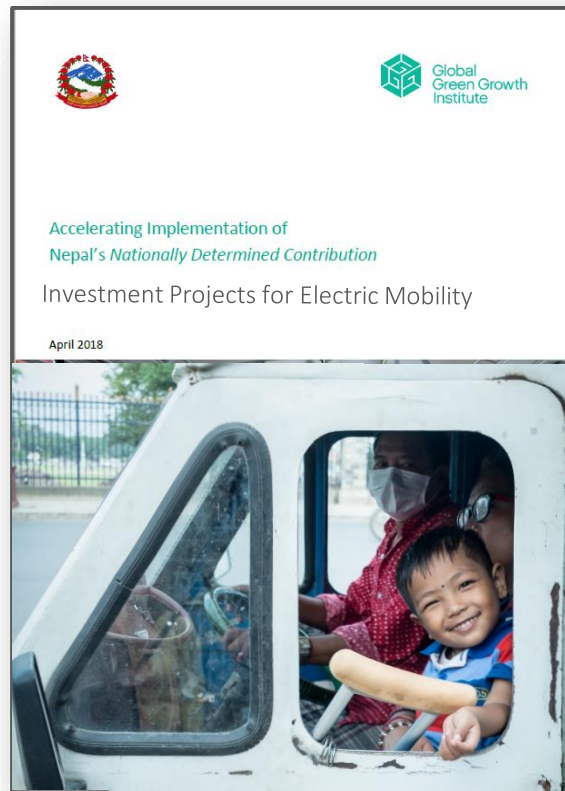
\*1 USD = 102.8 NPR

\*\* '-' here denotes a negligible value

\*\*\* Acquisition cost is exclusive of VAT as the operator is eligible for a VAT refund after purchase of the electric bus

# EMP Phase I

## Bankable Projects for Electric Mobility



Project	Size
Mid-size bus fleet	USD 10.9 million; IRR 5.1%
Trolleybus Project	USD 26 million; IRR 12.6%
Battery Leasing Scheme	USD 0.4 million; IRR 5.2%
Charging Stations Scheme	USD 70,000; IRR 26%
Battery Recycling	USD 4.9 million; IRR 20%
Taxi Conversion	USD 2.2 million; IRR 15%

EMP Phase II

## Current Engagements 2019-20



- Provincial Electric Mobility Strategy



- Electric Bus Investment Proposal



- Electric Mobility Knowledge Exchange

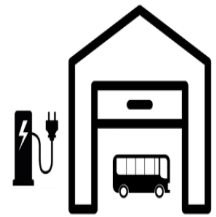


- Expanding Investment Opportunities



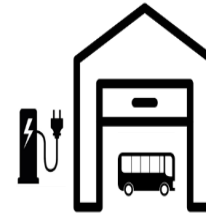
# EMP Phase II

## Electric Bus Investment Proposal



BIG  
BATTERY

Slow Charging  
at Depot



Slow Charging  
at Depot



SMALL  
BATTERY

Fast Charging  
at Terminals

Scenario A	Scenario B
Battery Capacity: 150-200 kWh (100%)	Battery Capacity: 45-60 kWh (30%)
Bus Price: Higher	Bus Price: Lower
Depot: Slow chargers	Depot: Slow chargers
Terminal: No chargers	Terminal: Fast chargers

EMP Phase II

# Electric Bus Investment Proposal

	Depot	Terminals
Land	Sajha Yatayat	To be provided by government
Upgrade Cost	Approx. NPR 39 lakh Approx. USD 35,000	Approx. NPR 16 lakh Approx. USD14,000 per terminal

EMP Phase II

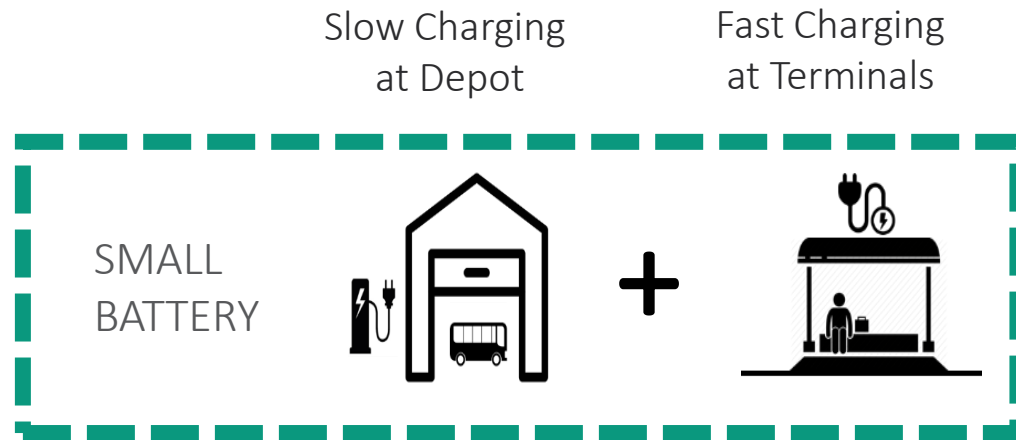
# Electric Bus Investment Proposal

	Scenario A	Scenario B	Difference
Bus Fleet Size	20	20	
Total CAPEX	NPR 34.6 crore USD 3.07 million	NPR 31.3 crore USD 2.78 million	NPR 330 lakh USD 290,000
Total OPEX (fleet per year)	NPR 31 lakh USD 28,000	NPR 40 lakh USD 36,000	NPR 9 lakh

Scenario B is 10% cheaper

EMP Phase II

# Electric Bus Investment Proposal



- Installation Risk
- Operational Risk



EMP Phase II

# Electric Bus Investment Proposal

Capital Expenditure	
Bus CAPEX	NPR 33 crore USD 2.99 million
Bus Registration	NPR 230 lakh USD 209,000
Charging Station CAPEX	NPR 237 lakh USD 211,000
Installation	NPR 102 lakh USD 91,000
Land Acquisition	0
Financing Cost	0
<b>TOTAL CAPEX</b>	<b>NPR 38 crore USD 3.41 million</b>

EMP Phase II

# Electric Bus Investment Proposal

Returns	
Project IRR	2.12%

Route	1
Type	Metro
Direction	North-South
Length	17 km
Buses deployed	11
IRR	1%

Route	2
Type	Metro
Direction	East-West
Length	21 km
Buses deployed	12
IRR	5%

## Electric Mobility

# Reflections on Three Years

- Growing interest, multiple levels
  - Scale up and replication potential
  - Supply improving, prices still high
  - Investment starting to flow
- Need for catalyst
  - Market risks
  - Infrastructure lacking



THANK YOU