FINAL STAKEHOLDERS WORKSHOP REPORT ON ELECTRIC MOBILITY POLICY AND ROADMAP IN SOLOMON ISLANDS

Heritage Park Hotel

29 August 2022

Background and objective

Solomon Islands is a Melanesian nation, east of Papua New Guinea and comprises a scattered archipelago of 994 islands. The total GHG emission of Solomon Islands (CO2 equivalent) in 2010 was 618.81 Gg CO2eq for which more than 50% that is 350.46 came from energy sectors.

Within the energy sectors road transport alone accounted for 176.91 Gg CO2eq of GHG emissions. The GHG emission from the transport sector have substantially increased from the year 2000 where these were 88.68 Gg CO2eq. Thus, mainly transport sector is critical for Solomon Islands to achieve its climate mitigation and GHG reduction goals. The voluntary commitments will bring down the emissions by around 30% by 2030 but will be unable to stop the upward trend in the growth of GHG emissions. The transport sector contributes hugely to energy-related emissions. The government wants to reduce the emissions from the transport sector by promoting sustainable transport measures including promoting alternative vehicle technologies, including electric vehicles (EVs).

Solomon Island plans for rapid expansion towards renewable energy sources; thus it is also imperative that policies and enabling framework is created to allow for use of electricity produced from renewable energy sources in the transport sector. From the vehicle growth scenarios, the main areas that could be targeted are the cars, goods vehicles and the public transport buses small and big. However, there is no uptake of e-mobility in Solomon Islands. This CTCN technical assistance is helping the Solomon Island government develop a policy framework for inclusive e-Mobility, a roadmap for inclusive e-Mobility and a market feasibility assessment for e-Buses.

Objective

- To validate the Policy Roadmap for eMobility in Solomon Islands
- To validate the Market Feasibility Study for eBuses in Honiara

Introductions and Opening Prayer

The meeting was opened at by John Korinihona at **9. 30 am** with a prayer and a round of introductions by participants in the room and a brief introductions from Subash of team at UNEP CCC, pManifold and CTCN.

This was followed by opening remarks by John Korinihona, Director, from Ministry of Mines, Energy and Rural Electrification. John emphasised the EVs are important for Solomon Islands to reduce their dependence on oil which Solomon Islands imports. The current war in Europe highlights the risks this dependence has for countries like Solomon Islands.

After this Clara Landeiro, CTCN gave her remarks and informed about the CTCN projects in Pacific region, projects happening in Solomon Islands and eMobility projects supported by CTCN.

In the end Subash Dhar, UNEP CCC provided an overiew of mitigation of climate and role played by electric vehicles. He highlighted that latest assessment of IPCC informs us that EVs will provide the biggest mitigation potential for land transport. He also highlighted mitigation potential is directly dependent on electricity and therefore renewable energy is crucial in case of Solomon Islands to reduce dependence on fossil fuels and also bring down the price of electricity.

Policy Roadmap for eMobility in Solomon Islands

A presentation was made by pManifold on the roadmap (Slides at Annex I) and there was a discussion on the following elements of the roadmap were presented

1. EV Policy Framework
2. EV Targets
3. Benefits from EV adoption
4. EV Policy Measures: Demand and Supply
5. Impact on Government Budget

The following points were discussed

Gender : There was a recommendation from gender expert to provide an extra incentive for women. There was a brief discussion around this and SC was of the view that it can be easily manipulated. It was clarified that it is only a small incentive e.g., 0.5% higher incentive and was accepted by SC.

Loss of revenues: Due to EVs there will be a loss of revue from fuel taxation and incentives. It was explained that it has been proposed in the roadmap to offset the revenue losses through increased taxation on ICE vehicles.

Capacity: Solomon Islands does not have capacity in EV technology and therefore needs to introduced in curricula for schools.

Raw Materials: Some Stakeholder were worried about increase in demand for materials to manufuacture batteries. It was clarified this is a global issue and at the global level there are efforts to diversify away from Nickel, Magnesium and Cobalt based battery technologies.

Waste Disposal: Some stakeholders were concerned from issue of used batteries and need for regulations on this. It was explained that the roadmap does include recommendations for waste management.

Transition to EV: It was informed by satkeholders that in Fiji transition has happened in two steps for from ICE to hybrid and then to EVs. It was clarified that even in case of Fiji to not pursue this approach and therefore not advisable to follow this step wise approach and directly embark to EVs

High electricity tariffs: Solomon Islands has some of the highest electricity tariffs (around 0.77 USD) since 95% of generation depends on diesel generation sets and current high fuel prices have made it even more expensive. Costs of renewable in comparison are lower around 0.2 USD per Kwh. Therefore John informed that Ministry plans to reform generation and involve independent private power producers and this can help in bringing down the cost of electricity and bringing in more renewable.

Market feasibility study for eBuses in Honiara

A presentation was made by pManifold on the roadmap (Slides at Annex I) and covered the following

1. Honiara city Landscape
2. e-Bus Techno-Commercial Feasibility
3. Investment Sizing
4. Impact of e-Bus Fleet
5. e-Bus and Charging Business & Financing Model
6. Enabling Policies and Way Forward

The following points were discussed

Number of buses: Why only 10 buses. This was decided so that overall size of pilot can be limited to below 2 million USD.

Depot locations : One of the bus locations is in the flood plain area. It was clarified that bus routes and depot locations identified together local partners (Honiara City Council)

Bus Sizes: The project proposal has 7 m buses and why not use 12 m buses. This was discussed with the local partners and the approach taken is to allow flexibility for operating the buses using a private bus operator or a public transport entity. The Honiara City Council suggested going for a 20 seater bus in place of a 16 seater bus.

It was calrified that the study is indicative and more details can be finalised during the preparation of a more detailed proposal to finalise the number of buses, depot locations and bus sizes.

Charging standrards: Under National Roadmap we do recommend for adopting a charging standard and global the movement is towards CCS standard.

Annex

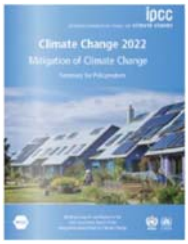
Annex 1 Agenda

Introduction to Solomon Islands E-Mobility Policy			
Session 1: Policy Roadmap for e-Mobility in Solomon Islands			
9 am to 11 am	15 mins	Welcome and round of introductions	John Korinihona
	10 mins	Opening Remarks by CTCN NDE / MECDM	Deputy Director CCD
	5 mins	Objectives of the Workshop	Michael Ha'apio
	10 mins	UNEP / CTCN Remarks	Clara Landeiro
	10 mins	Mitigation of Climate Change and role of electro Mobility	UNEP CCC
	30 mins	Presentation of the Roadmap for e- Mobility in Solomon Islands	pManifold
	30 mins	Discussion and Inputs from stakeholders	All
Tea Break (15 mins)			
Session 2: Market Readiness for e-buses			
11:15 am to 12:15 pm	30 mins	Presentation of Market Feasibility Study	pManifold
	30 mins	Discussions	All
Lunch Break			
Session 3: Training on fleet planning of eBuses			
1 pm to 2 pm		• Elements of e-Bus System and Planning • Battery, Charging infrastructure Selection, and impact on e-Bus operations	pManifold
		Q&A	
2 pm to 3:15 pm		• e-Bus Routes & Depot Selection and Network Planning • e-Bus Charging Strategies, trade-offs and overall fleet performance	pManifold
		Q&A	
3:15 pm to 4 pm		• e-Bus Life cycle Costs, Battery life, and Optimisation	pManifold
		Q&A	

Annex 2 Presentations

Presentation on Mitigation of Climate Change and role of electro Mobility

Transport emissions



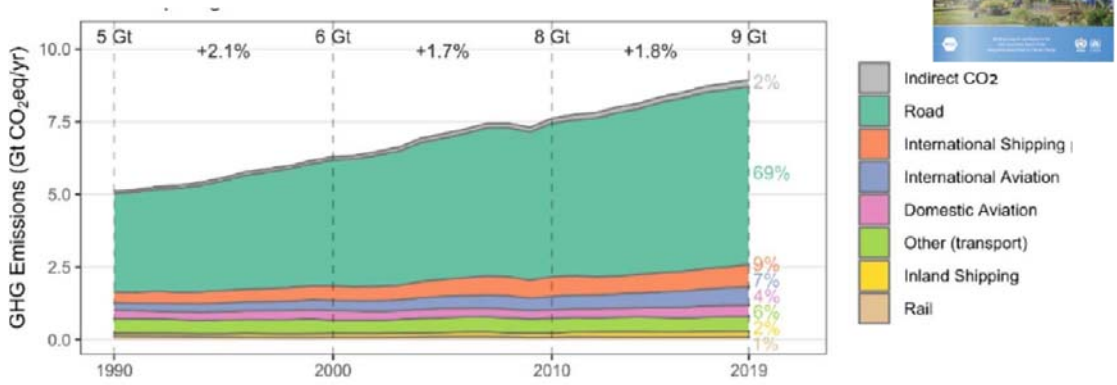
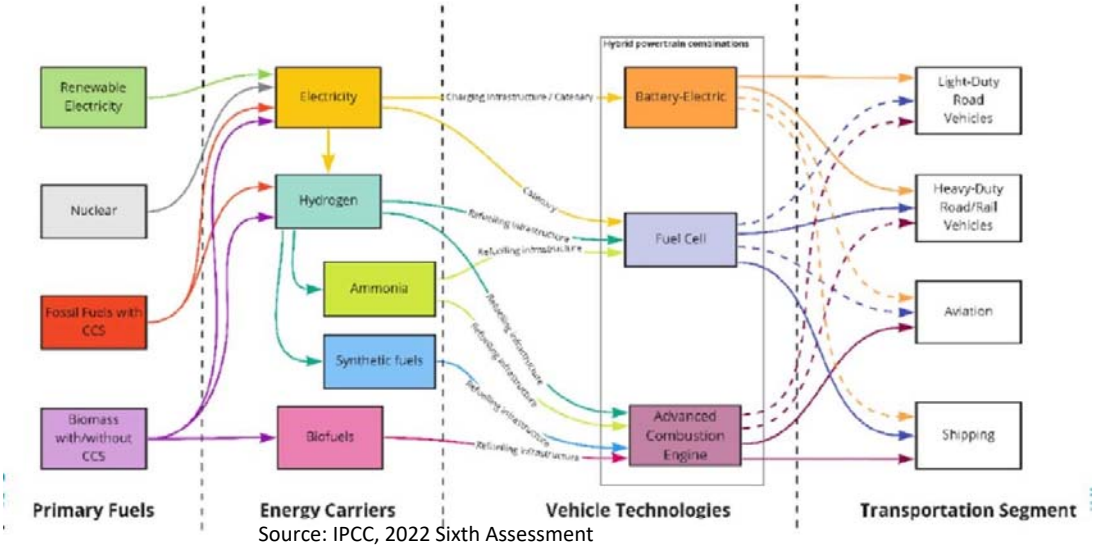


Figure 2.13a

Transport Sector emissions increased share from 13% in 1990 to 15% in 2019

Pathways for decarbonizing transport technologies



Source: IPCC, 2022 Sixth Assessment

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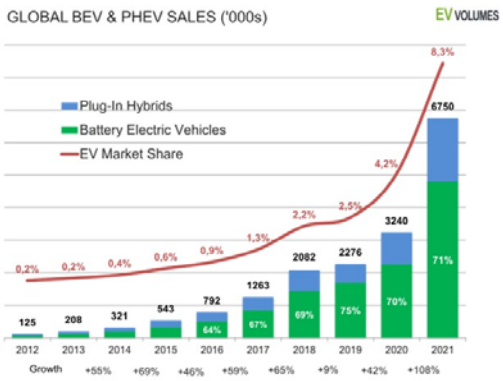
Trends in EVs



- Electric vehicles powered by low-emissions electricity offer the largest decarbonisation potential for land-based transport," IPCC SPM C8
- Upcoming Challenges
- Increasing costs of raw materials
- Disposal of batteries

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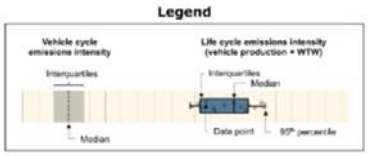
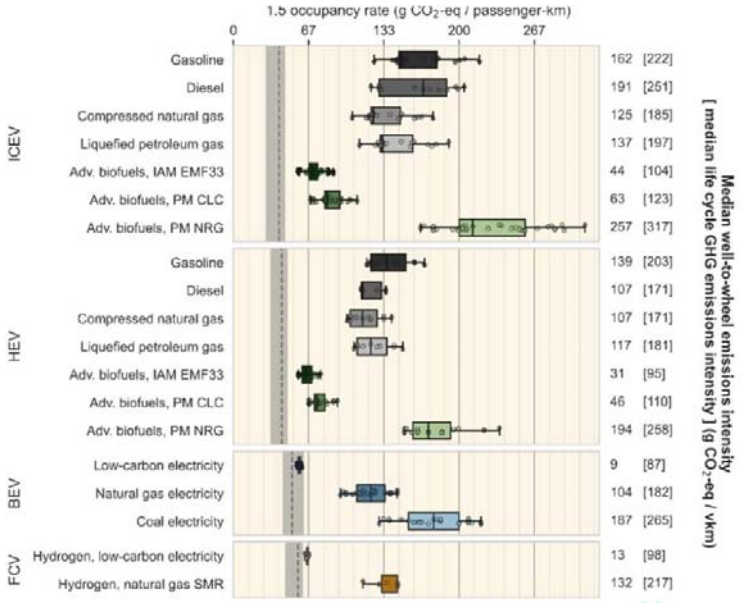
Life cycle emissions of different technologies for LDVs





Source: IPCC, 2022 Sixth Assessment

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Key Technology Trends

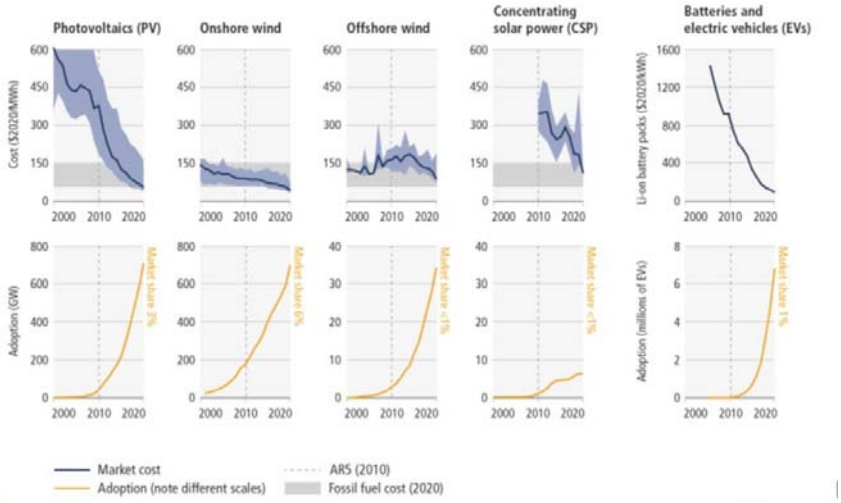

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Figure SPM3

Source: IPCC, 2022 Sixth Assessment

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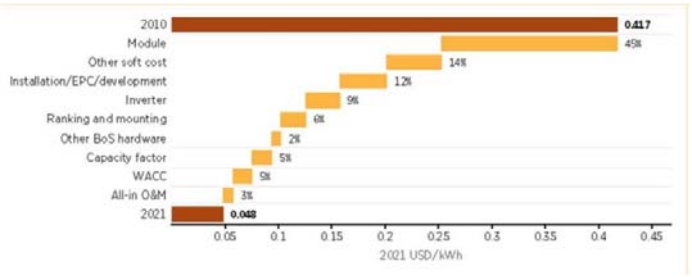
Electricity Generation Costs: Barrier & Opprtunity

- 98% of electricity generated for Honiara grid is from diesel

  Levelized Cost of Generation for Solar PV generators.
- Fuel cost for diesel generation in Honiara grid is US$0.29 /kWh.
- Solomon Power's Electricity Generation cost is US$ 0.41 /kWh
- However levelized costs of Solar PV is much lower US $ 0.048 /kWh



Source : IRENA (2021), Renewable Power Generation Costs in 2021

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Outputs under the CTCN Technical Assistance

- ✓A National EV Policy and Market Readiness Framework
- ✓A Policy Roadmap for E-Mobility
- ✓A Market Feasibility Report on e-Buses
- ✓A concept note for GCF on e-Buses
- ✓A Final Consultation Workshop
- ✓A Finalised Public Awareness Report on EV's

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E Mobility Initiatives

A new declaration signed by more than **100 national governments, cities, states and major car companies on zero-emission cars** and vans to end the sale of internal combustion engines by 2035 in leading markets, and by 2040 worldwide.

A new World Bank trust fund to mobilise **$200 million** over the next 10 years to **decarbonise road transport in emerging markets and developing economies**.

UNEP's **Global Electric Mobility Programme** supports more than 50 low-and-middle-income countries with the shift from fossil fuel to electric vehicles. **More countries being added under GEF8**

Green Climate Fund has recently funded several large eMobility programmes (450 million eMobility in Latin America,

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Next Steps

- Policy Roadmap for eMobility
- Market feasibility report on eBuses
- GCF Concept Note

UNEP CCC

Subash Dhar
Talat Munshi

pManifold consortium
Rahul Bagdia
Saudamini Telang

Gender Expert

Darshini Mahadevia

Local Consultant

Michael Ha'apio

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Presentation on Policy Roadmap on eMobility

Final Dissemination and Awareness Workshop

29th August 2022

Feasibility Study for Low Emission Land Transport Sector in Solomon Islands

EV Policy Roadmap for Solomon Islands

Prepared for

Government of Solomon

Supported by

CTCN Climate Technology Centre and Network

UN environment programme

UNOPS

Prepared by

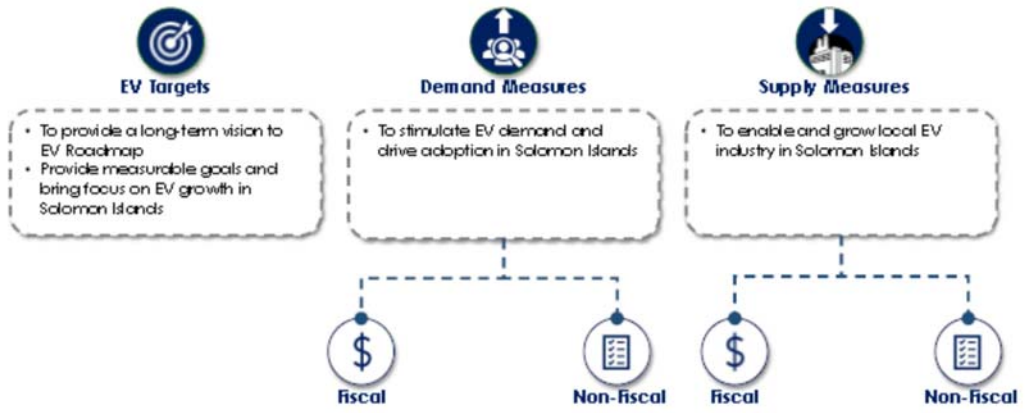
pManifold Business Solutions Pvt. Ltd.

Coverage

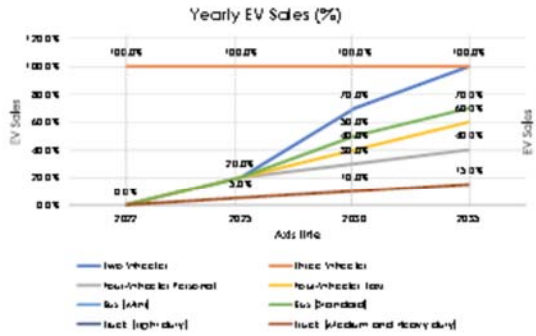
1. EV Policy Framework
2. EV Targets
3. Benefits from EV adoption
4. EV Policy Measures: Demand and Supply
5. Impact on Government Budget
6. EV Roadmap

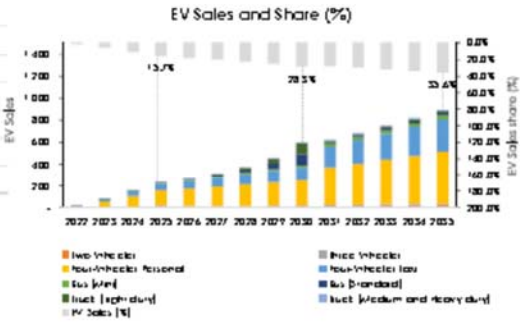
EV Policy Framework

e-Mobility Policy Framework



Proposed E-Mobility Targets for Solomon Islands (till 2035)





Vehicle Category	2025	2030	2035
Annual EV Sales Target	15.7%	28.3%	35.6%
EV Stock Mix (%)	1.2%	5.3%	12.3%

The targets have been arrived from Global benchmarks, inputs and validation from several stakeholder consultations, Ministerial meetings and validation workshops.

Benefits from EV Adoption (2022-2035)

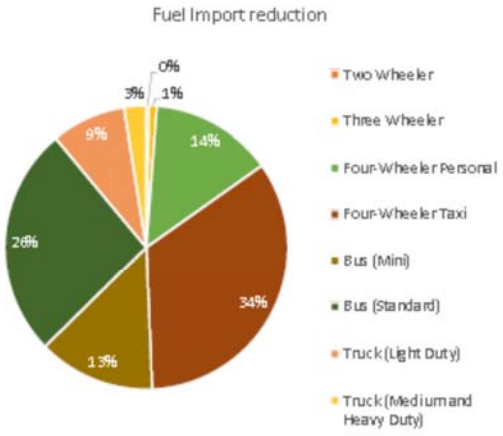
Fuel Savings

Fuel Import savings

52
Mn Litres

Forex Expenditure savings

162
Mn USD



Benefits from EV Adoption (2022-2035)

GHG Emission reduction (CO2)

Total CO2 emission reduction

166,422
Tons

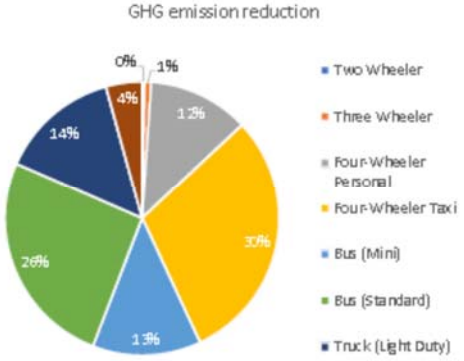
Air pollution emission reduction

PMx reduction
7
Tons

SOx reduction
1.0
Tons

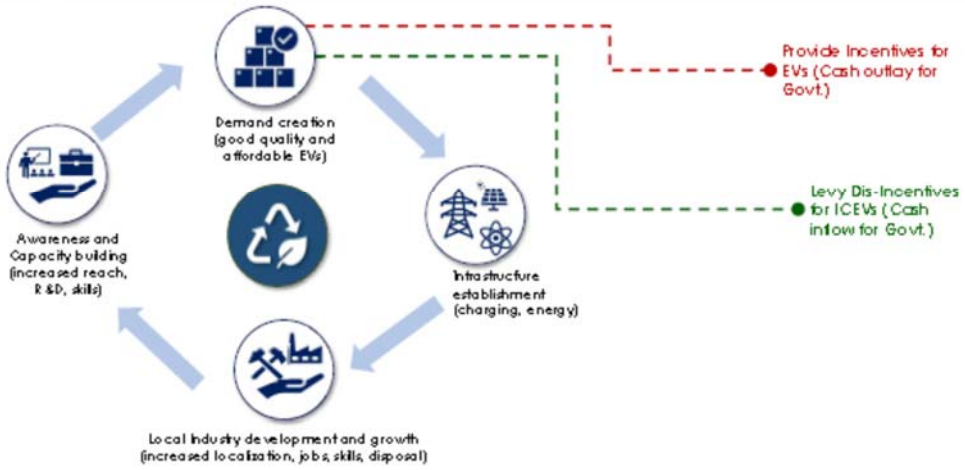
NOx reduction
309
Tons

Cost Savings
0.3
Mn USD



EV Policy Roadmap Development

Policy Balance is important to evolve EV Ecosystem in Solomon Islands

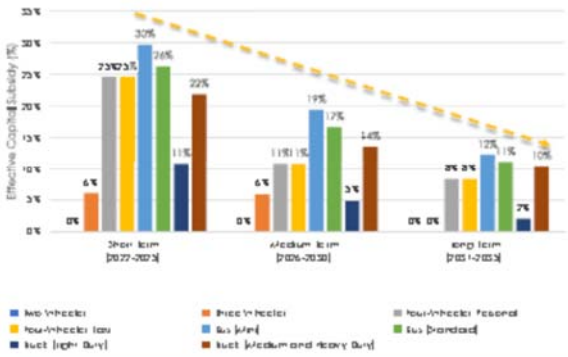


Making EVs Affordable

EV Segments	Two Wheeler	Three Wheeler	Four Wheeler - Personal	Four Wheeler - Taxi	Bus – Mini	Bus - Standard	Truck (Light duty)	Truck (Medium - heavy duty)
% higher cost over ICEVs without incentives	-23%	11%	60%	24%	175%	247%	197%	289%
% TCO advantage over ICEVs*	-17%	3%	65%	53%	191%	588%	10%	252%
% of Subsidy on battery	0%	10%	100%	100%	100%	100%	20%	100%
% GST reduced	0%	0%	84%	9.0%	100%	100%	0%	100%
% Customs reduced	0%	0%	0%	0%	100%	100%	0%	100%
% TCO advantage over ICEVs* with/after incentives	-23%	5%	51%	19%	124%	185%	182%	191%
% higher cost over ICEVs with/after incentives	-17%	-3%	0%	0%	49%	2.0%	0%	176%
Reduced GST (%) (Incentive)	No	No	Yes	Yes	Exemption	Exemption	No	Exemption
	19.0%	19.0%	3.0%	0.7%	0.0%	0.0%	19.0%	0.0%
Reduced Custom Duty (%)	No	No	No	No	Exemption	Exemption	No	Exemption
	10.0%	10.0%	10.0%	10.0%	0.0%	0.0%	15.0%	0.0%
Proposed Subsidy on batteries as % of total EV cost	0%	6%	25%	25%	20%	2.7%	11%	22%
Proposed Subsidy (USD/unit)	0	128	9,200	8,856	15,180	42,780	2,762	21,050

Providing Purchase subsidy for EVs

Reducing Subsidy over the period of 15 years



Total EV capital Subsidy (2022-2035)

26.3 Mn USD

- **e-2W and e-3W do not required subsidy** due to parity
- **But Bus (Mini and Standard segments), and Truck (medium to heavy segment) having higher TCO and not achieve parity will need support throughout till 2035**
- This is to be in the form of both Subsidies, GST and **custom duty reduction/exemption till 2035**

- Government would need to support **Bus segment (Mini & Standard), and Truck (Medium and Heavy)** due to very high purchase cost even after 2031

Proposed Differential Taxation for EVs

Incentivising EVs

Custom Tax incentive for EVs

No exemption on custom duty for e-2W, e-3W e-4W (private and taxi), and truck (Light duty).

Full Exemption on Custom duty for e-Bus (Mini & Standard), and e-Truck (Medium and Heavy) segments till 2035

Vehicle Category	2022	2025	2030	2035
Two Wheeler	10.0%	10.0%	10.0%	10.0%
Three Wheeler	10.0%	10.0%	10.0%	10.0%
Four-Wheeler Personal	10.0%	10.0%	10.0%	10.0%
Four-Wheeler Taxi	10.0%	10.0%	10.0%	10.0%
Bus (Mini)	15.0%	0.0%	0.0%	0.0%
Bus (Standard)	15.0%	0.0%	0.0%	0.0%
Truck (Light duty)	15.0%	15.0%	15.0%	15.0%
Truck (Medium and Heavy duty)	15.0%	0.0%	0.0%	0.0%

GST incentive for EVs

GST to be reduced **from current 19.05%** and **kept at par with ICE from 2031 onwards** for all vehicle segments.

Vehicle Category	2022	2025	2030	2035
Two Wheeler	19.05%	19.05%	19.05%	19.05%
Three Wheeler	19.05%	19.05%	19.05%	19.05%
Four-Wheeler Personal	19.05%	2.0%	2.0%	19.05%
Four-Wheeler Taxi	19.05%	0.7%	0.7%	19.05%
Bus (Mini)	19.05%	0.0%	0.0%	19.05%
Bus (Standard)	19.05%	0.0%	0.0%	19.05%
Truck (light duty)	19.05%	19.05%	19.05%	19.05%
Truck (Medium and Heavy duty)	19.05%	0.0%	0.0%	19.05%

49.2 Mn USD

Cumulative Tax Revenue loss to Govt. (2022-2035)

Proposed Differential Taxation for ICEVs

Dis-incentivising ICEVs

Custom Tax Increase for ICEVs

- 2-W(2-W(4-W (personal & taxi): Increase from current 10% to 12% till 2025, 14% for 2026 - 2030 , and 16% for 2031-2035
- Bus (mini & standard) and trucks: Increase from current 15% to 17% till 2025, 19% for 2026 - 2030 , and 21% for 2031-2035

Vehicle Category	2022	2025	2030	2035
Two Wheeler	10.0%	12.0%	14.0%	16.0%
Three Wheeler	10.0%	12.0%	14.0%	16.0%
Four-Wheeler Personal	10.0%	12.0%	14.0%	16.0%
Four-Wheeler Taxi	10.0%	12.0%	14.0%	16.0%
Bus (Mini)	15.0%	17.0%	19.0%	21.0%
Bus (Standard)	15.0%	17.0%	19.0%	21.0%
Truck (Light duty)	15.0%	17.0%	19.0%	21.0%
Truck (Medium and Heavy duty)	15.0%	17.0%	19.0%	21.0%

GST Increase for ICEVs

- GST increase on ICEVs from current 19.05% to 21.05% for 2022-2025; 22.05% for 2026-2030; 23.05% for 2031-2035 (across vehicle segments)

Vehicle Category	2022	2025	2030	2035
Two Wheeler	19.05%	21.05	22.05%	23.05%
Three Wheeler	19.05%	21.05	22.05%	23.05%
Four-Wheeler Personal	19.05%	21.05	22.05%	23.05%
Four-Wheeler Taxi	19.05%	21.05	22.05%	23.05%
Bus (Mini)	19.05%	21.05	22.05%	23.05%
Bus (Standard)	19.05%	21.05	22.05%	23.05%
Truck (light duty)	19.05%	21.05	22.05%	23.05%
Truck (Medium and Heavy duty)	19.05%	21.05	22.05%	23.05%

59.8 Mn USD

Cumulative Additional Tax Revenue to Govt. (2022-2035)

Other measures for EVs Demand creation

Convenience and Ease for EV registration
- Single window clearance and approval
- Priority and easy of process of registration, permits, transfers and ownership of EVs

Lower the repeat taxes
- Exemption of repeat taxes and registration charges on EVs

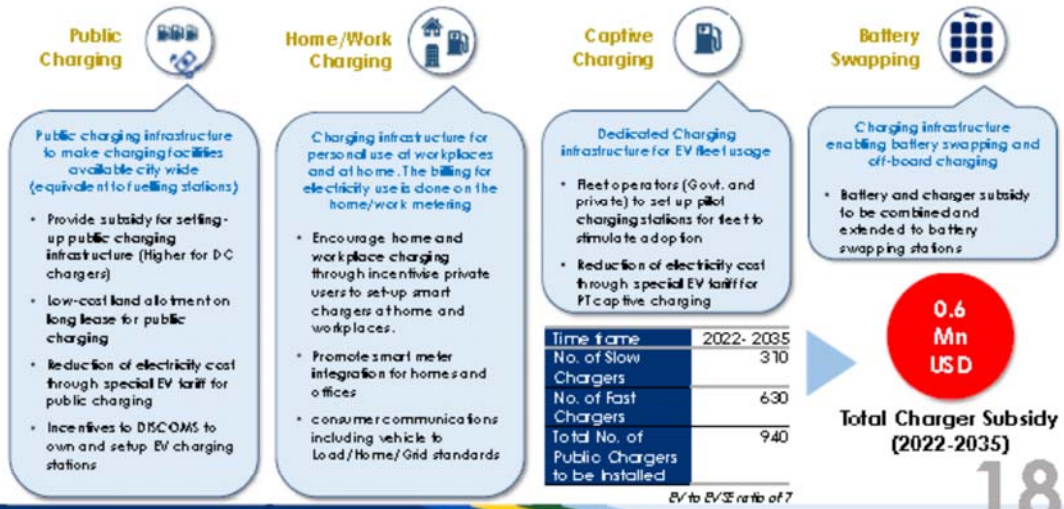
Convenience and Ease of Use
- Provision of preferential parking access (provision of parking and charging zones for EVs)

Exemption/reduction of repeat/one time taxes and registration fees
- Exempt the repeat taxes (registration renewal and licensing) on EVs
- Exempt registration fees, one-time taxes and recurring taxes on EVs

Lower the Financing cost
- Encouraging bank to finance Individual (B2C) & fleet (B2B) ownership and allowance of accelerated depreciation and/ or appropriate tax holidays for EVs

Additional 0.5% differentiation in tax reduction for Women is considered through-out fiscal incentives to boost women empowerment

Growing Charging Infrastructure

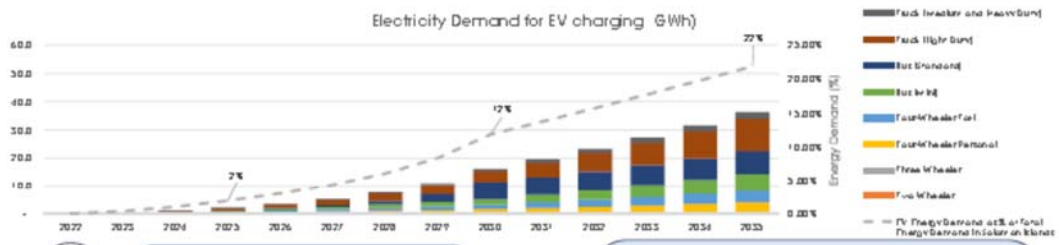


Standards for Growing Charging Infrastructure

Building code for setting up Charging Infrastructure
- Revise and Redraft Building code and City Development code to incorporate EV charging infrastructure (at home, work and public buildings/spaces)

EV Charging standards
- Formulate National standards for EV charging (AC and DC across vehicle segments and locations); for Home, Office, Public charging and battery swapping
- Type-2 for AC charging (3.7/7.2/22 kW); CHAdeMO and/or CCS Combo 2 for DC charging given high mix of Europe and Japan imports (30/50/100 kW)

Reforming and growing Energy Infrastructure
(Improve electricity supply and access to electricity)



Charging integration for Grid stability
- Guidelines/ standards for Grid and Chargers interconnectivity and communications for overall grid stability, safety, and EV transaction

Time-of-Use (TOU) Tariff system
- TOU tariff system for Grid load management to allow differential tariff

Improving Grid access in urban and rural
- Government and private investments in National Grid expansion
- Encourage (DRE) mini grids (by Govt. and Private players) to integrate EVs (including plug-in charging and swap batteries). Allow easy and lower interest rate of financing for Distributed renewable energy (DREs)

Reforming and growing Energy Infra
(Integration of renewable energy sources for EVs)

The existing contribution RE in Solomon gid is low. RE Integration will help to Cleaner the source and energy

Improve facilitation by DISCOM for enabling smart EV Charging at homes and workplaces including RE integration:
- Encourage home and work place charging through incentivising private users to set-up smart chargers at home and work places

- Encourage end-users and incentivise to adopt solar roof tops for improved electricity access.
- Allow net metering for Solar roof tops.
- Extending/ Bundling right fiscal incentives for solar rooftops and EV charging for residential and commercial users.

Synergies with Renewable Energy Road Map In Solomon Islands

- Solomon Islands Electricity Authority, trading as "Solomon Power" (SP), has targeted 100% RE in the Honiara grid by 2030 in its business plan.
- For aiming RE 100%, it is necessary to introduce a considerable amount of Solar PV, improve flexibility on the grid side and ; also including energy production from hydro and wind energy sources.

Building Local Industry Capacity & Competitiveness

Encouraging local EV assembling
- Incentives on EVs, sub systems and raw materials
- Exemption of import duties on EV sub-systems and raw materials

EV Pilots and Deployment
- Support for EV pilots and Experimentation

EVs Training and Capacity Building
- Setup EVs Training and Capacity Building ecosystem
- Encourage Technical Universities/ Institutes, skill councils to develop degree and vocational courses in EVs and broader e-Mobility.
- Strengthen EV repairs and services across the nation

EVs Quality and Safety Standards
- Formulation of EVs Quality and Safety standards for safe import and local production
- Clear definition of national standards for EV charging (AC and DC across vehicle segments and locations)

National R&D Centres on EVs
- Establishment of Industry-Academia EVs Centre of Excellence (COE)

Stricter Emission norms and other Supply side measures for EVs

Emission standards and pollution control
- Development of robust pollution measurement and control system with annual mandatory Pollution Test
- Stricter Vehicle emission standards and enforcement for ICEVs (new vehicle/ pre-owned)
- Stricter fuel standards for petrol, and diesel

EVs Vehicle classification
- Vehicle classification system revision to differentiate EVs (and any other future vehicle technology)
- Green number plates for EVs
- Maintaining same vehicle number throughout vehicle life(till scrappage)

Defining and enforcing End-of-Life measures
(Scrap and safe disposal/recycle)

Vehicle scrappage guidelines
- Definition of National guidelines for vehicle scrappage, both for commercial and passenger vehicles
- Mandate Extended Producers Responsibility (EPR) by for OEMs to set-up collection centers and recycling facilities

Battery re-use and recycle guidelines
- Outline environmental guidelines for battery re-use and recycle
- Support setting up battery recycling facilities

Retrofitment allowance
- Allow retrofit of ICEVs to EVs following safety standards

Budget Neutrality and Cost-Benefits to Government

		Short term 2022-2025	Medium term 2026-2030	Long term 2031-2035
EV adoption	Subsidies: Subsidy on EV capital, charger capital and expense on awareness	$ 5.1 Mn	$ 10.6 Mn	$ 6.3 Mn
	Tax reforms: Net impact Tax Revenue after change in vehicle tax structure and fuel tax structure incentivizing EV through tax reduction and disincentivizing ICE through tax increment	$ 2.6 Mn	$ 18.6 Mn	$ 58.8 Mn

EV Adoption Cost to Government

		Unit	Short Term 2022-25	Medium Term 2026-30	Long Term 2031-35	Total 2022-35
	EV Targets					
	EV Annual Sales Target (%)	% of sale	15.7%	28.3%	35.6%	<2% of GDP
	EV Mix (%)	% of stock	1.2%	5.3%	12.3%	
I	Program Budget	Mn USD	6.0	13.7	6.7	26.3
a)	EV Capital Subsidy	Mn USD	5.6	12.8	6.0	24.4
b)	EV Charger Capital Subsidy	Mn USD	0.1	0.2	0.3	0.6
c)	EV Public Awareness Program	Mn USD	0.3	0.7	0.3	1.3
II	Impact on Tax Revenue due to change in Vehicle Taxes					
	Tax revenue collected on ICEVs @ Increase in Taxes	Mn USD	69.1	106.7	135.2	
	Tax revenue collected on ICEVs @ No Change in Taxes	Mn USD	69.1	73.7	108.3	
a)	Additional Tax Revenue collected from, increase in taxes on sale of ICEVs	Mn USD	-	33.0	26.9	59.8
	Tax revenue collected on EVs @ Decrease in Taxes	Mn USD	2.5	9.3	63.2	
	Tax revenue collected on EVs @ No Change in Taxes	Mn USD	7.5	44.0	72.67	
b)	Loss in Revenue collected from, Decrease in taxes on sale of EVs	Mn USD	(5.0)	(34.7)	(9.5)	(49.2)
III	Net Impact on Vehicle Tax Revenue after change in vehicle tax structure [II a + III b]	Mn USD	(5.0)	(1.7)	17.4	10.7

EV Adoption Cost to Government

		Unit	Short Term 2022-25	Medium Term 2026-30	Long Term 2031-35	Total 2022-35
IV	Impact on Tax Revenue due to change in Fuel Taxes					
	Tax revenue collected on sale of gasoline @ Increase in fuel taxes	Mn USD	18.2	22.9	28.0	
	Tax revenue collected on sale of gasoline @ No Change in fuel taxes	Mn USD	17.5	17.2	16.8	
a)	Additional tax revenue on sale of gasoline	Mn USD	0.7	5.7	11.2	17.6
	Tax revenue collected on sale of diesel @ Increase in fuel taxes	Mn USD	44.5	58.2	75.7	
	Tax revenue collected on sale of diesel @ No Change in fuel taxes	Mn USD	42.8	43.7	45.4	
b)	Additional tax revenue on sale of diesel	Mn USD	1.7	14.6	30.2	46.5
V	Net Impact on Fuel Tax Revenue after change in fuel tax structure [IVa + IVb]	Mn USD	2.4	20.3	41.4	64.1
VI	Net Impact on Tax Revenue after change in both Vehicle and Fuel tax structure [III + V]	Mn USD	(2.6)	18.6	58.8	74.7
VII	Overall Cost to Govt. (I-VI)	Mn USD	8.6	(4.9)	(52.1)	(48.4)

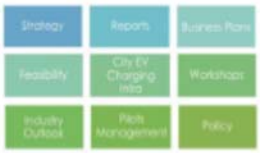
Proposed E-Mobility Roadmap for Solomon Islands

Components	Short Term (2022-2025)				Medium Term (2026-2030)					Long Term (2031-2035)				
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
EV Targets EV Chargers Targets Demand Side Measures	As per EV targets mentioned before													
EV Fiscal Measures														
1. Capital subsidy on EVs	Capital subsidy @ D-30%				Capital subsidy @ D-20%					Capital subsidy @D-15%				
2. Concessional rates on EVs														
- CSI	Reduce CSI on EVs as per requirement for different vehicle segments													
- Custom Duty	Reduce Custom Duty on EVs as per requirement for different vehicle segment													
- Vehicle registration charges	EVs exempted till 2035 on all vehicle segments													
3. Capital subsidy on chargers	Capital subsidy for slow chargers (SC) @ 50% and for chargers (FC) @ 75%				Capital subsidy for SC @ 30% and FC @ 30%					Capital subsidy for SC @ 20% and FC @ 20%				
EV Non- Fiscal Measures														
1. Ease the registration process	Yes													
2. Support the EV retrofit program	Yes													
3. Preferential access (meters, parking places etc.)	Yes													
4. Bank financing and accelerated depreciation	Include EV financing into the bank's priority sector lending portfolio. Allow accelerated depreciation on new EVs													
5. Amendment of building and city development codes to promote charging facilities	Yes													
ICEV Fiscal Dis-Incentive Measures														
1. Tax Increase on ICEVs														
- CSI Increase on ICEVs	Increase CSI to 21.05%				Increase CSI to 22.05%					Increase CSI to 23.05%				
- Custom Duty Increase on ICEVs	Increase Custom Duty to 12%				Increase Custom Duty to 14%					Increase Custom Duty to 16%				
- Fuel tax increase- custom duty	The yearly increase in customs duty on diesel and gasoline by 1%													
ICEV Non-Fiscal Dis-Incentive Measures														
1. Pollution test and certification	Mandatory periodic pollution test certification for all ICEVs													

Proposed E-Mobility Roadmap for Solomon Islands

Components	Short Term (2022-2025)				Medium Term (2026-2030)					Long Term (2031-2035)				
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Supply Side Measures														
EV Fiscal Measures														
1. Reduce import duties on EV sub-systems	Applicable													
EV Non- Fiscal Measures														
1. Vehicle emission norms	Develop vehicle emission standards and enforce				Enforce emission norms					Enforce and upgrade emission norms				
2. Fuel emission norms	Develop fuel emission standards and enforce				Enforce emission norms					Enforce and upgrade emission norms				
3. Revision of vehicle classification system to include EVs	Develop	Enforce								Enforce and upgrade				
4. EV and charging infrastructure standards	Develop	Enforce								Enforce and upgrade				
5. Charging infrastructure development														
- Low cost land allotment for public charging	Applicable													
- Incentivise power distribution companies	Encourage power distribution companies to set up public charging infrastructure													
6. EV grid management	Expansion of grid and off-grid infrastructure and power quality									Expansion and maintenance of grid and off-grid infrastructure and power quality				
7. Tariff revision	Revise EV tariff (yearly) and allow ICEV tariff													
8. EV plans	Focus on intracity public transportation with Die-Buses													
9. EV retrofit allowance	Applicable													
10. EV repair and maintenance (R&M)	Strengthen R&M capacity for EVs across the country									Upgrade R&M capacity for EVs across the country				
11. Scrappage and disposal measures														
- Battery recycling	Develop standards and enforce									Enforce and upgrade				
- Vehicle scrappage policy	Develop standards and enforce									Enforce and upgrade				
12. Awareness and skill development	Applicable													

Thank you !



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Presentation on Market Feasibility Study on eBuses

Final Dissemination and Awareness Workshop
29th August 2022

Feasibility Study for Low Emission Land Transport Sector in Solomon Islands

Market Feasibility for e-Bus in city of Honiara

Prepared for
Government of Solomon

Supported by
CTCN Climate Technology Centre and Network
UN environment programme | copenhagen climate centre
supported by UNOPS

Prepared by
pManifold Business Solutions Pvt. Ltd.

Coverage

1. Honiara city Landscape
2. e-Bus Techno-Commercial Feasibility
3. Investment Sizing
4. Impact of e-Bus Fleet
5. e-Bus and Charging Business & Financing Model
6. Enabling Policies and Way Forward

Honiara city Landscape

- Context and scope of project
- Existing Fleet composition of in the city of Honiara
- Desired e-Bus Type and Fleet Size for First Deployment

e-Mobility Policy Structure

Phase I : EV Policy Roadmap

Prioritised e-Buses for Intracity Public Transport

Phase II : Market feasibility for e-Buses in City of Honiara

Existing Fleet composition and Selected e-Bus Type for First Deployment

Private Bus Operator

- No formal Public Transport Authority in Honiara
- No Depot in Honiara

Total Operational Buses	900+
Bus Lengths	4.5-7m, 12m
Passenger Capacity	15-30
Avg distance/day/bus	150-200km
Avg. Fare	0.3 USD/trip
Average daily ridership per bus per trip	15
Operations	Unscheduled

Desired e-Bus Type and Fleet Size for First Deployment

10 Intracity e-Buses

7 m

AC, Standard Floor

Based on consultations with Honiara City Council:

7 m AC Standard Floor buses are chosen for first e-Bus deployment because;

- Low ROW in the city
- Bigger buses consume more energy which adds on to the higher battery capacity and higher costs

Source: Local consultations

e-Bus Techno-Commercial Feasibility

- Depot and Routes Selection
- Routes Energy assessment
- Battery sizing
- Charging strategy
- Proposed e-Bus deployment
- Proposed e-Bus operations

Selected Depot and Routes

Proposed Depot at MID building selected for electrification

- Large vacant land which will be able to set up the new proposed facility
- Near the Honiara city Market which has high traffic and passenger demand

Vacant land behind MID building Identified for new Depot

2 Routes are selected for electrification

- 6 routes were identify initially namely 1) Honiara City market to AJ City mall 2) Honiara City market to Kakambona 3) Didao Circular Route 4) Honiara City Market-Tuvaruhu 5) Honiara City Market Circular (via Guadalcanal Memorial) 6) Honiara City Market Circular (via H&M Enterprise)
- Among these 6 routes are finals elected for electrification as follows;

R1: Honiara City Market to AJ City mall

7.3 Km one way

R2: Honiara City Market to Kakambona

5.3 km one way

The selected routes are,

- ✓ **Longest with more distance travelled per day**
- ✓ The e-Bus TCO of the route is estimated to be **1.61 USD/km** (with selected scenarios)

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Selected Depot and Routes

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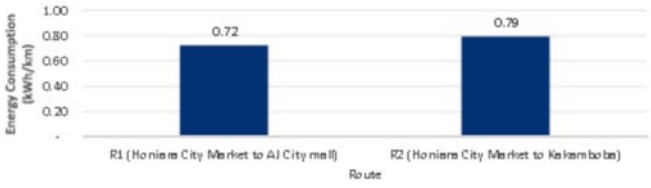
Route energy consumption (for 7m, AC e-Bus)

R2 has higher energy consumption between 2 selected routes



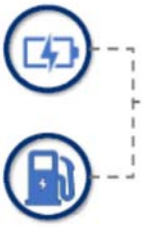
Key Outcomes	Units	R1	R2
	Energy consumption [kWh/km]	0.72	0.79
		Honiara City Market to AJ City Mall	Honiara City Market to Kakambona
Total Energy Consumption	kWh	10.6	8.4
Existing number of Buses	Nos.	85	65
Average speed	Kmph	16	16
Average passenger occupancy	Pax/trip	14	14
	Pax/round trip	28	28
Round Trip Distance	Km	14.6	10.6
Round Trip Duration	Hrs	00:55	00:40

Battery Size and Charging strategy selection

80 kWh & 118 kWh
Initial battery size alternatives

Battery & Charging
Scenario assessment

Scenario assessment
Total Cost of Ownership (TCO) Assessment



Scenarios	Scenario 1	Scenario 2
Battery size	80 kWh	118 kWh
Charging strategy	Overnight + Opportunity Charging	
Charging Location	@ MID Depot (Place identified. Not developed)	

118 kWh
is the minimum battery size required for smooth e-Bus operation with **lowest TCO for selected 2 routes**

Overnight + Opportunity Charging @ MID Depot
(Scenario 2)

Initial Charging options and strategies identified
Fast DC chargers plug-in type chargers
Overnight @ MID Depot + Opportunity charging @ MID Depot after every round trip

Proposed e-Bus Architecture

Specs: 7 m AC, 15 seater
Fleet Size: 10

Battery Technology: Lithium ion
Proposed Battery Size: 118 kWh

Charging Technology: DC Fast charging
Charging strategy: Overnight + Opportunity charging @ MID Depot
Charger size:
- **3 Nos.** of 55 kW DC Fast Chargers | MID Depot Location
- **Peak Power requirement:** 165 kW
- **Total Energy Demand:** 1,337 kWh

Rationale

- Number of fleet proposed across select 2 routes is 10 e-Buses
- Fleet size determined based on 1st pilot investment limitations

- Minimum battery size required to fulfil route level energy demand and ensure smooth bus operations

- Opportunity charging is suggested in every round trip. This allows keeping SOC between 40-60% which is good for battery life
- Charging facilities only at the depot reduces the investments
- Optimised charging schedule between e-Buses across both routes allows for better grid load management

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e-Bus Operations on R1 (Honiara City Market- AJ City Mall)

Overnight Charging

IN CHARGE OUT
~20% 99%
2 Hrs Charge +5 min logistics

Opportunity Charging

IN CHARGE OUT
00:15 Hrs Charge After every round trip

MID Depot

- **Total Operational Hours:** 15 Hrs
- **No of e-Buses in R1:** 6
- **e-Bus Headway:** 16 Minutes
- **Average Trip time (peak):** 00:55 Hr

- **Round trips per bus per day: 12**
- **Average distance travelled per bus per day:** 168 km/bus/day*

- **Energy Requirement per km:** 0.72 kWh/km
- **Average daily Energy consumption per bus:** 121 kWh/day
- **Number of Charging Events:** (Total 12)
  - Overnight charging – 1
  - Opportunity Charging - 11
- **Number of e-Buses shared per charger:**
  - 55 kW DC Fast Charger (Overnight + Opportunity) - 3 bus/charger

*The last bus won't be able to make the 12th trip in a day with the proposed schedule. Henceforth a weighted average of the trip distance across all buses has been considered

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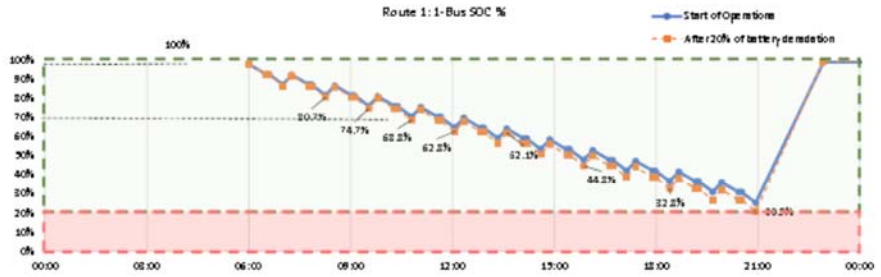
Charging Strategy for R1



Total trips	Headway	Opp. Charging		Overnight Charging	
12	16 Min	15 Min	11	2 Hrs	1
		Depot		Depot	

Bus	Charger	Battery
6 Buses	2 Fast DC Chargers (55 kW) @ Depot	118 kWh – Li-ion battery
79% fleet utilisation	61% charger utilisation	8.8 years life

Investment Sizing

- CAPEX Requirement
- OPEX Requirement
- Total Cost of Ownership (TCO) for the Recommended e-Bus Option

Investment required for e-Bus deployment set-up

for 10 e-Buses

CAPEX

	e-Bus (w/o battery)	Battery	Charging Infrastructure	Total Equipment	Land
Avg. Cost per Unit *(including all taxes)*	110,950 USD	37,157 USD	16,326 USD		No Existing Depot. Green field land and depot to be setup
Total cost for Fleet/complete set-up	1.11 Mn USD	0.37 Mn USD	0.04 Mn USD	1.52 Mn USD	~1.9 Mn USD*

[*] This cost is not accounted in TCO modeling
[**] The total investment is not inclusive of Solar RE power plant to supply power for EV Charging. This is considered as one of the optimal scenario.

Investment required for e-Bus deployment set-up

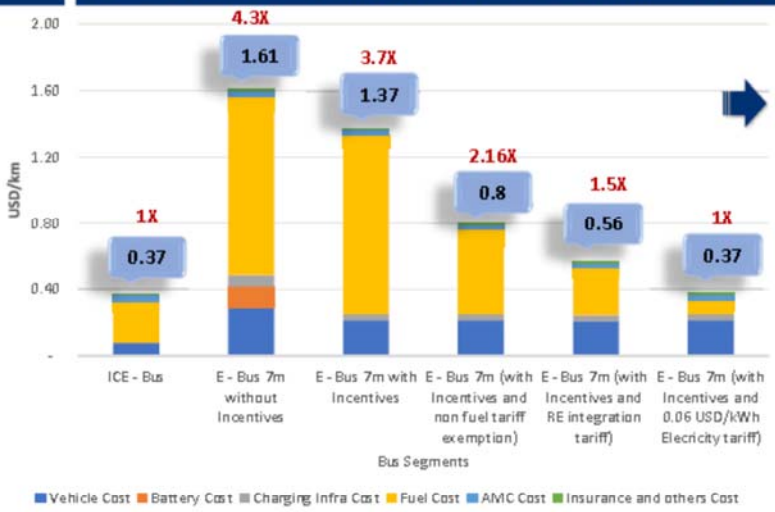
for 10 e-Buses

OPEX

	Electricity	Annual Maintenance Cost	Insurance	Total Mn USD /Year
Avg. Cost per Unit *(including all taxes)*	0.77 USD/kWh*	0.003 USD/km	0.6% Total Vehicle cost	
Avg. Total cost for Fleet/Year	0.55 Mn USD /Year	0.02 Mn USD /Year	0.002 Mn USD /Year	0.57 Mn USD

[*] Assuming existing grid electricity tariff. Tariff as per Dec 2021 Tariff order.

Total Cost of Ownership (TCO) for the Recommended e-Bus Option



Recommendation

- It is **recommended to exempt the non-fuel charges (0.42 USD/kWh)** on fuel, to bring down the TCO of the e-Bus
- It is recommended to integrate RE will also reduce the **electric tariff (0.2 USD/kWh)** to bring down the TCO of the e-Bus
- However for the e-Bus to achieve parity with the ICE bus a tariff **of 0.06 USD/kWh is recommended**

Impact of e-Bus Fleet

- Fuel Savings
- GHG emissions Reduction
- Direct economic savings
- Indirect economic savings

Impact of e-Bus Deployment

for 10 e-Buses

Fuel Savings *(over lifetime)*

~ 1.6
Million Litre

Direct Economic savings from fuel savings *(over lifetime)*

~ 1,9
Mn USD

GHG Emission Reduction *(over lifetime)*

~ 3,148* / ~ 3,750**
Tons Tons

Indirect economic savings *(over lifetime)*

~ 0.4
Mn USD

2,000 + trees saved

* This is assuming existing grid supply for EV charging and gradual increased RE adoption as per Energy Roadmap 2035.
** This is assuming 100% Solar RE supply for EV charging through the life of e-Buses.

e-Bus and Charging Business & Financing Model

- Business Model
- Financial Analysis of e-Bus Deployment

Business Model for e-Bus deployment

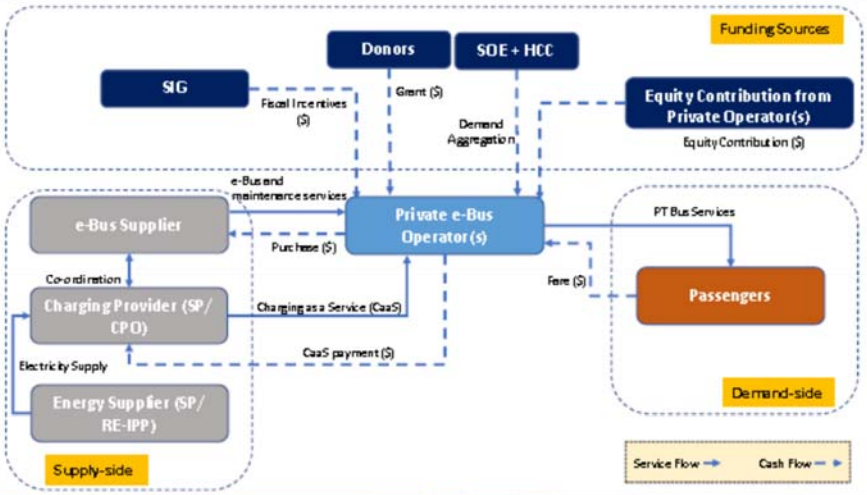
Existing ICE Bus Business Model	
Existing ICE buses procurement models in Honiara	1. Privately operated buses with fare regulated by City of Honiara

Potential Business models for e-Bus Operations

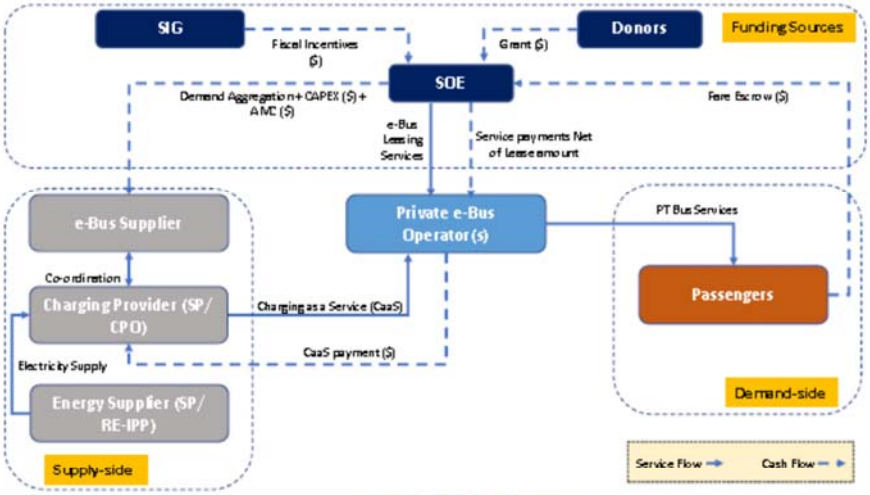
Potential Business Models	e-Buses Demand Aggregation	e-Buses Investment	e-Buses Ownership	e-Buses Operations	e-Buses Maintenance	Chargers' Setup and O&M	Energy Supply	Ticketing
Model-1 (Private Operator Ownership)	SOE+ HCC	Donor agency + SIG support + Private Operator(s)	Private Operator(s)	Private Operator(s)	e-Bus Supplier/Private Operator(s)	Solomon Power (SP)/ CPO	Solomon Power (SP)/ RE-IPP	Private Operator(s)
Model-2 (Leasing from SOE)	SOE+ HCC	Donor agency + SIG support + SOE	SOE (leasing to Private Operator(s)	Private Operator(s)	e-Bus Supplier/Private Operator(s)	Solomon Power (SP)/ CPO	Solomon Power (SP) / RE-IPP	Private Operator(s) (Escrow to SOE)

SIG- Solomon Islands Government
SOE- State Owned Enterprise
HCC- Honiara City Council
RE-IPP- Renewable Energy Independent Power Producer
CPO- Charge Point Operator

Proposed Business Model 1: Private Operator Ownership



Proposed Business Model 2: Leasing from SOE



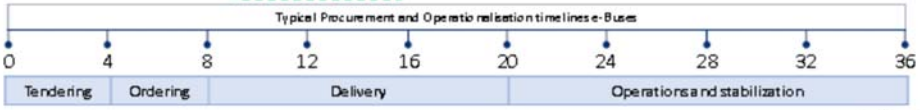
e-Bus Deployment Plan

Funding (for infra of first e-bus deployment)
10 e-Buses
1.52 Mn USD

**Estimated CAPEX including e-Buses, chargers, other infra and taxes*

e-Bus Deployment schedule for Short term

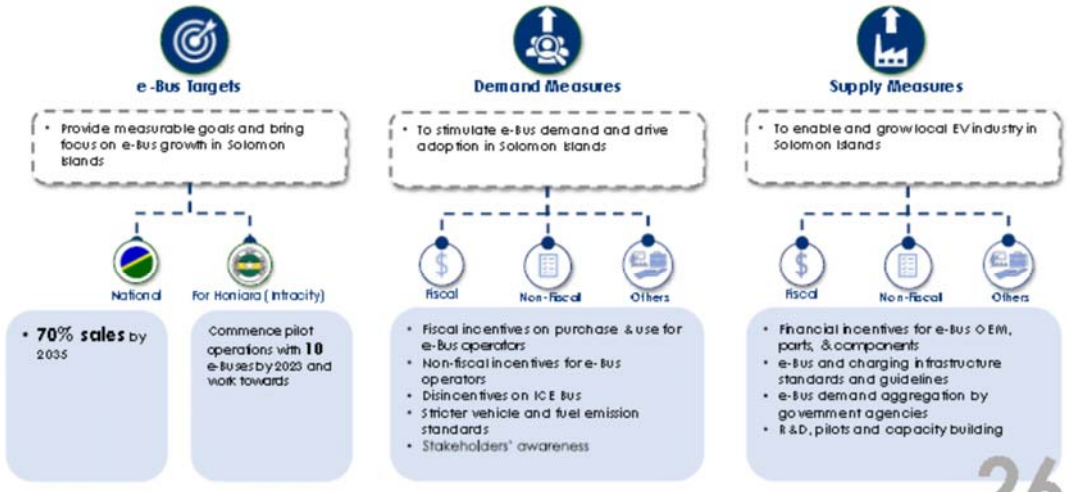
Phases	Year-1	Year-2	Year4-5
Planning & Procurement	10 e-Buses Pilot	Second batch of 20 e-Buses	Third batch of 45 e-Buses
Plying		10 e-Buses	10+20+45=75 e-Buses
Monitoring & Capacity Building		First pilot learning and capacity building	Capacity and fleet expansion and related capacity building



Enabling Policy Measures for e-Bus Adoption and Way forward

- Enabling Policy measures for e-Bus adoption
- Long term e-Bus deployment plan
- Way Forward

Enabling Policy measures for e-Bus Adoption



Thank you !

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Annex 2 Pictures

Annex 4 Participants

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6.	Mr. Sammy Airahui	Climate Change Officer	Ministry of Climate Change, Environment Conservation, National Disaster Management & Meteorology (MECDM)
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