100 E-Bus Trial Jakarta
Final Report

February 26, 2021

C40 CITIES FINANCE FACILITY

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C40 CITIES

ABOUT THE C40 CITIES FINANCE FACILITY

The C40 Cities Finance Facility (CFF) is a collaboration of the C40 Cities Climate Leadership Group and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The CFF supports cities in developing and emerging economies to develop finance-ready projects to reduce emissions to limit global temperature rise to 1.5°C and strengthen resilience against the impacts of a warming climate. The CFF is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ), the Children's Investment Fund Foundation (CIFF), the Government of the United Kingdom and the United States Agency for International Development (USAID).

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

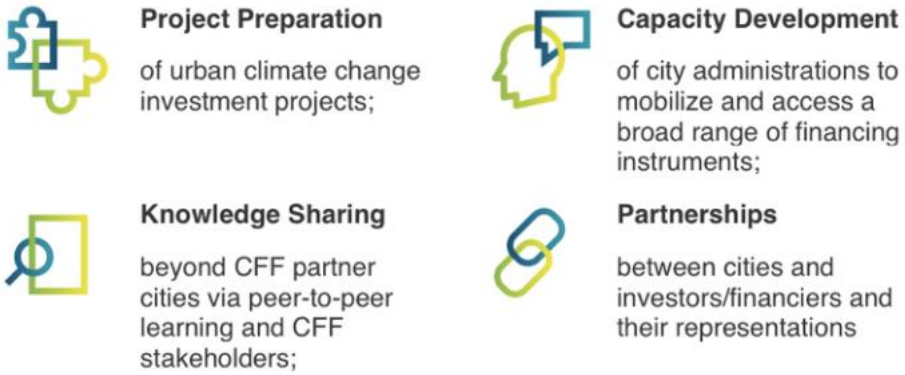
ACI	Adaptive Capability Index
AFOLU	Agriculture, Forestry, Others Land Use
B-30	Biodiesel 30%
BDF	Biodiesel Fuel
BEB	Battery Electric Bus
BEV	Battery Electric Vehicle
Bodetabek	Bogor Depok Tangerang Bekasi
BPTJ	Badan Pengelola Transportasi Jabodetabek
BRT	Bus Rapid Transit
°C	Degree Celsius
CH4	Methane
CNG	Compressed Natural Gas
CO	Carbon monoxide
CO2	Carbon dioxide
COVID-19	Coronavirus disease 2019
CN	Cetane Number
CNG	Compressed Natural Gas
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station
CS	Charging Station
CWD	Consecutive Dry Days
DAS	Daerah Aliran Sungai
DKI Jakarta	Daerah Khusus Ibukota or Special Capital Region of Jakarta
E-Buses	Electric Buses
ERP	Electronic Road Pricing
ETCCDI	Expert Team index on Climate Change Detection and Indices
GCM	Global Calculation Model
Gg	Gigagram
GHG	Greenhouse gas
GIS	Geographic Information Systems
Gr	Gram
GWh	Gigawatt Hour
HDI	Human Development Index
ICCT	The International Council on Clean Transportation
ICE	Internal Combustion Engine
ICTP	The International Centre for Theoretical Physics
IKU	Indeks Kualitas Udara
IPCC	Inter-Governmental Panel on Climate Change
IPPU	Industrial Products and Product Use
ISPU	Index Standar Pencemar Udara
JAC	Jabodetabek Airport Connection
KESDM	Kementerian Energi dan Sumber Daya Mineral
km	kilometer
kV	Kilo volt

kWh	Kilowatt Hour
LPG	Liquefaction Petroleum Gas
m/s	Meters per second
mb	Milli bar
MEMR	Minister of Energy and Mineral Resources
MJ	Megajoule
mm/day	millimeter per day
MW	Megawatt
Natcom	National Communication
NDC	Nationally Determined Contribution
NMVOC	Non Methane Volatile Organic Compound
NOx	Nitrous oxide
OPD	Organisasi Perangkat Daerah (Regional Administrative Organization)
PJB	Pembangkit Jawa Bali
PLN	Perusahaan Listrik Negara (Indonesia's state-owned electricity company)
PM	Particulate matter
Perum DAMRI	Perusahaan Umum Djawatan Angkoetan Motor Repoeblik Indonesia
Perum PPD	Perusahaan Umum Pengangkutan Penumpang Djakarta
Pusliitanak	Pusat Penelitian Tanah dan Agroklimat (Center for Soil and Agroclimate Research)
Q	Quotient
RCM	Regional Climate Models
RCP	Representative Concentration Pathways
RITJ	Rencana Induk Transportasi Jabodetabek
RON	Research Octane Number
RTRW	Rencana Tata Ruang Wilayah
RX1DAY	Maximum 1 day precipitation
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SEI	Sensitivity and Exposure Index
SNI	Indonesian National Standard
SOD	System Outage Duration
SOF	System Outage Frequency
SO2	Sulphur Dioxide
SUTET	Saluran Udara Tegangan Extra Tinggi
SUTT	Saluran Udara Tegangan Tinggi
TDL	Transmission and Distribution Losses
TJ	Terrajoule
TTW	Tank to Wheel
UHSLC	University of Hawaii Sea Level Center
UNFCCC	United Nations Framework Convention on Climate Change
WIB	Waktu Indonesia Barat (Western Indonesian time)
WTT	Well to Tank
WTW	Well to Wheel

1. INTRODUCTION

The Government of Indonesia through the DKI Jakarta has prepared project entitled "Zero Emission Buses in Jakarta". The project was implemented over a 13-month period beginning February 2020, with the support of the C40 Cities Finance Facility (CFF).

The ultimate objective of CFF is to reduce greenhouse gas emissions and increase resilience in cities by mobilizing finance for city-level climate change action. It aims to achieve the following high-level project outcomes:



In February 2020, the Memorandum of Understanding (MOU) for the Trial of E-Buses has been signed by GIZ, C40 Cities Climate Leadership Group and PT. Transportasi Jakarta. The purposes of the cooperation are to work together to establish an executable business case for E-Bus operations and enable a trial of 100 E-Buses, which has been suggested to CFF as one of DKI Jakarta's high priority projects to provide sustainable public transportation and improve air quality in Jakarta.

1.1. Project Scope

The City Government intends to completely 'electrify' commercial vehicles used for public transport in Jakarta. This project is the implementation of an operational trial fleet of 100 E-Buses in the network of TransJakarta (TJ). For Jakarta, the trial project and its preparation are seen as an opportunity to learn about the technology, operation and business model of E-Bus fleets.

1.2. Purpose of the Final Report

The purpose of this Final Report is to provide and document: a combined final version of all deliverables under this contract.

Several amendments to the ToR occurred during contract implementation, the most noteworthy of which was contract Addendum 3 (December 2020) which included a new Deliverable WP 2.7, Bus Operational Planning Tool and allowed for an extension in contract implementation period until end February 2021[1].

1.3. The Project Team

The project team included the following management, specialists and support personnel all of whom have detailed experience and knowledge of working with GIZ, TJ and DKI Jakarta.

Table 1: Project Team- Summary at February 2021

No	Name	Role	Notes
1	David Shelley	Team Leader	Attended Kick Off meeting, engaged to end February 2021
2	Lalu Damanhuri	Expert: Municipal Finance and Capacity Development	Attended Kick Off meeting, left project in mid 2020
3	Sutanu Pati	International Expert : Finance	Joined Team Fall 2020, replacing L Damanhuri
4	M Nanang Prayudyanto	Expert: Transport Engineer / Planner	Attended Kick Off meeting, completed work mid 2020
5	Wahid La Ode Muhammad	STE: Climate Proofing Lead	Engaged to end February 2021
6	Dr Dikshya Thapa	STE: Gender and LNOB Lead	Attended Kick Off meeting
7	Adam Adiwinata	STE Good Governance,	Attended Kick Off meeting, designated as Jakarta Comms point March 2020
8	Andyka Kusuma	STE: Lessons Learned Lead	lLft project in mid 2020
9	Pawan Mulukutla	STE: Electrical Charging and Power Supply Expert, later STE for WP2.7	Additional Engagement for WP2.7 December 2020
10	Nancy Finger	Project Coordinator and Report Support	Cap Dev: replacing L Damanhuri mid 2020. LL: replacing A Kusuma mid 2020
11	Nimisha Pal	International Short Term Expert: Good Governance	Joined Team December 2020, replacing A Adiwinata

Source: Consultants Team

In response to an invitation from CFF to attend the kickoff event, GFA HEAT achieved a rapid mobilization after the project award to the Inception Phase. Five members of the Consultants Team attended the meetings and Kick-Off event in Jakarta on Monday/Tuesday February 17/18, 2020.

During the course of the project implementation a number of replacements were made within several (three) Contract Variation Orders. The key information is summarized below:

1. Long-term Expert: Lalu Damanhuri (municipal finance responsibilities) replaced by International Expert (Sutanu Pati) in mid-2020,
2. Long-term Expert: Lalu Damanhuri (Capacity Development responsibilities) replaced by STE (Nancy Finger) in mid-2020,
3. Long-term Expert: M Nanang Prayudyanto (technical responsibilities) replaced by International STE Electrical Charging and Power Supply Expert (Pawan Mulukutla) in mid-2020,
4. STE: Good Governance Expert Adam Adiwinata replaced by international STE (Nimisha Pal) in December 2020. (Adam Adiwinata continued in his role as Jakarta communications point for the entire Team until the end of project); and

[1] The third amendment also saw the addition of resources, principally from senior members of the Indian consulting team working with CFF/GFA (HEAT) on the Bangalore E-Bus Project.

5. STE: Lessons Learned Expert Andyka Kusuma replaced by STE (Nancy Finger) in mid-2020.

Within the project implementation period, no changes were made to the staff assignments of Project Coordinator and Backstopper Ms Nancy Finger, Team Leader David Shelley, STE: Climate Proofing Expert Wahid La Ode Muhammad or STE: Gender and LNOB Expert (Dr. Dikshya Thapa).

The main purpose of the staff replacements was to bring in international experience in the technical, financial and good governance work packages. A secondary purpose was to bring in international experience in the Capacity Development and Lessons Learned work packages.

2. PROJECT MOBILISATION AND DEMOBILISATION ARRANGEMENTS

2.1. Project and Mobilisation and Demobilisation Dates

The salient dates for the project are as follows:

Effective Date:	17 February 2020[2]
Expiry Date:	28 February 2021[3]
Commencement Date:	16 February 2020

2.2. Office and Workplace Arrangements

Due to the outbreak of the Coronavirus in December 2019, and the Government of Indonesia restrictions on movements / policy of social distancing, all project staff, as well as the Jakarta Senior Project Advisor (SPA: Ms. Gitafajar Saptyani) worked from their respective home-offices during the course of the project. Some desks were made available for team members at the TJ office for occasional use, once the first phase of COVID-19 had normalized. The Team members that have worked at TJ office included Lalu Damanhuri and M Nanang Prayudyanto. Other team members (Dr. Dikshya Thapa and Wahid La Ode Muhammad) made occasional visits to discuss and collect data during the limited time that the work spaces were safely available.

2.3. Establishment the liaison procedures, communications protocols and channels as a result of COVID-19

The Team set up regular conference calls to get updates on the status of work, and to discuss progress, problems, potential risks and appropriate actions to achieve deliverables on time. As a consequence of the global health situation, procedures and communications channels were established at three levels, as follows:

External Meetings:

1. CFF/GIZ Bonn and Jakarta/C40/Contractor Progress Meetings (held every Tuesday morning at 9.00 am Bonn time via MS Teams with a pre-meeting published agenda: '*WEEKLY UPDATE CALL';* and
2. GIZ Jakarta, TJ/GFA/HEAT: regular external meetings (held every Thursday afternoon at 3.00- 5.00 pm Jakarta WIB via MS Teams) with regular

[2] Contract 20.02.2020, however Team mobilised earlier to attend the Kick-off Event in Indonesia.
[3] As confirmed in Contract Addendum No. 3 (December 2020).

presentations on specific technical and financial and procurement related issues and as a continuous Capacity Building exercise over the duration of the project (from May 2020 onwards).

Internal Meetings:

3. GFA/HEAT internal project progress and technical meetings (held biweekly via MS Teams with a pre-meeting published agenda; and
4. GFA/HEAT Ad Hoc internal meetings via MS Teams on various technical and logistical matters with smaller groups of Team Members.

In addition, to ensure transparent communication and information sharing among project partners, we set-up a share-point group in MS Teams.

All External Progress Meeting calls with CFF/C40 have been documented, and minutes are available on MS Teams.

In addition, CFF/ C40 held:

1. bi-weekly meetings with ITDP as the project implementer of UNEP/CTCN in developing e-mobility in Jakarta
2. Ad Hoc meetings with other organizations such as the ADB, and
3. GoI projects in the area of E-Bus/ transport.

To ease communication challenges due to lack to travel to Indonesia, we appointed Adam Adiwinata – (national Good Governance Advisor) as our local contact point Jakarta.

2.4. Project Steering Structure

Detail of the Steering Structure is provided in Annex 1. Our Team Leader, David Shelley, has overseen the management of activities for this project. He has been supported by our other experts who are guided by the consortiums' backstoppers. The activities have been coordinated with the CFF City Coordinator, based in Germany, and the SPA located in Jakarta, as well as with C40 partners. Regular communication formats were established. Key tasks refer to overall coordination and project management, knowledge management and capacity development.

2.5. NDA Arrangements

To ensure confidentiality about on disclosure, it was agreed that data collection would be accompanied with a GIZ/CFF/TJ/GFA NDA letter, which will also assure the individual entities that the data will be treated confidentially and in a non-competitive

way. The NDA was prepared for e-signature to mandate the data collection under the project. The letter assured that only aggregated data will be used in final reports, no confidential of company specific data will be reported or published. The NDA (a legal document) was finalized with signature by all parties.

2.6. CFF Interim Report

CFF prepared an interim progress report for the period February 2020–September 2020. This was distributed on September 14, 2020.

3. SCOPE AND OBJECTIVES

3.1. Project Overview and Background

The population of Jakarta is nearly 10 million inhabitants with 32 million people living in the metropolitan area. Reportedly, 60% of the population suffers from various air pollution related diseases. Although commercial vehicles, including buses, only representing less than 0.5% of the total vehicles in the city, they are responsible for 10-20% of emissions.

Jakarta is among the global cities with the worst air quality. The migration to electric vehicles is also seen as an important measure in Jakarta's air quality action plan. Jakarta's Governor champions the introduction of electric vehicles in Jakarta. The city is further encouraged to strengthen air quality measures as several citizens have taken legal action against government organisations over Jakarta's air pollution situation. The City Government intends to completely 'electrify' commercial vehicles used for public transport in Jakarta. Through these contexts, Indonesia has set itself the goal to become a major player in the production and operation of electric vehicles.

Jakarta is home to the world's largest public bus system, with 800,000 commuters using the TransJakarta Bus Rapid Transit (BRT) per day (ITDP, 2019). Launched in 2004 as Southeast Asia's first BRT system, it is now the world's longest, covering over 244 kilometres. TransJakarta operates 13 main corridors and 155 feeder routes in the Greater Jakarta Area. As of 2019, the 3,334-strong fleet comprised 1,849 diesel buses, 1,145 gasoline buses, and 340 CNG buses including small, medium, single, maxi, and articulated sizes. Jakarta's BRT system has been hailed because of successes in efficiency and integration. As a consequence, TransJakarta wants to replace all of its fossil fuel buses with E-Buses by 2030.

3.2. Project Scope

There are indications that Indonesia is moving to support electric mobility to improve air quality, reduce GHG emissions and grow automotive manufacturing. The government unveiled the Presidential Decree on Acceleration of Battery-Electric Vehicles in August 2019. The scope of the project was to prepare an operational trial of 100 E-Buses in the network of TransJakarta. For Jakarta, the trial project and its preparation are seen as an opportunity to learn about the technology, operation and business model of E-Bus fleets.

3.3. Project Objectives

The Service Provider aided CFF in its ultimate objective to engage primary and secondary cities worldwide to mobilise financial resources for transformative actions, which significantly reduce their greenhouse gas emissions and build climate resilience. To generate this impact, the CFF works to achieve the following high-level

project outputs:

- **Project Preparation and Access to Finance:** CFF works with its partner cities to prepare climate action project proposals including financial models to ensure the projects will reach financial feasibility and financial resources.
- **Capacity Development:** CFF supports its partner cities to draft and implement capacity development measures with regard to the preparation of bankable climate action projects according to agreed respective strategies.
- **Knowledge, Learning and Policy Dialogues:** CFF contributes to improving the knowledge base and discourse on financing cities' climate action projects.

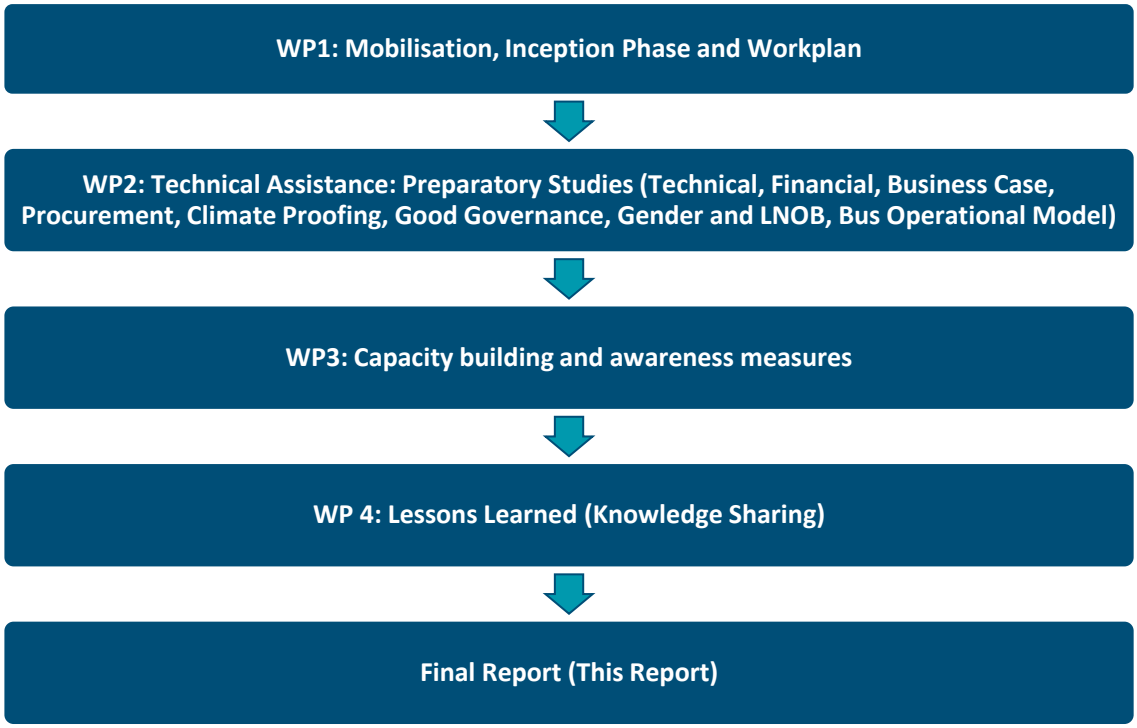
4. OVERVIEW OF IMPLEMENTATION STEPS AND INCEPTION PHASE (WP1)

An Inception Report (WP1) was finalized on April 24, 2020. This final report provides a summary of the four Work Packages. The process to implement the project follows the steps as demonstrated in figure 1 below.

Annexes provide details of the following:

- Annex 1: 100 E-Bus Trial Kick-off Meeting: Some Key Slides from CFF and TJ Presentations
- Annex 2: Project Steering Structure
- Annex 3: C40 Zero-Emission Bus Benefits Webinar February 22, 2021: Program and Agenda
- Annex 4 : Closing Event February 24, 2021 : Program and Agenda
- Annex 5: Project Component Interlinkages
- Annex 6: Capacity Development Plan

Figure 1: Main implementation steps for the Study



4.1. Work Package 1: Inception and Workplan

4.1.1 Activity 1 Inception Report

The inception period of 6 weeks involved the key international and national specialists working in Jakarta and elsewhere at Homebase. The key deliverable was the Inception Report.

Deliverables according to ToR's:
Inception Report
(Activity WP1) ToR Submission: April 24, 2020

4.1.2 ToR Inception Phase

In broad terms, the ToR required the establishment of the service providers project team, the establishment the liaison procedures, communications protocols and channels, commencement with the gathering of relevant information from all available sources and affirmation of the Project Work Plan. The project team followed the approach and methodology and undertook the following activities during the inception period:

• Broad consultation with project stakeholders (Kick-off Meeting) followed by follow-up meetings and teleconference discussions; and

• Review and analysis of relevant reports and documentation (ongoing and being continued across all WP's).

4.1.3 Project Kick-off Meeting Tuesday February 18, 2020

The kick-off mission took place between the 17 and 18 of February 2020 at the Morrissey Hotel in Central Jakarta with participant stakeholders. Some Key slides are presented in Annex 1.

The objective of the kick-off workshop was to get to know the major stakeholders in Jakarta and get them involved in the process through some Capacity Building activities. The workshop ensured involvement of all major players and decision makers, including high-level officials from both DKI and TJ. In February 2020, the MOU for 100 E-Bus Trial project was signed by C40, GIZ, and TJ.

4.1.4 Consultants Approach and Staff Allocation

As part of the inception phase activities, our team worked on preparatory activities for all of the four main Work Packages, reviewed literature and other previous studies, in consultation with the city administration, PIU and SPA.

WP 1 was carried out by the Team Leader David Shelley, in cooperation with Team members, who supplied technical inputs.

4.1.5 Updated Project Schedule/Detailed Work Plan

An updated work schedule including individual tasks and deliverables was produced. The timeline was in accordance with the timeline required by the TORs of the tender and followed the deadlines for the deliverables as mandated in the TORs. All deliverables have been completed by the end of the thirteenth month from the point of the signing of the contract (28.02.2021).

The Service Provider updated the Work Plan in close cooperation with the CFF and SPA on a regular basis. Three Contract Addenda were issued; to progressively bring additional expertise into the Team, and to add a new activity WP2.7 (E-Bus Operational Planning Tool), which effectively extended the project duration by two months.

5. WORK PACKAGE 2: TECHNICAL ASSISTANCE

5.1. Activity 2.1 Preparatory Studies

As part of the collection and review of all relevant information tasks, the Team carried out the necessary consultations, studies and activities in order to be able to prepare the Preparatory Studies.

5.1.1 ToR Deliverables

Deliverables according to ToR's:
Preparatory Studies, consisting of:
• Technical Feasibility 2.1.1
(Activity WP2.1) ToR Submission October 7, 2020

5.1.2 ToR Technical Feasibility Study

The aim of the Technical Feasibility Study was to prepare the technical aspects of the project to a degree that allows the city to make correct decisions and potential bidders to prepare a robust proposal.

The E-Bus technology system has the following three elements: Battery Technology (powertrain), Charging Stations and the Infrastructure and Power supply.

5.1.3 Consultants Approach and Staff Allocation

The consultant undertook the following steps:

- Assessment of the TJ Trial Results (Task 2.1.1a)
- Review Data collection and Reference Documents and Existing E-Bus Studies (Task 2.1.1b)
- Examination of Current Bus Operations on Selected TJ Routes (Task 2.1.1c)
- Recommendations for Design of E-Bus Operations (Task 2.1.1d)
- Recommendations for Design of E-Bus Power Supply Options (Task 2.1.1e)
- Recommendations for Fleet, Vehicle Standards, etc. (Task 2.1.1f)

A non-disclosure agreement was prepared and signed by all relevant parties such that TJ could release full information concerning their existing E-Bus pre-trials.

A full review of existing reference documents and other E-Bus studies was undertaken. Activity 2.1 was initially carried out by national consultant Muhammad Prayudyanto

(Nanang) and later taken over by international consultant Pawan Mulukutla, reporting to the Team Leader. Lalu Damanhuri supplied financial inputs. The final Technical Feasibility Study was submitted on October 7, 2020.

5.1.4 Key Findings and Conclusions

It is recommended to deploy big battery E-Buses on the BRT routes. For the Non-BRT corridors with single bus or low-entry bus it is recommended to deploy medium battery E-Buses with fast charging. Furthermore, some of the findings include:

- Route Characteristics play an important role in rolling stock selection;
- Total Cost of Ownership needs to be calculated at the route level;
- Government fiscal incentives are needed in the early push for E-Bus deployment. China deployed a National Policy for deploying E-Buses with subsidies;
- The infrastructure requirement cannot be an afterthought but needs to be planned at the very beginning;
- There is a need to plan for maintenance for E-Buses;
- There is a need to understand vehicle availability in the market to avoid customization;
- New Actors should be considered – at Transantiago in Santiago, Chile, the implementation of E-Buses meant that the energy companies (ENEL & ENGIE) carried out the acquisition of the fleet and sublet it to the operators.

TCO Analysis for E-Buses with big battery size (324 kWh) was carried out for each of the 13 BRT routes and was then compared to the TCO for diesel buses. The TCO for E-Buses is higher than for diesel buses by about 29 % (on average). The average TCO/km for E-Buses is $ 1.32[4] whilst for diesel buses the average TCO/km is $ 1.02.

TCO Analysis for E-Buses with medium battery size (180 kWh) was carried out for each of the 13 BRT routes and was then compared to the TCO for diesel buses. The TCO for E-Buses is higher than for diesel buses by about 11 % (on average). The average TCO/km for E-Buses is $ 1.13 while for the diesel buses the average TCO/km is $ 1.02.

TCO analysis was further calculated for the non-BRT routes (currently operating low entry or single buses) with Big-Battery and Medium-Battery sizes. The average TCO/km for E-Buses with a big battery size is $ 1.49, for E-Buses with medium battery size it is $ 1.26 and the TCO/km for diesel buses is $ 1.10. The average TCO for E-Buses with bigger battery size is 36% higher when compared to the average TCO for diesel buses whilst the average TCO of E-Buses with medium battery size is 13% higher when compared to average TCO of diesel buses.

[4] Conversion Factor 1 USD= 14,600 IDR.

TCO analysis was then calculated for Non-BRT routes (currently operating medium buses) with small battery size (135 kWh). The average TCO/km of E-Buses is $ 0.94, and the average TCO/km for diesel buses is $ 0.61. The average TCO of E-Buses is 53% higher when compared to the average TCO of diesel buses.

Using energy consumption of 1.3-1.5 kWh/km for the 100 E-Buses, with an average running kms of 240 kms, it is estimated that the energy required on a daily basis will be in the range of 31 Mwh to 36 Mwh. Most of this charging will be overnight charging, with opportunity charging as required. Assuming that about 15% of the buses may be needed to be charged during peak load, the peak-loading power requirement will be about 2.25 MW.

5.1.4.1 A Phased Road Map for Electrification

A detailed road map for electrification needs to be put in place, ideally at the city level. This road map should take into account measures that will help overcome the challenges related to adoption of E-Buses. Based on learning from across the globe, four major factors are listed below that will help in moving towards complete electrification of the buses in the TJ network:

- National and local subsidies;
- Leases to reduce upfront (capital) investment;
- Optimized charging and operations; and
- Lifetime warranty of batteries.

Accordingly, a 5-phase road map for EV rollout in Jakarta has been suggested, as highlighted below:

- **Phase 1- Continuation of trials phase (About 5-10 E-Buses)** – where an initial set of buses are deployed to create a quick demonstration value; this phase has to be short;
- **Phase 2-Scale up phase (About 100 E-Buses)** – where subsidy incentives and persuasion help reach a tipping point;
- **Phase 3- Self-propelled phase (1000+ E-Buses)** - where the technology has established itself and business models are in place towards large scale electrification;
- **Phase 4- Progressive Development Charging Systems phase (1000-2500 E-Buses)** - where the technology has established itself and where the ability to try new technologies and business models as a stepping stone towards large scale electrification exists; and
- **Phase 5- Progressive Development Charging Systems and DKI e-fleet expansion** including other vehicles such as Motorcycles, Trucks and all buses.

The support of CFF to TJ considers only Phase 2 above: the scaling up from the pre-trial phase in 2020 to the provision of the 100 E-Buses and associated charging infrastructure trial, in 2021.

5.1.4.2 Recommendations

Routes:

The following BRT and Non-BRT routes have been shortlisted for the deployment of E-Buses[5]:

- **BRT:** Route 1, 3, 4, 6, 8 and 10.
- **Non-BRT:** Route 1A, 7A, 7D, GR1, 6D, 1B, 6H, 9D, 5F and GR2.

Charging Strategy:

The charging strategy for BRT and Non-BRT routes should be selected based on the battery size. In case a big battery size is selected (>300 kWh), it can serve a distance of 230 kms in single charge and depot charging alone is recommended. One (1) charger for two buses with a power rating of 50-100 kW is recommended.

In case a medium or small battery is selected to serve a distance of 230 kms, depot charging and opportunity charging (Fast Charging) at terminals is required. One (1) charger for two buses with a power rating of 50-100 KW and one (1) fast charger for five buses with a power rating of about 150 KW is recommended.

5.2. Institutional and Legal Feasibility

5.2.1 ToR Deliverables

Deliverables according to ToR's:
Preparatory Study, consisting of:
• Institutional and Legal Feasibility 2.1.2
(Activity WP2.1) ToR Submission May 29, 2020

5.2.2 ToR Institutional and Legal Feasibility Study

The Institutional and Legal Feasibility Study included the following components:

a. Identification and analysis of legal framework and legal instruments for implementation and operation, including international, national and local legal context;
b. Feasibility of possible implementation and operation models in the given

[5] Note: TJ selected BRT route 6 and Non BRT routes 6D and 9D.

institutional and legal framework; and

c. Recommendations for implementation and operational structure.

5.2.3 Consultants Approach and Staff Allocation

With the aim of establishing an effective and workable institutional structure in implementation and operation of the project, Jakarta requires support and recommendations based on its specific institutional circumstances.

National Consultant Lalu Damanhuri carried out activity 2.1.2, reporting to the Team Leader, in cooperation with Muhammad Prayudyanto (Nanang), Pawan Mulukutla who supplied technical inputs.

The Baseline Institutional and Legal Report was submitted on May 29, 2020. The following two steps in the ToR were incorporated into the Business Case Study.

5.2.4 Key Findings and Conclusions

The development of the 100 E-Bus Trial in Jakarta aims to reduce greenhouse gas (GHG) emissions for climate change mitigation. Successful implementation of this project can lead to reduced congestion, which can increase overall productivity of the city, leading to economic advancements.

However, the process of transitioning to E-Bus transportation poses many significant challenges that must be addressed through careful planning and coordination. Therefore, the Due Diligence Study[6] has recommended the development of a best practice legal and regulatory framework, increase cooperation among different stakeholders through mutual understanding, regular meetings and communication to increase institutional capacity, and improve managerial and organizational efficiency and experience. Carefully framed policies are required to ensure the success of this E-Bus Trial project.

A first Paper prepared the Legal and Institutional Baseline Report of relevance for the 100 E-Bus Trials in Jakarta. A mapping of regulations and policies that will have an impact on the introduction and development of zero emission transport has been conducted by the Due Diligence Team. This Baseline Report was followed by Business Case Report (February 2021) which included a brief assessment of different implementation and operational models and recommended the Legal and Institutional Framework for the 100- E-Bus Trial.

The legal structure for E-Bus project implementation can be categorized into five groups as follows: Road Traffic, Air Pollution/Environment, Energy, Local Government, Project Scheme and Others (Spatial Planning, Technology).

Before an E-Bus can be inducted into the fleet of the operator, it needs to be registered with the police. The vehicles must pass tests and approvals including homologation,

[6] Rebel Group Final Report April 2020.

vehicle type registration for testing, vehicle physical testing, type testing certificate , and type testing registration certificate.

President Regulation No. 55/2019 'Acceleration of Battery-based Electric Vehicle Program for Road Transport' was promulgated on August 12, 2019 to provide direction, foundation and legal certainty in the implementation of the acceleration of the battery-based electric motor vehicle program.

The Ministry of Mineral Resources (the "MEMR") has issued the MEMR Regulation No. 13 of 2020 on the Provision of Electric Charging Infrastructure for Battery Electric Vehicle ("MEMR Regulation 13/2020") in August 7, 2020. It complements the already existing MEMR Regulations which regulates other aspects of BEV charging in Indonesia, (MEMR 35 of 2013, MEMR 12 of 2016) and serves as the ground rule for the provision of BEV charging infrastructure, stipulating the various types of charging infrastructure, the necessary licensing requirements and safety standards, as well as determining the tariff to be imposed for BEV charging. It also specified the tariff to be charged by PLN for charging of electric vehicles.

Institute for Transportation and Development Policy (ITDP) is currently undertaking a study on policy requirement and actions required to facilitate the deployment of E-Buses and related infrastructure relevant for Jakarta.

The key legal impediments identified at this time for implementation of 100 E-Bus Trial Project are the following:

- Change in DKI Jakarta Governor Regulation No. 96/2018 to allow concession period of 12 years or more as against the current practice of 7-10 years
- Ensuring the E-Bus specifications are in accordance with the local regulations

5.3. Financial Feasibility

5.3.1 ToR Deliverables

Deliverables according to ToR's:

Preparatory Study, consisting of:

• Financial Feasibility (including Market Study) 2.1.3

(Activity WP2.1) ToR Submission September 14, 2020

5.3.2 ToR Financial Feasibility Study

The city required support in constructing a viable business case, financial model and developing revenue streams that finance the operations. The Financial Feasibility Study included the following components:

1. Support in determination of financial model for investment and operations. As the city determined the final technical structure, the Service Provider supported

the city in determining the financial model for the 100 E-Bus Trial.
2. Study of financial capacity of the municipality for funding the 100 E-Bus Trial.
3. Study of potential for developing ancillary income streams.
4. Development of ancillary revenue streams.

5.3.3 Consultants Approach and Staff Allocation

We provided assistance in developing a Financial Feasibility Study for the 100 E-Bus Trial project. We will also studied the financial capacity of the Municipality to fund the 100 E-Bus Trial project. As part of the work on examination of the potential for developing ancillary income streams, we supported TJ to conduct a market study.

Lalu Damanhuri carried out activity 2.1.3, reporting to the Team Leader, in cooperation with Muhammad Prayudyanto (Nanang) and Pawan Mulukutla who supplied technical inputs. The final Financial Feasibility Study was submitted in mid-September 2020.

5.3.4 Key Findings and Conclusions

Most of the E-Buses on the road in the world have been paid up-front, either by the Municipality or the bus operator. The most popular method of financing E-Bus projects today is a combination of self-funding and various levels of grants. The grant funding covers much of the cost with the rest coming from state and local governments and the bus operator itself. The situation is similar in Jakarta where the 100 E-Bus trial project was originally planned to be funded predominantly through the city budget (APBD). This method is, however, not sustainable. The funding is usually limited and irregular, and is usually sufficient to purchase only a few buses at a time.

The biggest challenge is that operators often make procurement decisions based on the up-front cost (initial CapEx) of the bus. The perceived high up-front cost of E-Buses compared to equivalent diesel buses could make it difficult for many bus operators to transition to E-Buses without knowledge of the TCO/km per route analyses. A comparative TCO/ km route analyses model has been developed by the Consultant Team to allow informed decision making. In phase 2 some explicit subsidies appear necessary, however in the near future it is expected that E-Buses can be cost competitive against diesel buses, besides bringing significant external benefits (in terms of reduced GHG emissions and air quality (health) benefits.

The Teams' Financial and Technical Experts made a high-level presentation to the DKI Jakarta PIU on June 24, 2020. The current financing position of DKI Jakarta was highlighted, the main elements of the TCO/Km comparison between E-Bus and diesel bus were presented, the important budget steps were highlighted, and some next steps identified. Due to COVID-19, opportunities for self-financing have been reduced. Domestic funding arrangements have been compared and some recommendations

made. The main conclusion was that operator self-financing through the domestic banking sector looks promising[7].

5.4. Activity 2.2 Business Case and Financial Model (Task 2.2)

5.4.1 ToR Deliverables

Deliverables according to ToR's:

• Business Case 2.2.1

• Draft Financial Model 2.2.2

(Activity WP2.2) ToR Submission of Final Version of the Business Case February 23, 2021

5.4.2 ToR Business Case

The Service Provider prepared a Business Case, containing a business justification for the entire project duration. The Business Case clearly investigated if the project is desirable, viable and achievable, and therefore worthwhile for the city and/or private investors to invest the amounts needed.

The Business case also supported a communication approach, which was crystallized in the form of a video production of the 100 E-Bus Trial[8], shared with the Governor of DKI Jakarta as a basis for having convincing arguments when communicating with media, civil society, private sector, etc.

5.4.3 ToR Draft Financial Model

The Service Provider prepared a draft financial model for the project. This financial model was reasonably accurate to portray the economic and financial feasibility of the project under a variety of scenarios and assumptions.

5.4.4 Consultants Approach and Staff Allocation

We provided assistance in developing a Business Case and financial model providing appropriate bankable implementation structures based on solid travel demands and pricing simulations. We supported the communication of the (business case) proposal through an internal Communication Strategy based on convincing arguments provided

[7] In the Market Survey of operator checks have been made to evaluate the extent to which operators would be a) willing and b) in a position of credit worthiness to receive financing through domestic banks.
[8] Funded by CFF and presented at the Project Closing Event on February 24, 2021.

over the course of an extensive dissemination and Capacity Development program for TJ and the Expert Team. Discussions and presentations were also made to DKI PIU and Dishub experts, such that they could communicate with media, civil society, private sector, etc. to portray the financial feasibility of the selected project[9].

This step included Tasks 2.2.1 and 2.2.2 of the ToR's and was worked on in parallel, using synergies in data collection where possible. The activity was conducted by international consultant Sutanu Pati, reporting to the Team Leader, in cooperation with Pawan Mulukutla who supplied technical inputs. The final version of the Business Case was submitted on February 23, 2021. In parallel the financial model was made available to the TJ Expert Team and uploaded to MS Teams.

5.4.5 Key Findings and Conclusions

TJ has identified BRT Route 6 and non-BRT routes 6D and 9D for implementation of E-Bus Trials (Phase 2). The total cost of the project in the base case is estimated at IDR 560,214 million (US$ 37.35 m) as per details given below:

Table 2: CapEx for the 100 E-Bus trial

	Route 6	**Route 6D**	**Route 9D**	**Total**	
No. of Buses	66	18	16	100	
Cost Component	**IDR m**			**IDR m**	**US$ m**
Cost of Buses	317,460	94,500	84,000	495,960	33.06
Charger Cost	22,548	1,808	1,582	25,939	1.73
Power Connection	6,983	2,328	2,328	11,638	0.78
Fees/Contingency	17,350	4,932	4,395	26,677	1.78
Total CapEx	**364,341**	**103,568**	**92,305**	**560,214**	**37.35**

The operation of E-Buses is also likely to have significant social benefits as mentioned below:

- Reduction in carbon emissions by up to 33 tons per E-Bus per year
- Reduction in Sox, NOx and particulate matter by 1 ton per E-Bus per year
- Reduction in noise from diesel buses

[9] An important component of the Communications Strategy was a video prepared by CFF under a separate contract on the 100 E-Bus Trial for Jakarta.

Given the high initial investment required, the cost of operation per km of the E-Buses has been found to be between 3% and 36% higher than comparable diesel buses as shown in Table 2. However, considering projected energy prices (without subsidy), additional taxes on E-Buses and socio-economic benefits, the overall cost of E-Buses is about 16.0% less than the cost of diesel buses. Further, with a larger scale of implementation, expected reduction in E-Bus costs in near future, advancements in battery technology, the E-Buses are likely to become much more affordable.

Table 3: Total operating cost / km

Particulars	**Unit**	**Diesel**	**Electric**			
		7 Years	**7 Years**	**8 Years**	**10 Years**	**12 years**
Route 6	IDR/km	19,873	23,869	22,740	21,488	20,556
Additional Cost	*IDR/km*	--	*3,996*	*2,867*	*1,616*	*684*
	%	--	*20%*	*14%*	*8%*	*3%*
Route 6D	IDR/km	23,682	32,290	30,509	28,912	27,580
Additional Cost	*IDR/km*	--	*8,608*	*6,827*	*5,230*	*3,898*
	%	--	*36%*	*29%*	*22%*	*16%*
Route 9D	IDR/km	22,281	29,403	27,833	26,424	25,249
Additional Cost	*IDR/km*	--	*7,122*	*5,553*	*4,143*	*2,969*
	--	--	*32%*	*25%*	*19%*	*13%*

The cost of operation is found to be lower for longer contract period and when TJ invests in the depot and charging infrastructure rather than the operators. **Hence it is recommended that concession period of 10 years is adopted with possibility of extension by 2 years at a time.**

TJ being one of the pre-eminent transport agencies in Indonesia, the electrification of bus fleet by TJ is likely to create a demonstration effect and result in faster adoption of EVs throughout the country. However, the project requires active support from GoI/DPRD. The legal impediments for initiation of procurement process of the E-Bus need to be expeditiously removed/clarified and approval for the following financial assistance granted:

- Operating Subsidy : IDR 95,034 (12 years) to 118,363 million (7 years)
- (annual) (about 10 to 38% more than comparable diesel buses)

5.5. Activity 2.3 Project Procurement

5.5.1 ToR Deliverables

Deliverables according to ToR's:

- RFP 2.3.1
- Draft Contract 2.3.2
- Technical Schedules 2.3.3

(Activity WP2.3) ToR Submission (incorporated in final version of the Business Case February 23, 2021

5.5.2 ToR Procurement

The Service Provider provided a structure for the procurement of assets and operations, based on the previous activities:

1. **Recommendations for procurement**. Based on the market study and the dialogue carried out, and in collaboration with the PIU, the Service Provider developed recommendations for the selection of providers, operators and financiers. These recommendations were aligned with the selection mechanism that can be legally used by the city, including a national or international, open or closed bidding process or direct selection.

2. **Draft bidding or contracting scheme and documentation (RFPs support),** based on the institutional structure and capacity of the city, the legal context identified, and the specific services to be acquired and the model for acquisition selected (one contract for assets and operation or separate contracts).

3. **Draft Bus Purchase Contract support**, based on all of the above, including the technical schedules to be executed.

4. **Design of digital data room and scouting for possible bidders, investors, funding institutions[10].** Once the municipality is ready to launch the bidding process, it will need to disseminate the projects, procurement process, requirements and additional information among possible bidders and financiers to secure the presentation of viable proposals to implement the project.

5.5.3 Consultants Approach and Staff Allocation

Building on the technical assistance activities, our experts provided a structure for the Procurement of assets, operators and financing partners to assist and train in project

[10] Following DKI Jakarta and TJ's decision to adopt the BTS approach for the 100 E-Bus Trial, there was consequently no need to work on Sub- Item 4 of this WP's (2.3) ToR.

documentation for planning tendering and financing requests to help the city´s technical departments get access to finances for the investments needed for the subproject's implementation. Following initial work by national expert Muhammad Prayudyanto (Nanang), this activity was thereafter led by international expert Sutanu Pati, reporting to the Team Leader. Pawan Mulukutla supplied technical inputs.

5.5.4 Key Findings and Conclusions

TJ operates its fleet both on the owner-operator model as well as the Gross Cost Contracting model, also popularly known as the "Buy The Service" or BTS model. Recent fleet acquisitions by TJ has been through the BTS route. **Given the high capital cost, limited technological knowhow and operating experience of E-Buses with TJ, the BTS model is recommended for the 100 E-Bus Trial.**

TJ does not allocate fixed routes to its operators and the contracts permit operation of the buses as per plan prepared and modified by TJ from time to time. However, given the constraints of the E-Buses regarding operating range, and charging requirements, the buses and charging systems would need to be designed for specific routes and this restricts the operators to those routes. To reduce the size of investments by the operators and to avoid diseconomies of very small scale operations, it is proposed 3 operators may be inducted with approximately equal split in terms of fleet size i.e. 2 operators for BRT#6 with 33 buses each and one operator for the non-BRT routes with 34 buses.

Transport authorities are preferring longer concession periods for E-Buses. For example, many cities in India availing the FAME-2 scheme where the national Government provides up to US$ 67,000 subsidy per bus have preferred a concession period of 10-12 years.

It is also seen that the expected operating cost is minimum for 12 year duration. However, so far there no precedence available for any E-Bus completing 12 years since induction of E-Buses into regular operations is a rather recent phenomenon. Hence it is difficult to anticipate the reliability and cost of maintenance and operations over a long period for the operators. **In view of the same, a concession period of 10 years with an option of extension by 2 years is recommended for the TJ 100 E-Bus Trial.**

The Operators in the BTS model is remunerated as follows:

- Periodic (weekly, biweekly or monthly) remuneration based on kilometres run
- Even if the authority does not utilize the contracted kilometres, it pays for a stipulated number of minimum kilometres per day to cover the fixed costs
    - The procurement for the100 E-Bus Trial will be done through the E-Catalogue system which is governed by the Presidential Regulation No. 16 of 2018 and LKPP Regulation No. 9 of 2018 concerning Guidelines for The Implementation of Goods/Services through the Provider and Regulation LKPP No. 11 of 2018

concerning Electronic Catalogue. Integrity and transparency measures that are crucial for effectively countering corruption risks and to deliver quality infrastructure in the sphere of influence of the procurer and bidders. The tender requirements including qualification requirements both technical and financial should be such that they serve the purpose of the procurement and at the same time make possible broader participation by suitable local and international parties. The concession agreement terms need to protect the interests of both the procurer and the bidder and avoid excessive discretion or onerous conditions for and against either party for optimum procurement outcome while ensuring.

- TJ must develop a proper tendering and procurement guideline according to the Local Government procurement regulation, whilst early consultation with LKPP on the matter is very advisable.
- The final action plan is likely to be sharpened by further guidance by DKI and TJ and additional inputs from external consultations.

5.6. Activity 2.4 Climate Proofing

5.6.1 ToR Deliverables

Deliverables according to ToR's:

• Climate Proofing Report 2.4

(Activity WP2.4) ToR Submission Final Report February 25, 2021

5.6.2 ToR Climate Proofing Objectives

The first objective was to undertake a thorough project specific climate impact, vulnerability and risk analysis. Based on the results, the second objective was the assessment and subsequent appraisal of relevant climate proofing measures that increase the resilience of the 100 E-Bus Trial project.

5.6.3 ToR Climate Proofing Report

The Climate Proofing Report included the following components:

Sub Activity 1: Project Screening

The objective of the sub-activity was to identify whether the 100 E-Bus Trial project is vulnerable to the current impacts of climate change and if future climate projections have an impact on the lifecycle of the 100 E-Bus Trial project. It entailed three different sub-components:

1. **Validation** on the existence of relevant climate data and information for the specific projects sites, sector and target groups;
2. **Pre-Sensitivity Analysis** through a pre-screening of the climate sensitiveness of the projects; and
3. **Exposure Evaluation** that evaluates the exposure of the projects' assets to current and projected climate hazards and impacts.

Sub-Activity 2: Climate Proofing and Mitigation Analysis

The objective of the sub-activity was a thorough analysis of possible direct and indirect impacts, vulnerabilities and risks of the project in the context of climate change. A focus should be placed on the project units that were identified as "medium", "highly sensitive", or "exposed" in Activity 2.4.1. This sub-activity included

1. **Gap Analysis:** that identified the data gaps that prevented a good climate proofing analysis from being carried out and suggested next steps/information gathering required for the city of Jakarta.
2. **Impact Assessment** that analyzed current and projected effects of climate change on the natural and human system within the 100 E-Bus sector. Specifically, on the design of the 100 E-Bus Trial. This includes the development of climate and socio-economic scenarios for the project's life cycle.
3. **Vulnerability Analysis** that identified current and projected causes for the Trial's climate vulnerability.
4. **Risk Assessment** that built upon the vulnerability assessment and identified risks and opportunities to improve environmental performance of the 100 E-Bus Trial in the medium and long term.
5. **GHG emissions**[11] **and noise baseline**, calculation of potential reductions and plan for air quality and noise contamination monitoring.

Sub-Activity 3: Assessment of Climate Proofing and Mitigation Options

The goal of this assessment was to identify and prioritize the most appropriate and cost-effective measures to qualify the projects as resilient to the current and projected impacts of climate change. The assessment was built on the results from studies prepared under sub activities 1 and 2 above. This sub-activity included:

1. **Assessment of possible climate proofing and mitigation options** through a first identification of measures and a subsequent assessment of their cost-effectiveness, technical feasibility and resilience benefits; and
2. **Participation on a C40 organized Climate Benefits webinar** with local government and external stakeholders (local academia, NGOs, users, etc.) with the objective of disseminating results and prioritizing identified measures.

[11] This was prepared by the C40 GHG Emissions Study (Final Report) February 10, 2021.

Sub-Activity 2.4.4: Integration of climate proofing measures

The objective of this sub-task was to integrate the agreed climate proofing and mitigation measures and their technical specifications into relevant project-planning documents.

5.6.4 Context and Setting

An ADB commissioned study estimates Jakarta's transport related Green House Gas emissions in 2016 at 18 MtCO2 and predicts them to double by 2030 under a business as usual scenario. Transport emissions of the city represent around 11% of Indonesia's GHG transport emissions. Compared to conventional vehicles, electric vehicles have 20%-35% lower emission, given the current power grid carbon load factor.

5.6.5 Consultants Approach and Staff Allocation

From an early stage of the project, our short-term expert focused on delivering a plan approach for the Climate Proofing Component of the study. Activity 2.4 was carried out by La Ode Muhammad Abdul Wahid (Wahid), reporting to the Team Leader. The Climate Proofing Report was issued in late February 2021, following the Climate Proofing presentation/webinar on February 22, 2021.

5.6.6 Key Findings and Conclusions

The purpose of this work package was to undertake a thorough project specific climate impact, vulnerability and risk analysis for the 100 E-Buses Trial.

The climate proofing study has been conducted on the utilization of E-Buses for the 100 E-Buses Trial in DKI Jakarta using corridor 6, 6D, and 9D, related to climate change adaptation. DKI Jakarta Province conducted a climate change adaptation analysis in 2019, covering climate hazards, climate vulnerability, and climate risks that can occur in DKI Jakarta which is an important reference study for this work package.

The potential for hazards are tabulated below.

Table 4: *Hazard Class and Level*

Infrastructure	Hazard Class and Weight					Hazard Level
	Very High	High	Medium	Low	Very Low	
	(5)	(4)	(3)	(2)	(1)	
Flood Hazard						
Corridor 6	0%	15.7%	7.5%	73.8%	2.9%	2.36
Corridor 6D	0%	0%	22.7%	77.3%	0%	2.23
Corridor 9D	0%	20.8%	14.8%	64.4%	0%	2.56
CS at Pesing Depot	0%	100%	0%	0%	0%	4
CS at Cawang Depot	0%	0%	0%	100%	0%	2
Cs at Cijantung Depot	0%	0%	0%	100%	0%	2
Landslide Hazard						
Corridor 6	0%	0%	6.6%	65.2%	28.2%	1.78
Corridor 6D	0%	0%	9.9%	45.1%	45.0%	1.65
Corridor 9D	0%	0%	12.9%	66.3%	20.9%	1.92
CS at Pesing Depot	0%	0%	0%	0%	100%	1
CS at Cawang Depot	0%	0%	0%	100%	0%	2
Cs at Cijantung Depot	0%	0%	0%	100%	0%	2
Sea Level Rise						
Corridor 6	0%	0%	0%	0%	100%	1
Corridor 6D	0%	0%	0%	0%	100%	1
Corridor 9D	0%	0%	0%	0%	100%	1
CS at Pesing Depot	0%	0%	0%	0%	100%	1
CS at Cawang Depot	0%	0%	0%	0%	100%	1
Cs at Cijantung Depot	0%	0%	0%	0%	100%	1

Note: CS = Charging Station

The potential for hazards are mostly at a low level. However, there are about 15.7% and 20.8% of length of the corridor 6 and corridor 9D respectively that are at a high flooding hazard class. Charging station at Pesing Depot is in high-risk flood class area, while others are in low-risk flood class area. On the other hand, Pesing Depot is in very low-risk landslide class, as others are in low-risk landslide class. Thus, the operation of E-Buses on corridors 6 and 9D as well as CS at Pesing Depot needs more attention, for example raising the surface area of the corridor lane and CS also improving drainage. The medium landslide hazard class also needs attention, including rerouting surface and underwater drainage, using chemical agents to reinforce slope material, and strengthening infrastructure by installing structures such as piles and retaining walls.

The corridor vulnerability levels are tabulated below.

Table 5: *Vulnerability Level*

Indicator	Corridor			CS at Depot		
	6	6D	9D	Pesing	Cawang	Cijantung
SEI	2.67	2.67	4.00	5	5	5
ACI	2	4.67	4.67	1	1	1
Vulnerability Level	**2.33**	**3.67**	**4.33**	**3**	**3**	**3**

In terms of vulnerability, corridor 9D is much more vulnerable than corridors 6D and 6. The main reason is that corridor 9D has the longest route and is not specifically dedicated for BRT. Other parameters such as incomplete control system, lane ownership and limited E-Bus reserves are also contributed to the vulnerability of corridor 9D. To reduce the vulnerability, it is necessary to use a centralized control system, build dedicated BRT lines, and add E-Bus reserves. Vulnerability for all CS is the same. This due to the assumptions on number and ownership of CS for each depot are the same. Further insight on vulnerability of CS can be determined during the E-Bus implementation and design phase, in 2021.

Based on the climate risk level determination matrix using the potential for climate hazards and infrastructure vulnerability, the climate risk level for each of the three evaluated E-Bus infrastructures can be obtained. The climate risk analysis on the E-Bus corridors 6, 6D, and 9D shows that corridor 6D and corridor 9D are more at risk to climate change than corridor 6. The climate risk level for corridors 6D and 9D is at medium-risk level , while the climate risk level for corridor 6 is at a low-risk level. The climate risk for all charging stations at the proposed depots is the same, at a medium-risk level[12].

Adaptation measures in order to overcome flood hazards usually involve pumps to drain the flooded areas to the flood canal. Concerning the landslide hazards, the proposed adaptation measures are usually clearing the affected areas by excavator, backhoe, and truck.

[12] Electricity substation infrastructure has not been evaluated because the locations of the infrastructure will only be fully determined during the E-Bus implementation and design phase, in 2021

5.7. Activity 2.5 Good Governance

5.7.1 ToR Deliverables

Deliverables according to ToR's:

• Good Governance Action Plan Report 2.5

(Activity WP2.5) ToR Submission February 23, 2021

5.7.2 ToR Good Governance Report and Objective

The objective of this task was to support and advise the city on good governance through a risk-based approach in the respective project context. The Good Governance Support included the following components:

1. Identification of all corruption risks and which actors are involved at which stages of the respective project cycles;
2. Analysis to what extent opportunities, incentives or costs for wrongdoing exist based on potential risks of corruption, not on actual cases of corruption or evidence of corruption;
3. Identification of the negative impact of the above risks on the objectives of the project;
4. Propose integrity and transparency measures that are crucial for effectively countering corruption risks and to deliver quality infrastructure in the sphere of influence of the client and its partners;
5. Propose capacity building measures (minimum two measures) that support the professionalization and integrity of public servants and suppliers and are within the capacity development framework of the client (C40 Cities Finance Facility's Capacity Development Framework, 2017).

The identified processes among those phases should be prioritized in the report according to:

- The extent to which the risks in the process lies in the sphere of influence;
- The negative impact of the corruption risks on the achievement of the process' objective; and
- Potential positive impact of mitigating this risk.

5.7.3 Consultants Approach and Staff Allocation

From an early stage of the project, our short-term expert focused on delivering a plan approach for the Good Governance Component of the study. An early draft was prepared in June 2020, before the commencement of the Business Case.

At the start of the Study, national consultant Adam Adiwinata carried out activity 2.6, reporting to the Team Leader. Once the Business Case component had been finalized,

it was jointly decided that the addition of international experience would be valuable in this area, and therefore international consultant Nimisha Pal would join the Team, under Addendum 3. Nimisha subsequently joined the project in December 2020, reporting to the Team Leader. The GGAP Report was issued in February 2021.

5.7.4 Key Findings and Conclusions

Governance can be considered as a system of interplay of players, processes and performance. Good governance or lack of it is reflected through the success or failures across multiple factors, for example, the E-Bus Trials useful life, expenditures incurred, prospective outcomes and ultimately satisfaction levels amongst key stakeholders.

In general, bus procurement and operations are prone to various degree of losses and failures world-wide. Low financial and operational performance is attributable to individual as well as to organisational inefficiencies and inexperience. Given the lack of E-Bus operational experience in Jakarta, a higher risk of failures and losses could be expected, if not well managed. However, such enhanced risks are customary in Bus Technology Trials, which should be closely monitored and from which lessons should be learned, leading to more optimised phases of E-Bus rollout in future years. The higher than usual initial investments required for the E-Bus Trial could further amplify the impact of operational failures; although this initial high investment cost is off-set to a certain extent by the lower cost of E-Bus operations, when compared with conventional ICE bus operations.

Risk identification and mitigation strategy formulation has been undertaken for minimizing potential governance failures in 100 E-Bus Trial. The adopted analytical framework for risk analysis and corresponding mitigation is **Process-based**, further supported by an **Actor-based** assessment. Processes are set of involved activities and their approaches while Actors are represented by entities and institutions responsible to carry out the processes.

Due to unfamiliarity of existing institutions/ entities with E-Bus technology and their operations, process-based gaps are identified first, for the next steps and updating of needs, followed by a broad assessment of the strengths of involved actors. A perception-based risk scoring is performed by the Consultant's team based on recommendations of Technical Feasibility Study (TFS), Financial Feasibility Study (FFS), a Market Study of operators conducted by TJ, on the short-listed routes (Nos. 6, 6D and 9D), the Business Case (BC) Study, Capacity Development undertaken by CFF/C40 and discussions held with TJ, DISHUB and BPPBJ.

Four project phases (denoting the Processes) are at the centre of governance failure risk assessment and their implications on achievement of 100 E-Bus Trial project outcomes. These four phases are Appraisal, Planning, Tendering and Implementation. Further, the 100 E-Bus trial project implementation primarily involves TransJakarta as the lead implementing agency, with the global level project monitoring and procurement related procedural support from DKI agencies (namely Transport agency (DISHUB) and the provincial procurement agency (BPPBJ). The bus routes operations

and maintenance are carried out by public and private sector bus operators. A brief review of these organisations identifies areas of potential governance failure. Additionally apex governance institutions such as MoT and DKI Governor's office are considered for their policy, legal and regulatory roles in the 100 E-Bus Trial as well as the wider E-Bus roll-out.

The risk assessment has considered the support provided by the CFF technical assistance for the planning phase and consequent capacity development of TJ.

Risk assessment appears to be heavily tilted towards the **Tendering and Implementation** phases, although the risk levels are expected as '**Very low' to 'Low'.** This is on account of **a dependence on the public and private sector operators** for procurement and operations under the BTS model. Potential for **Delayed procurement** is expected with **Medium to High level** risk. '**Low**' **financial risk** is expected with most of the CapEx+OpEx dependence on the private and public operators. However, absence of a finalised and approved **legal and regulatory framework** is foreseen as **a potential High-risk** governance failure as it concerns E-Bus fleet imports/ manufacturing, registration and on-road operations. This can potentially stall or delay the 100 E-Bus Trial project activities.

As the threat of corruption grows out of conflicting interest of direct and indirect stakeholders whilst deepening its roots in the absence of transparency, accountability and integrity controls and monitoring, the draft GGAP requires to simultaneously consider minimising corruption risks in parallel with the design of required transparency and accountability measures. The draft Good Governance Action Plan (GGAP) provided below consists of a range of potential mitigation measures, responsible agencies and approximate timelines (Table 6).

Table 6: GGAP for Implementing the 100 E-Bus Trial

Sl. No.	Mitigation Measure (Good Governance Actions)	Responsible agency	Timelines
1	Technical Assistance for 100 E-Bus Trial implementation advisory and support	TJ	2021 - 2024
2	Technical Assistance for M&E advisory and support	TJ, PIU	2021-2024
3	Capacity Development Programs (On site and Off site)	TJ, PIU	2021-2024
4	Legal & regulatory framework for E-Bus Trial	MoT (with support from DISHUB/ PIU)	2021 - 2022
5	Deepened Market survey	BPPBJ/ TKPP with support from TJ	Second Quarter of 2021
6	Tender Documents (for bidding and contract conditions)	BPPBJ/ TKPP	2021 (starting March 2021)

Sl. No.	Mitigation Measure (Good Governance Actions)	Responsible agency	Timelines
7	Monitoring & Evaluation Framework (with ready base line)	TJ, DISHUB, DKI Governor's office	2021
8	Tender Award and Contract Signing	BPPBJ/ TKPP with support from TJ	Late 2021/ 2022
9	Contract Management	Private or Public Operator/ Concessionaire	2022/ 2023 onwards
10	Review Meetings/ Seminar	TJ and DISHUB	2022/ 2023 onwards

Source: Consultant's team

In order to avoid or at least minimise above negative outcomes from this 100 E-Bus Trial project implementation, relevant mitigation measures are identified (a) to strengthen the tendering process through a deepening of the existing market survey; (b) for inclusion and integration of a robust monitoring & evaluation mechanism in the project processes; and (c) for capacity development of both public and private sector operators. Necessary E-Bus related legal and regulatory framework needs to be in place, in parallel to progress on desired implementation path.

With the completion of ongoing technical assistance to TransJakarta on 100 E-Bus Trial, an initial support (planning phase) is completed. Further technical assistance during the procurement and implementation phases is recommended. Technical assistance for implementation shall assist incorporation of suggested mitigation measures and GGAP.

5.8. Activity 2.6 Gender and LNOB Analyses Report

5.8.1 ToR Deliverables

Deliverables according to ToR's:

- Gender and LNOB Analysis Report 2.6

(Activity WP2.6) ToR Submission Final Gender and LNOB Report February 23, 2021

5.8.2 ToR Gender and LNOB

The Service Provider prepared project-specific Gender and LNOB Analyses that also encompass other dimensions of diversity; apart from gender, disability is a main concern in public transport in Jakarta. The purpose was to gain insight into current gender and disability relations and roles, interests, needs, potentials in urban mobility in Jakarta. The analyses produced recommendations that enable the

conceptualization of activities that are in-line with equality policies and the principle to Leave no One Behind.

The overarching aim was to identify the 100 E-Bus Trial possible unintended negative impacts and the potential positive impacts in terms of gender equality and human rights in order to address them in project design and implementation.

Therefore, the Gender and LNOB-Analysis should create a clear understanding of the social, economic, physical and political factors underlying climate change-exacerbated inequalities in Jakarta and the implications of these inequalities for the individual projects. It created a gender- and disabilities-sensitive narrative around the project in order to identify how it may be designed in a more gender- and disabilities-responsive way. The analyses and plan may also function as a baseline against which gender- and disability-specific impacts of the extension of the E-Bus Trial project can be measured in the future.

The Service Provider conducted the Gender and LNOB Analysis through literature review, data/information collection, surveys, interviews and consultations with stakeholders. Data collection was inclusive of representatives of relevant groups, marginalized groups in particular. The results of the analyses were synthesized into a narrative describing the gaps, issues and problems that will be addressed during E-Bus Trial project implementation.

5.8.3 Consultants Approach and Staff Allocation

From an early stage of the project, our short-term expert focused on delivering the Gender and LNOB Analyses Component of the Study. The Gender and LNOB Analyses Report was issued in February 2021[13]. Dr. Dikshya Thapa carried out activity 2.6, reporting to the Team Leader.

5.8.4 Key Findings and Conclusions

The findings below reflect results from an assessment of TransJakarta services, using primary and secondary analysis, and take four dimensions into account: (i) infrastructure, its accessibility and safety impact; (ii) affordability of service; (iii) awareness and training on safety concerns; and (iv) representation in decision making and operating the service.

5.8.4.1 Infrastructure

The assessment found that TransJakarta and its operating partners are already increasing service accessibility to women and vulnerable populations. The Minimum Service Standards (MSS) ensure buses have wheelchair access (though not all) and priority seating for elderly, pregnant women, and disabled groups; drivers

[13] Following the recovery of the Short-term expert from COVID-19, contracted during late 2020.

follow speed regulations and stop at designated locations; and transit infrastructure is safe for women and accessible for disabled population. Buses contain equipment to enable disability inclusiveness and prevent gender-based harassment, for example, with the use CCTVs, announcements, and route information.

However, the full implementation of these measures are yet to be measured through a full-scale user survey as it is not clear to what extent they have been effective on the ground. In terms of infrastructure, one measure put in place in 2014 to protect female drivers themselves is the installation of a separator between the passenger and driver to reduce the risk of harassment and to prevent passengers potentially distracting the drivers[14].

5.8.4.2 Affordability

In general, all transport modes charge a very affordable flat rate per trip, which is 3,500 rupiah, around 30 US cents. In addition, free ridership for 14 categories of marginalized groups is offered. Buses were integrated with micro buses in 2018, and with the MRT in 2019, using a single (one time) tapping payment system that connects different vehicles. This should significantly reduce costs from an earlier scenario of having to pay each time a vehicle change occurred (although estimates are to be verified with a rigorous evaluation).

5.8.4.3 Training

Gender harassment mitigation measures have reportedly been increasing recently (reporting information, fare information, route announcements). Some other measures include providing sexual harassment training modules as part of general operator training.

However, according to the interview with female drivers, the training for bus drivers at TransJakarta is gender neutral and does not highlight gender aspects specifically. Furthermore, female drivers showed varied understanding of reporting mechanisms and follow-up actions to be taken in the event of harassment or other unsafe occurrences. Responses on such actions ranged from “one should go to the security officers that are present in every shelter” to “contact customer complaint hotlines to which customer can report inconvenient experiences” as well as “issues should be dealt with on the spot”[15].

5.8.4.4 Representation and Recruitment

TransJakarta has already been promoting female driver recruitment on the basis of quotas of 30% representation. Beyond, the 100 E-Bus Trial Project, TransJakarta can also increase women’s representation in service provision and transport planning.

The gaps described above also form the context for evaluating the project’s possible risks on project-affected persons. It is expected that the risks are fairly limited initially, as the 100 E-Bus Trial Project is part of a gradual transition to an

[14] Information on the number of buses with separators between drivers and passengers is not presently available.
[15] Source: Interview with female bus drivers January/February 2021.

electric charging system of buses, using the existing transit stops and routes. However, key risks and resultant mitigation measures include making E-Buses more useful and user friendly by vulnerable groups like the elderly, pregnant women, children, and people with disabilities, by ensuring that E-Bus infrastructure, transit infrastructure and charging stations are be accessible; that measures are taken to mitigate gender violence risks; and that services are continually affordable.

Based on these emerging findings, inputs were provided to the Business Case for the 100 E-Bus Trial. The following recommendations are also provided as part of a tentative **Gender Action Plan.**

5.8.4.5 Short term measures within the scope of 100 E-Bus Trial project

- Carry out a **workshop**/webinar to introduce the Gender Action Plan.
- Ensure that the design of **infrastructure** (buses, shelters, charging stations) is inclusive for people with disabilities and for women, keeping. Features that create or guarantee safety/accessibility include disability seating, wheelchair space, security cameras, route announcements and fare information, well-lit areas, at level crossing, pedestrian bridges, and elevator facilities. It is crucial that the city along with, DKI Jakarta Public Works Agency, the agency that control the pedestrian facilities of TransJakarta, make accessibility a priority to improve TransJakarta's service to its passengers[16]. Furthermore, getting an assured seat and having mechanisms to report distress institute a sense of increased personal safety. As mentioned in the Business Case, it should be ensured that buses planned for procurement and charging stations contain these universal access features.
- Ensure that the **affordability** aspects of the integrated system are continued in the new E-Bus system. Decisions to make E-Buses part of Jaklingko should be made with adequate assessment of how it impacts financially on consumers, especially poorer beneficiaries. If the tariffs are increased, the current subsidized population must be exempt from additional charges. The Single Tapping Payment system should be retained to the extent possible.
- Use **awareness and training to improve safety and GBV response** and prevention through trainings and safety equipment inside buses and in transit areas. Improving safety entails proper training for drivers to have full knowledge of responses and courses of action in case of harassment occurrence. TransJakarta has a 24 call center for complaints and information services, each shelter also has a complaints box. Besides this, complaints can be reported to an officer on the bus or security at the shelter. However, procedures should be adequately implemented as both customers and drivers/shelter staff are not always aware of procedures. Trans Jakarta can also ensure that any contractor and subcontractor firms hired have zero tolerance of sexual misconduct and GBV in their employment.

[16] https://www.itdp.org/2019/07/15/transjakarta-study-success/

5.8.4.6 Medium to longer term measures beyond the 100 E-Bus Trial project

- **Technologies and social media campaigns can be harnessed to help prepare young migrant workers for living, working and travelling in a new city**. For example, Pulse Lab Jakarta has designed a "Know Your City App" – an application designed for new migrant workers, allowing them to digitally document places they visit and their experiences as a way to familiarize themselves with a new city. Furthermore, efforts can be placed to equip bus drivers with a unique digital identification as part of the accountability mechanism and passengers can offer feedback on grading. With a digital system in place to assess such grading, drivers can be rewarded or reprimanded for following or not adhering to the standard operating procedures.
- Improve gender balanced **recruitment** and diversity **representation** among TransJakarta planners and engineers and female bus drivers. This can be done using improved recruitment, retention and promotion methods as described in detail in Annex 4. In implementing these measures, stakeholders can also use awareness training and capacity building interventions, communications and learning materials, and using social and other forms of visual and audio means which could provide strategic openings for women.
- Gender and LNOB **representation** can also be addressed through more upstream areas such as in decision making and board rooms, and through such as improved linkages with vocational training centres, schools, and universities. In particular to join efforts with "inclusive STEM" activities for improving women's entry into transport and engineering. To compliment such efforts, the importance of gender and leaving no one behind can be brought up during the high-level meetings with city leaders where possible.
- **TransJakarta can initiate efforts alone or in partnership with civil society organizations** to push through regulation that recognizes sexual harassment in public transport. Currently, the lack of regulation most seriously hampers authorities in dealing with sexual harassment on public transportation when the harassment occurs. Thus, each public transportation management such as TransJakarta has its own standard operational procedures about what to do when it happens, but when they do handle it and report it to the police the police do not know what sanctions to impose or how to deal with it because there is no regulation[17].
- Improve **data collection** efforts on the transport and mobility use and needs of women and vulnerable groups and how they might differ from men. Lack of data on gender differences and vulnerability affected persons in the transport sector in Indonesia is part of a general data gap in relation to gender and excluded persons along most SDG indicators[18]. Recently, some countries have started using big data, and participatory data to collect such information, by combining a wide range of data sources, including commercial sources of call detail records, and high-resolution satellite data, to see whether there is mobility

[17] ASEAN Plus News, December 2019 https://www.thestar.com.my/news/regional/2019/12/01/sexual-harassment-on-public-transportation-in-indonesia-second-only-to-on-the-street-survey
[18] UN Women, 2019

inequality from a gender perspective[19]. The implementation of such data efforts in Indonesia would substantially improve the gender specific indicators needed to carry out baseline trends and establish reliable and timely indicators to better understand women and vulnerable groups urban mobility needs.

5.9 Activity 2.7 Bus Operational Planning Tool

5.9.1 ToR Deliverables

Deliverables according to ToR's (as amended by Contract Addendum 3, December 2020):

• Bus Operational Planning Tool WP 2.7

(Activity WP2.7) ToR Submission : first version February 17,2021 final version: end February 2021

5.9.2 Bus Operational Planning Tool

The service provider shall prepare a (i) Excel-based Decision-Making Tool and based on that, (ii) an Operational Plan for E-Bus implementation taking into consideration charging strategies at the terminals and bus operations.

At a minimum, the (i) Excel-based Decision-Making Tool should include the following features:

- Identification of various strategies of charging during peak and non-peak hours with and without depot locations in the corridor.
- Identification for charging strategies for three scenarios with regard to two charging locations selected (e.g. Ragunan, Pejaten).
- Identification of operational plan at route level for at least three selected BRT routes. Hereby reflecting on arrival rates of buses, departure rates, dwelling time at the terminals, manoeuvring of buses/lane changes, bus bunching etc. and determine the time needed to charge using pantograph or fast dc chargers and clearly identify potential on-ground challenges and solutions.
- User-friendly user guide and reference to input data.

Next to the Excel Tool, a concise (ii) Operational Plan shall include the following components:

- Identify charging strategies during peak and non-peak hours for at least three selected E-Bus routes.
- Identify the available time for each selected route for charging.

19 UN Women, 2019.

- Determine the charging options with power rating for selected routes.
- Determine the costs for charging infrastructure deployment for selected routes.
- Integration of study findings towards renewable energy (i.e. solar PV) penetration.

5.9.3 Consultants Approach and Staff Allocation

WP 2.7 was added to the project in December 2020 (Addendum 3). Pawan Mulukutla carried out principal work for activity 2.7, supported by Sutanu Pati. He reported to the Team Leader.

5.9.4 Key Findings and Conclusions

The Bus Operational Planning Tool was presented to the TJ Technical Team on February 18, 2021. Final comments on the draft Tool were received from TJ on February 23, 2021. The final version of the Tool was uploaded on February 27, 2021 together with a short summary.

6. WORK PACKAGE TASK 3: CAPACITY DEVELOPMENT

6.1 ToR Deliverables

Deliverables according to ToR's:

Capacity Development 3.0

• Strategy Report 3.1 submitted October 19, 2020

• Summary Report 3.2

(Activity WP3) ToR Submission, Final Summary Report February23, 2021

6.2 ToR Capacity Development

The Service Provider supported the SPA in implementing the Capacity Development Strategy that included the following aspects:

- Identified capacity gaps grouped by levels of capacity development and type of standard capacity
- Description of targeted capacity need by identified core area of project preparation
- Potential capacity development responses to address capacity gaps, including the type of instruments to be used and their expected outcomes
- Suggested participants (individuals/organizations) by activity
- Potential responsible organization or partners that can provide support (e.g. the CFF, GIZ, C40 networks, city administration, etc.),
- Mapping of potential training, organisations that provide capacity building, webinars, study tours, organizational development expert to provide advice
- Estimated time and date for each intervention (hours, days, months)

The Service Provider included the following components based on a plan developed by CFF:

1. High-level meetings with city leaders.
2. Facilitation of peer-to-peer learning with local implementation teams[20].
3. Technical training and capacitation of local implementation teams, which were to include at least three full day technical training sessions[21] and the production of at least three webinars on key topics. Due to Coronavirus alternative solutions were found, as GOI banned non-essential meetings and large gatherings.

[20] Predominantly TJ Technical and Management Teams, DKI PIU and DKI Dishub Experts.
[21] Implemented in the form of regular Thursday afternoon Capacity Development training sessions with the TJ Technical Team.

6.3 Consultants Approach and Staff Allocation

From an early stage of the project, our short-term expert developed a draft Capacity Development plan that was continuously updated throughout the project.

National consultant Lalu Damanhuri carried out initial activities of WP3 with support from the Team, reporting to the Team Leader. Lalu Damanhuri conducted high level meetings with DKI PIU and Dishub. Later in the project implementation period, international expert Nancy Finger took over responsibility for the WP, with support from the Team Leader.

6.4 Key Findings and Conclusions

The implementation of the Initial Stakeholder and Capacity Development Event in February 2020, the CAST, the follow-up Key Informant Interviews Surveys, as well as directions from the C40 Capacity Development Framework have together provided the basis to develop the Capacity Development Plan with specific capacity development activities which have already been substantially implemented in the technical and financial areas over the period from February 2020 continued until the beginning of February 2021.

The activities regarding the implementation of the 100 E-Bus trial (involving Procurement and Implementation) were conducted according to the Capacity Development Plan[22] until beginning of February 2021.

The key results of the Capacity Development evaluation undertaken from December 2020 to January 2021 were as follows:

- 83% of the respondents answered positively on the *Capacity Development Implementation* questions, 17% of the respondents were partially satisfied.
- Excluding those for whom the questions were not relevant, 87.5% of the respondents agreed to the anticipated *Capacity Outcomes / Learnings* in Project Management & Administration, as well as Financial and Technical matters, 12.5% didn´t agree. The biggest gap was identified in the Financial area where further support might be needed and could be considered for the next CFF phase.
- Overall, the *Capacity Development Activity Appropriateness* was considered by stakeholders to be either *Very Useful* or *Useful.* No negative reactions were recorded.
- While some responses under the *Final questions* section confirm the positive Capacity Outcomes / Learnings, some others provide valuable feedback regarding future Capacity Development Activities for the project stakeholders, as well as for other CFF cities.

Due to the adverse impact of COVID-19, no final project workshop was possible. Despite this, a series of webinars were organized by CFF during November-December 2020 and a key project closing event took place on February 24, 2021. (See Annex 4). The Capacity Development Plan is indicated in Annex 6.

[22] With some modifications arising from project closing in February 2021.

7. WORK PACKAGE 4: LESSONS LEARNED: KNOWLEDGE SHARING

7.1 ToR Deliverables

Deliverables according to ToR's:

• Lessons Learned Report 1 4.1 Submitted August 12, 2020.

• Lessons Learned Report 2 4.2

(Activity WP4) ToR Submission Final Report end February 2021

7.2 ToR Knowledge Sharing

The Contractor captured lessons learned from implementation of support to DKI through close coordination with and constant feedback to the C40 Knowledge and Partnerships Manager and the SPA. The Knowledge & Learning support included the following components:

1. Support the C40 Knowledge and Partnerships Manager in the review of knowledge products (e.g. manuals, guidelines). This may involve the review of materials to present to national and international policy-makers.

2. Prepare 4-page reports, due 6 months and 12 months after the official kick-off, outlining the lessons learned from the delivery of technical assistance to the city. The reports formed part of the knowledge gap assessment for each city. These reports will not be published nor shared with the city. The reports addressed the following questions:

- With respect to the project, what technical and financial knowledge is the city currently lacking?
- What is the reason for these knowledge gaps?

7.3 Consultants Approach and Staff Allocation

Knowledge management goals: Building on the combined expertise of our team, the Team worked closely with the C40 KAPM, the PIU and the SPA to develop knowledge products for dissemination to the C40 network. Together with the implementation of the capacity development strategy (WP 3), the obtained knowledge and experiences was anchored in Jakarta.

Focus of knowledge products, creation and dissemination: We ensured comprehensive documentation of all relevant outputs in a structured and well accessible documentation system by using an online server system (e.g. SharePoint) and provided them to CFF and PIU in a timely manner.

Knowledge management products were tailored to the different actors and disseminated in appropriate fora. We provided information material on the 100 E-Bus Trial project and supported CFF in producing materials. The project team participated in three Indonesian focused webinars (two in November/ December 2020 and one in February 2021), where key findings and lessons learned from the delivery were shared with other cities and practitioners.

The project team participated in two Panama focused webinars (two in February 2021), where key findings and lessons learned from the delivery were shared with Panama city and its practitioners.

Initially national consultant Andyka Kusuma carried out activity 4 with support from international consultant Nancy Finger, reporting to the Team Leader. Just prior to work on the first Lessons Learned Report the international consultant took full responsibility for this WP4.

The first Lessons Learned Report was submitted on August 12, 2020. The second and final Report was submitted on February 25, 2021, just after the project closing event. As these are two C40 CFF internal reports, the findings are not shared here.

8. FINAL REPORT

8.1 ToR Deliverable

Deliverables according to ToR's:

• Final Report

(Activity 5) ToR Submission: end February 28, 2021

8.2 ToR Final Report

This final report is issued at end February 2021, comprising:

A summary report referencing all final versions of all preceding deliverables under the contract together with MS Teams Directories, including all deliverables in CFF format.

This baseline finalized the Preparatory Studies and has assisted in developing capacity and promoting Knowledge Sharing.

8.3 Consultants Approach and Staff Allocation

The Team Leader David Shelley has carried out activity 5, supported by Nancy Finger.

9. CONCLUSION AND NEXT STEPS

9.1 Conclusion

In terms of the approach set out in Figure 1, the project team is now at the end of the project, with the submission of the Final Report.

9.2 Next Step

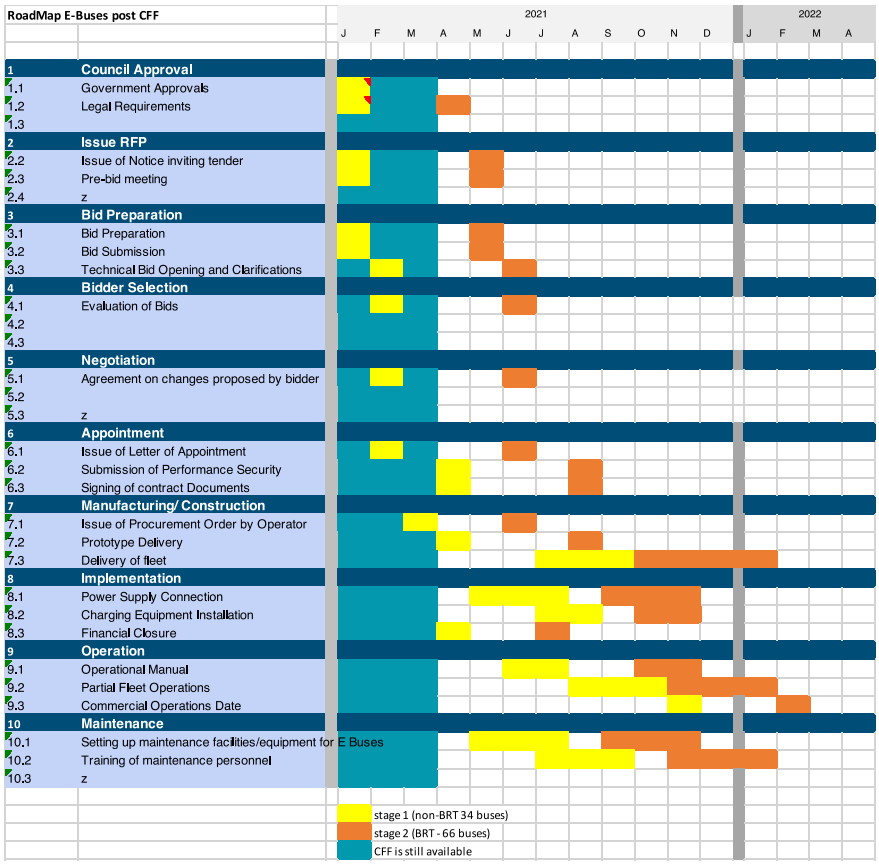
Details of the post CFF Roadmap are presented in Figure 2 (December 2020). Since that time a potential extension of CFF assistance has been discussed to provide financial closure for the 100 E-Bus Trial, with a focus on procurement and implementation.

The Consultant recommends proceeding with the immediate next step (for commencement in April 2021) based on the following:

1) Stock-taking of the Regulatory and Market Situation in early 2021; followed by

2) Updating of all pertinent Technical and Financial inputs to support the 100 E-Bus Trial procurement process in 2021.

Figure 2: Post CFF Roadmap



ANNEX 1 100 E-BUS TRIAL KICK-OFF MEETING: SOME KEY SLIDES FROM CFF AND TJ PRESENTATIONS

Figure 3: CFF: Focus of Support

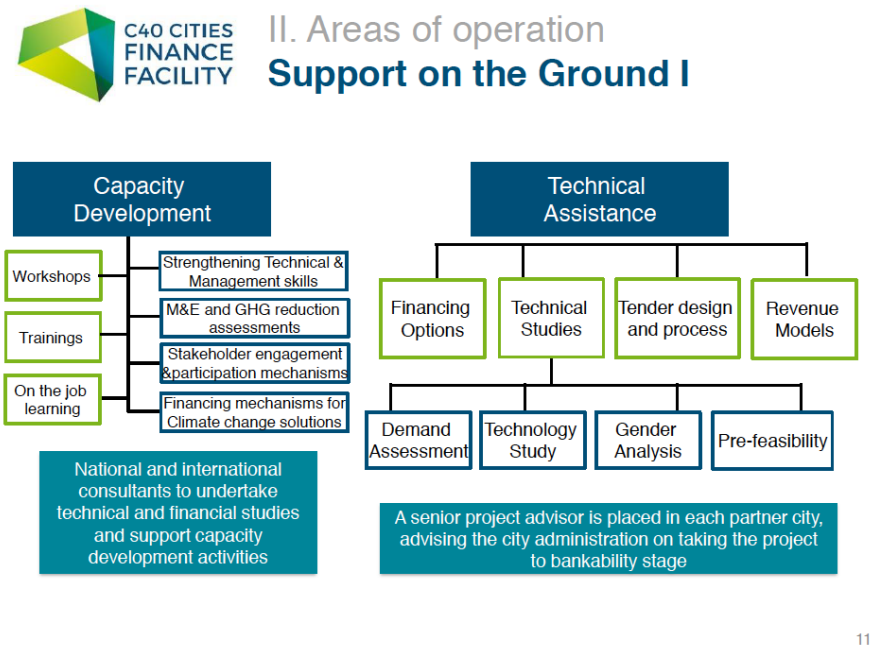


Figure 4: CFF: Draft Schedule – 100 E-Bus Trial Project Overview

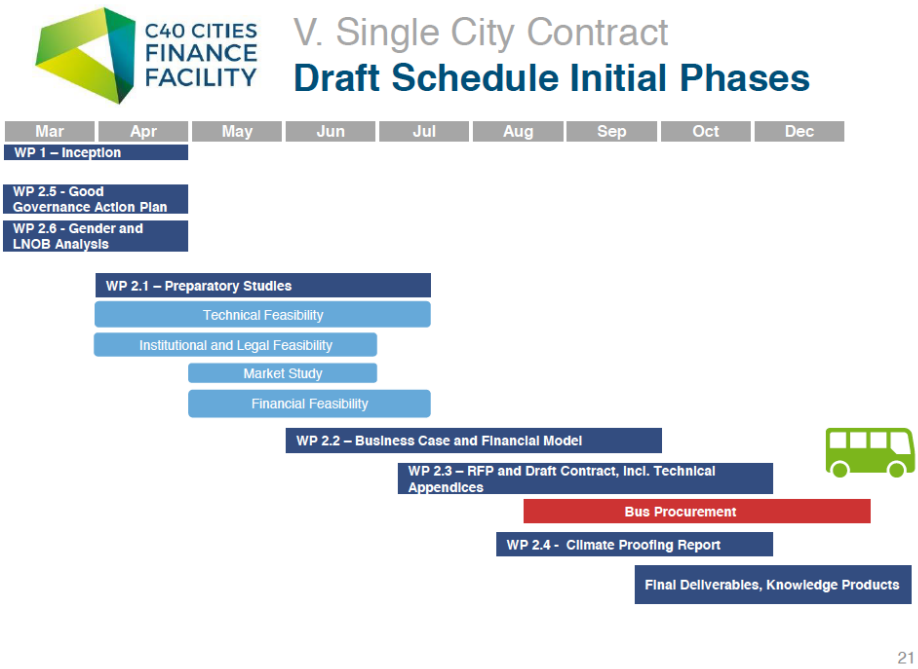


Figure 5: TJ: Plan for Migration to an EV fleet

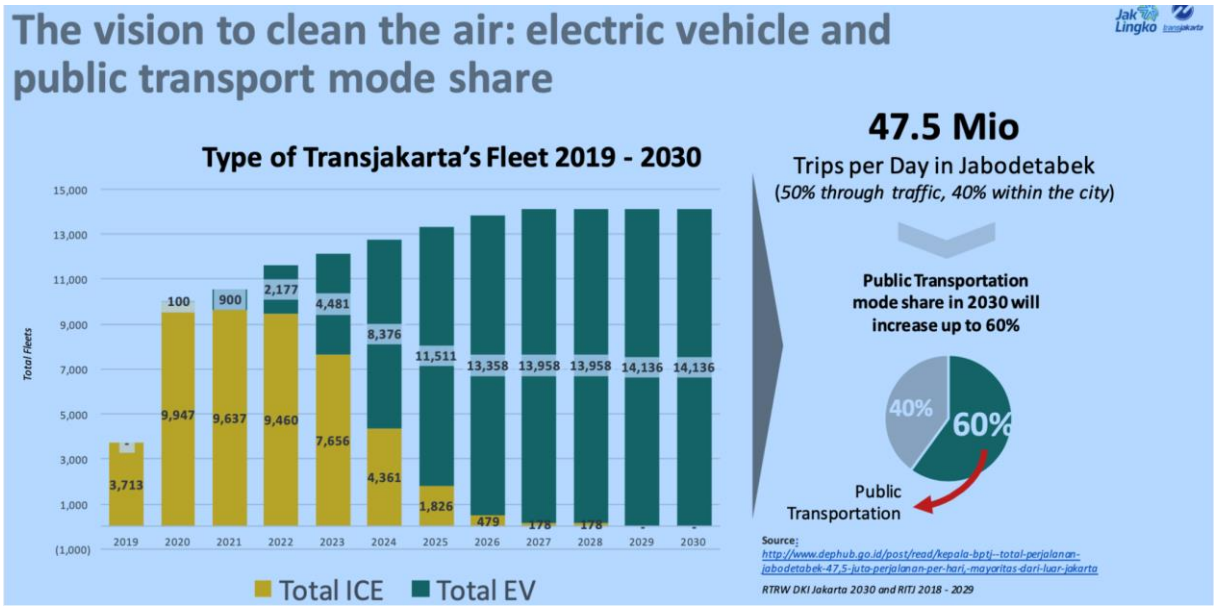
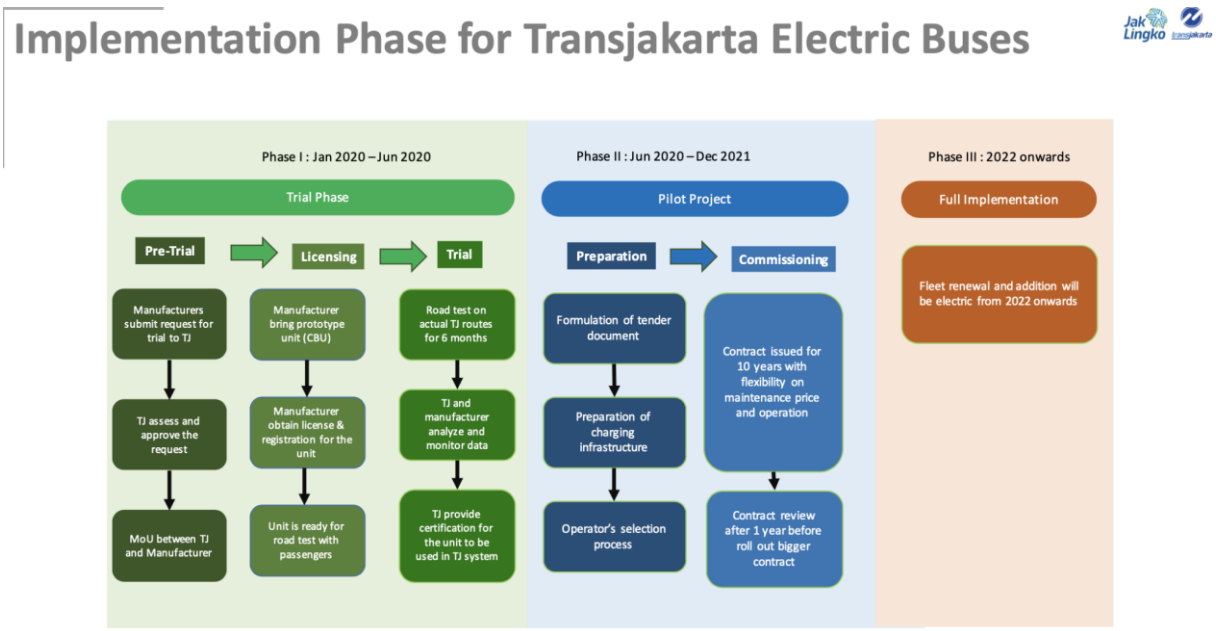
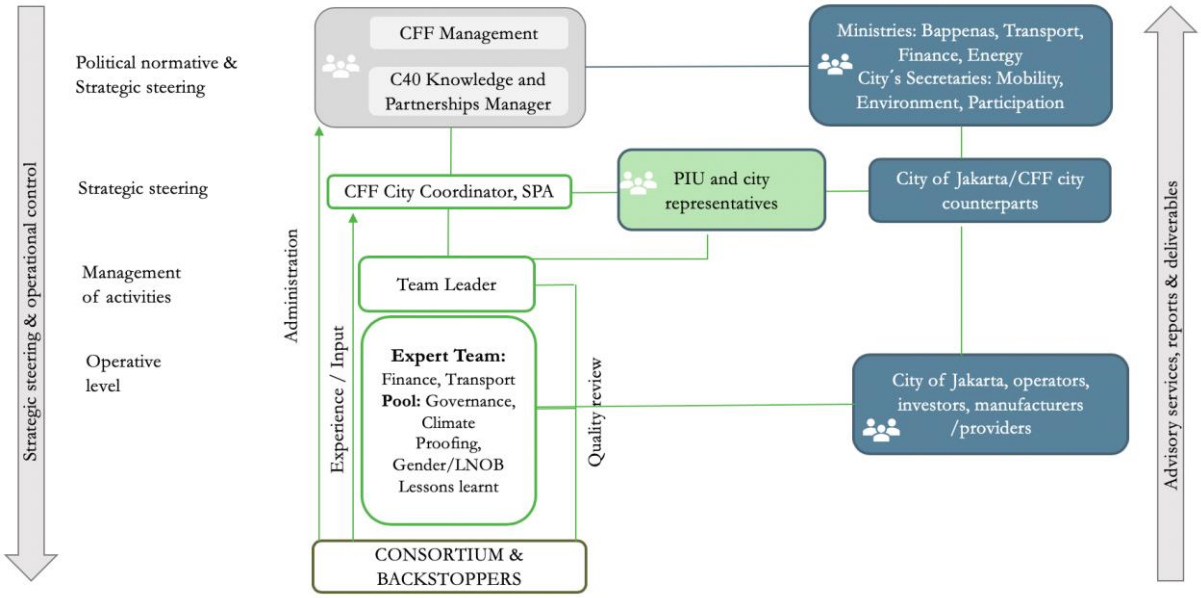


Figure 6: TJ: implementation phase for TransJakarta



ANNEX 2 PROJECT STEERING STRUCTURE

Figure 7: Details of Project Steering Arrangements[23]



[23] Communication with the city of Jakarta, operators, investors etc. by the team of experts are closely coordinated with the SPA. The SPA also had a direct communication line to ministries, as she was the contact person for all stakeholders involved on site.

ANNEX 3 ZERO-EMISSION BUS BENEFITS WEBINAR

Organized by the C40 Cities Finance Facility

22 February 2021	Zero-Emission Bus Benefits:
15.00 am (UTC +7)	Benefit Study, GHG Reduction and Climate Proofing

A3.1 Introduction

Traditional buses – those with internal combustion engines – are responsible for a significant share of greenhouse gas emissions and air pollution. And this remains true even when constituting only a small portion of all vehicles in a community. In response, cities are increasingly looking to zero-emission bus technologies including battery-electric, trolley systems and fuel cell electric or hydrogen to contribute towards greener and healthier streets and become part of the climate change solution.

All around the world, battery-electric buses are the most prevalent solution deployed. It has been studied that battery-electric buses are able to deliver substantial health, environmental, and economic benefits through cleaner air quality and emissions reductions. These benefits compensate the steep upfront costs of zero-emission buses and in the longer run will show proven transition towards sustainable transport.

For this reason, diverse efforts throughout the world are supporting cities to ease these concerns through the implementation of pilot projects. Thus, it is paramount that these benefits are thoughtfully studied to answer critical and outstanding questions, build confidence among decision-makers, and inform a broader strategy of electrification.

The C40 Cities Finance Facility (CFF) is organizing this webinar hoping to encourage DKI Jakarta to plan and implement and materialize a shift towards zero-emission buses given these benefits of cleaner and healthier city.

A3.2 Objectives

The overall aim of the webinar is to contribute to an accelerated deployment of zero-emission buses in DKI Jakarta by sharing Benefits Study, GHG Reduction Study and Climate Proofing to ensure the smooth deployment of zero-emission buses.

The expected results and outcomes of the webinar include:

- City officials and decision makers are familiar with benefits of zero-emission bus deployment
- The city is encouraged to materialize the planning of 100 electric bus trial in Jakarta to initiate further electrification of their bus fleet and transport systems

A3.3 Target Participants

The event will be accessible to DKI Jakarta officials and TransJakarta. To reach the desired outcome, the webinar is specifically targeted for the following participants:

- Cooperation Affairs Bureau, The Provincial Government of DKI Jakarta
- Economic Affairs Bureau, The Provincial Government of DKI Jakarta
- Transportation Agency, The Provincial Government of DKI Jakarta
- PT. Transportasi Jakarta
- Regional Planning Agency (Bappeda), The Provincial Government of DKI Jakarta
- Regional Procurement Agency (BPPBJ), The Provincial Government of DKI Jakarta

A3.4 Format

The webinar is completed by a 90-minute session using the Zoom platform, composed of 3 (three) presentations up to 60 minutes and an open plenary for questions and answers up to 30 minutes.

The session will open 15 minutes before the scheduled start.

Simultaneous interpretation for English and Bahasa Indonesia will be available.

A3.5 Agenda

Figure 8: Zero Emission Buses Benefits Webinar Agenda

Time	Topic
15.00– 15.10	**1 Welcome and settling in**
15.10 – 15.30 (20 mins)	**2 Benefit Study** C40 Cities Presentation on the Benefits of ZEB deployment in context of Jakarta.
15.30 – 15.45 (15 mins)	**3 GHG Reduction** C40 Cities Presentation on how the GHG Reduction is calculated
15.45 – 16.00 (15 mins)	**4 100 E-Bus Trial Climate Proofing** Laode Abdul Wahid, GFA – HEAT Presentation on how the 100 E-Bus Trial will be climate-proofed in respond to Jakarta's climate
16.00 – 16.30 (10 mins)	**5 Open Plenary & Closing** Submitted questions will be answered by the resource speakers

ANNEX 4 CLOSING EVENT FEBRUARY 24, 2021 : PROGRAM AND AGENDA

The project support comes to an end in March 2021. Therefore, an official handover ceremony with donors, media, and other stakeholders is planned for February 24, 2021.

A4.1 Objective

- Sharing the outputs and outcome of the project and attributions to the city's goals related to 100 E-Bus Trial as well as experiences in implementation of project preparation.
- Identifying way forward in institutionalizing project initiatives through other existing projects and programs of the Provincial Government of DKI Jakarta and other development agencies.
- Handing-over of studies and knowledge products and acknowledge the support of implementing partners.

A4.2 Expected Outputs

- Documentation of implementing partners' highlights and insights on the preparation of 100 E-Bus Trial.
- Studies and project knowledge products available to other agencies and cities for upscaling or replication.

A4.3 Agenda

Figure 9: Closing Workshop Agenda

Proposed Agenda

Timeline	Activities	Resources
15.00 – 15.10 (10 min)	Keynote Speech (preferably live or recorded)	The Governor of DKI Jakarta
15.10 – 15.20 (10 min)	Speech from the Ministry of Transportation **National Plan for E-Mobility**	MOT (TBD)
15.20 – 15.30 (10 min)	Speech from the Ministry of Energy and Mineral Resources **National Readiness to Support E-Mobility**	MEMR (TBD)
15.30 – 15.35 (5 min)	100 E-Bus Trial Video	CFF
15.35 – 15.50 (15 min)	Summary of Achievements:	Head of Transportation Agency (*Dinas Perhubungan DKI Jakarta*)
15.50 – 16.05 (15 min)	Overview of the next steps	Director of TJ
16.05 – 16.10 (5 min)	UK Embassy **Potential Support Beyond the Project**	UK Embassy (TBD)
16.10 – 16.15 (5 min)	German Embassy **Potential Support Beyond the Project**	German Embassy (TBD)
16.15 – 16.25 (10 min)	Closing Remarks	CFF
16.25 – 16.30 (5 min)	Group photo	

ANNEX 5 POST CLOSING GENDER EVENT MARCH 4, 2021: PROGRAM AND AGENDA

The project support comes to an end at end February 2021. However one C40/CFF/ ITDP GESI event is planned for March 4, 2021. Details are provided below.

Background

Terms of Reference GESI Webinar on Electric Bus

Electric mobility (e-mobility) is now part of emerging technologies in the world to limit the emission produced in the transport sector. Indonesia aims to take part in the e-mobility landscape and to accelerate the implementation of e-mobility through Presidential Regulation 55/2019. Jakarta as the capital of Indonesia has introduced several steps providing initial actions for e-mobility deployment, including the introduction of the electric bus (E-Bus). The initial implementation of E-Bus in Jakarta will be provided by Transjakarta, the regional-owned company operating the biggest bus rapid transit (BRT) system in the world. Transjakarta expects to have a pilot project of E-Buses in 2021 and later implement fully electric bus fleets in 2030 as stated in their long-term plan. Institute for Transportation and Development Policy (ITDP) has led the Supporting Jakarta's Transition to E-mobility project to help the implementation of electric buses in Transjakarta.

In the development of E-Bus implementation in Jakarta, there is a critical urgency to incorporate the Gender Equality and Social Inclusion (GESI) aspect into the E-Bus implementation. While most of GESI aspects are still overlooked in the broader transportation landscape in Indonesia, it is essential to bring safe, inclusive, and accessible electric buses for the general public and vulnerable groups, especially in the pilot and initiation period in Jakarta. Several issues need to be addressed in the deployment of electric buses, such as the lack of GESI issues included in the current policy including Presidential Regulation 55/2019 and no GESI provision in the policy related to charging infrastructures. As an impact, it means that the implementation of electric buses in Jakarta should consider GESI issues included in the planning, operation, maintenance, management, monitoring, and evaluation process.

Objective

1. To elaborate current policy and policy gaps of GESI issues in the e-mobility development, especially for electric buses deployment in Jakarta;
2. To disseminate the policy recommendation to improve the incorporation of GESI aspects in the deployment of electric buses; and

3. To raise awareness from the related stakeholders (government) regarding GESI issues in the context of e-mobility and E-Buses development

Target Audience

The webinar focuses mainly on the policy issues related to GESI on the deployment of electric buses. Therefore, the webinar will invite policymakers, international organizations, non-government organizations (NGO), and academia as the audience.

Expected output

1. Support from key stakeholders and policymakers to incorporate GESI issues in the specific regulations and/or policies related to electric bus deployment.
2. Incorporate GESI issues into the development and implementation of electric buses deployment in Jakarta.
3. Constructive inputs and responses from essential GESI communities to answer the future challenges in terms of development in electric buses deployment in Jakarta.

Proposed Schedule

Date: March 4, 2021
Time: 09:00 - 11:00
Duration: 120 minutes
Location : Online virtual meeting using Zoom

Format

This webinar will be formatted into experts presentation and panel discussion.

Platform

The webinar will be carried out online using Zoom.

Moderator

1. Urban Planning Associate in the Institute for Transportation and Development Policy (Deliani Siregar/Anggi)

Speaker

1. Transport Associate of ITDP working in Supporting Jakarta's Transition to E-mobility project (I Made Vikananda)
2. GESI Expert of Supporting Jakarta's Transition to E-mobility Project (Dewi Novirianti)
3. GESI Expert from C40 Cities Finance Facility (Dikshya Thapa)

Panelists

1. Ministry of Women Empowerment and Child Protection
2. Ministry of Transport
3. Transport Agency of Jakarta
4. PT. Transportasi Jakarta
5. UN Women
6. Gerakan Aksesibilitas Umum Nasiona (GAUN)

Figure 10: Gender Workshop Agenda

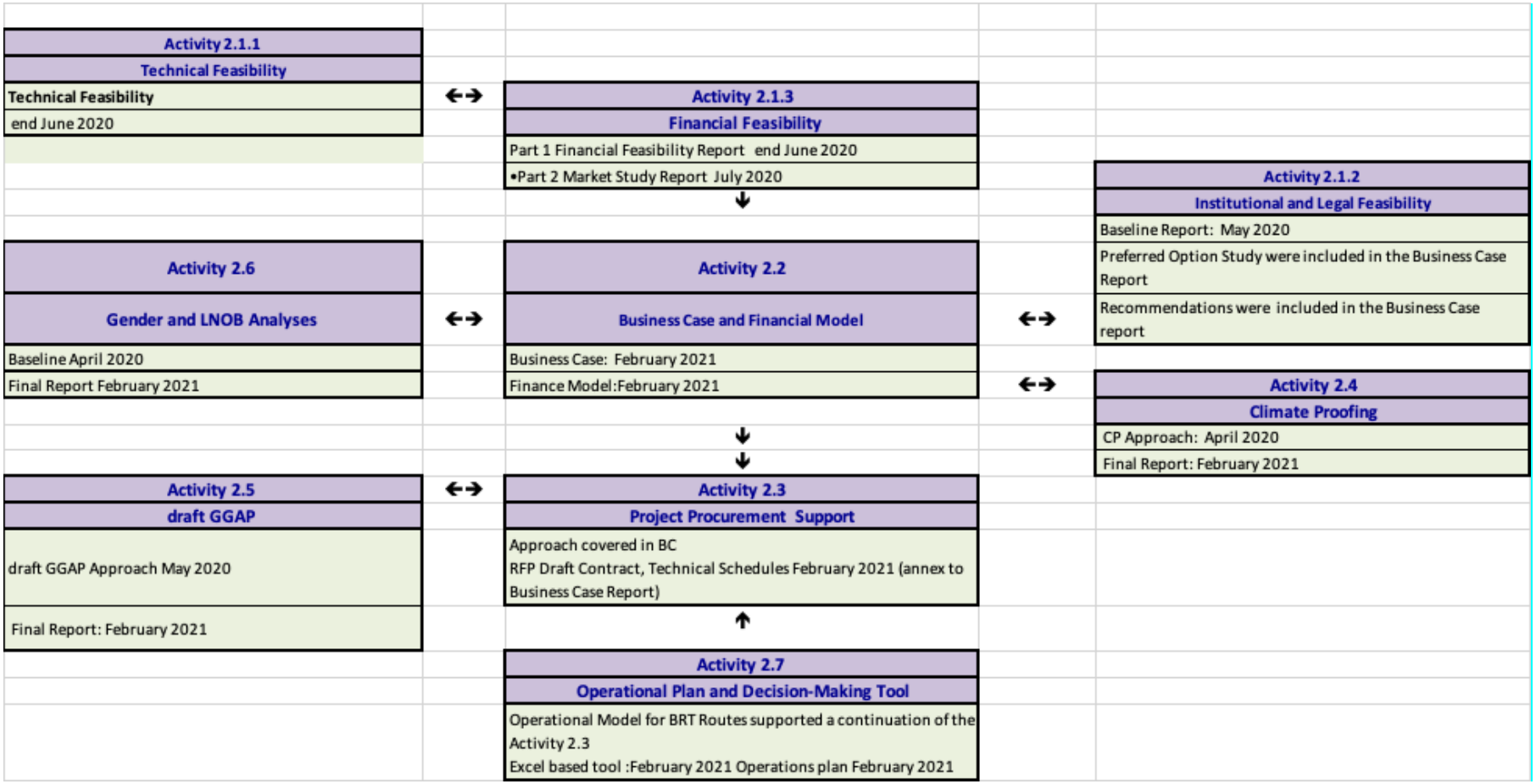
TIME THURSDAY MAR 4, 2021	DURATION	AGENDA	PIC
08:30 - 09:00	30	Webinar Preparation	IR
09:00 - 09:05	5	Addressing audiences and waiting for more participants	AR
09:05 - 09:10	10	Technical brief: housekeeping, rules, features	AR
09:10 - 09:15	5	Opening: objectives, introduction	DS
09:15 - 09:22	7	Overview of the e-mobility project	IMV
09:22 - 09:37	15	GESI policy recommendation regarding Transjakarta E-Bus deployment	DN
09:37 - 09:47	10	C40 Cities Finance Facility Presentation for GESI Report	DT
09:47 - 10:47	60	Question Session to Panelists	DS
10:47 - 10:55	8	Wrapping Up and Conclusion	DS
10:55 - 11:00	5	Closing	DS

Figure 11: List of Questions to Panelists

Guided Questions	Stakeholders
What is the current national policy and regulation that has covered the GESI issues on electric mobility, especially for electric buses?	Ministry of Transport Ministry of Women Empowerment and Child Protection
What are the action plans for the national and regional government to give provision for GESI groups in the deployment of electric mobility and electric buses in Jakarta?	Ministry of Women Empowerment and Child Protection Ministry of Transport Transport Agency of Jakarta
What is the future plan in the roll-out strategy of the electric bus in Jakarta to be inclusive, especially in Transjakarta?	Transport Agency of Jakarta PT. Transportasi Jakarta
What kind of features or facilities can be provided in electric buses to bring more inclusivity in the future electric bus operation in Jakarta?	Transport Agency of Jakarta PT. Transportasi Jakarta
Are the recent policies and/or regulations on public transport enough to cover the needs of GESI and in practice, what are the existing challenges faced by the users?	GAUN UN Women
What are the points that should be noticed to be avoided (could be in policies and practices) in the implementation of electric buses?	GAUN UN Women

ANNEX 6 PROJECT COMPONENT INTERLINKAGES

Figure 12: WP2: Project Component Inter-linkages



ANNEX 7 CAPACITY DEVELOPMENT PLAN

Table 7: Capacity Development Plan with grey shaded activities that were evaluated via the Capacity Development Survey

Learning Area	Capacity Development Intervention	Learning outcome / Capacity to…	Target Group/s	Learning event type	Period of time	Activity led by	Timing for activity	Comment
Project management capacity / collaboration capacity	Stakeholder Map- Identification of relevant stakeholders for the 100 E-Bus trial	✓ identify important actors, potential allies, veto players ✓ map all stakeholders ✓ define the roles of stakeholders	CFF partner institutions & key stakeholder	Inception Meeting	4 hours	CFF	18.02.2020	Conducted
Technical capacity	Knowledge sharing and lesson learnt from implemented E-Bus project in other countries	✓ understand the advantages / disadvantages of each technology ✓ transfer knowledge on the approach taken by countries implementing E-Buses and the result / status quo ✓ conduct E-Bus trials through lessons learned on tech. topics	TJ	Meeting /on-the-job learning	weekly	CFF SPA / GFA HEAT	ongoing	Ongoing since March 2020
Technical capacity	E bus adoption and integration, Lessons from Europe and The Middle East	✓ learn from other countries on E-Bus implementation and adapt their knowledge in the local context	TJ, Transportation Agency	Webinar	2 hours	GIZ, P Manifold Solutions	April 16 2020	Conducted: TJ and the Transportation Agency participated
Internal collaboration capacity /	Establishment of PIU, project management	✓ learn about project preparation process and E-Bus project implementation approach	PIU	Meeting	monthly	CFF SPA / GFA HEAT	ongoing	Ongoing since May 2020; PIU consists of

Project management capacity	and decision making for E-Bus implementation	✓ create an effective management structure for e-mobility projects beyond the 100 E-Bus Trial ✓ improve existing project management processes ✓ improve exchange between different stakeholders to strengthen collaboration ✓ lead communication with other high-level actors for strategic decision making						DKI, Transportation Agency and TJ
External collaboration capacity	Set up of steering committee, decision making for E-Bus implementation	✓ coordinate and leverage synergies between e-mobility projects (CFF and UNEP / CTCN) ✓ include different levels of government needed for transition and herewith strengthen collaboration on technical and political level ✓ ensure sustainability of e-mobility projects in Jakarta (particularly for E-Bus)	DKI, TJ	Meeting	Monthly	CFF SPA	ongoing	Conducted; steering committee consists of DKI, Transportation Agency and TJ
Project Management capacities	Introduction to SOURCE, an online platform for project management	✓ gain knowledge on monitoring systems for project preparation	PIU	Webinar	0.5 days	CFF	May 27 2020	Conducted
Technical capacity	E-Bus adoption and integration, Lessons from South Asia and Latin America	✓ learn from other countries on E-Bus implementation and adapt their knowledge in the local context	TJ	Webinar	2 hours	GIZ, P Manifold Solutions	May 28 2020	Conducted; TJ participated with 5 attendees

Technical capacity	How to Implement COVID-safe Urban Transport Solution by The Smart Cities Mission	✓ learn about COVID-19 measures in the transport sector and to apply them	TJ	Webinar	2 hours	GIZ SMART SUT, WB, ITDP	June 10 2020	Conducted; TJ participated with 6 attendees
Technical capacity	Assessment of E-Bus technology and route selection criteria	✓ understand bus & battery technology; ✓ learn about charging infrastructure; ✓ select routes (BRT) (based on ridership, fleet size, replacement ratio, TCO); ✓ assess grid supply and impact	TJ	Meeting (Pres.+ Q&A)	2.5 hours	GFA HEAT	June 23 2020	Conducted
Technical capacity	Preparation and approach for E-Bus trials	✓ define charging strategies ✓ select route and charger type ✓ collect the required data ✓ understand route profiling ✓ evaluate performance	TJ	Meeting (Pres.+ Q&A)	2 hours	GFA HEAT	July 09 2020	Conducted
Technical capacity / Financial capacity	Preparation for the Business Case: Review of bus operators	✓ understand the importance of the involvement of operators ✓ make investment decisions based on operator experience and feedback (among other aspects)	TJ	Meeting (Pres.+ Q&A)	2 hours	GFA HEAT	July 16 2020	Conducted
Technical capacity / Financial capacity	Definition of selection criteria for buses, routes and charging method	✓ select route (non-BRT) (ridership, fleet size, replacement ratio, TCO); ✓ define criteria for charging method ✓ understand the market	TJ	Meeting (Pres.+ Q&A)	2 hours	GFA HEAT	July 23 2020	Conducted

External collaboration capacity / Project Management capacities	Land Transport Authority of Singapore to share information on existing plans for electric bus adoption	✓ learn from other countries on E-Bus implementation and adapt their knowledge in the local context	TJ	Bi-lateral information exchange / Webinar	1.5 hours	CFF	July 28 2020	Conducted
Technical capacity	Definition of selection criteria for buses, routes and charging method	✓ further adjust technical models based on more data and feedback received	TJ	Meeting (Pres.+ Q&A)	2 hours	GFA HEAT	July 29 2020	Conducted
Financial capacity	Identification and evaluation of different institutional and financial options	✓ analyse and understand domestic and foreign financial options by applying the SWOT analysis ✓ understand financial institutions and financial capacities of TJ, DKI ✓ choose applicable finance options ✓ improve decision-making	TJ, DKI	Meeting (Pres.+ Q&A)	4 hours	GFA HEAT	July 02 2020 & July 30 2020	Conducted; Feedback from TJ / DKI: preference is the Buy The Service model with bus operators; decision by TJ (BoD): Buy The Service model
External collaboration capacity	National webinar organized by Indonesian Transportation Society	✓ share information about the E-Bus Implementation Plan and therewith build a support network for strategic alignment	Indonesian transport sector	Webinar	1.5 hours	Indonesian Transportation Society /TJ	August 11/12 2020	Conducted; TJ presented
Technical capacity /	Preparation for the Business Case: Review of	✓ understand how technical and financial aspects feed into the Business Case	TJ	Meeting (Pres.+ Q&A)	2 hours	GFA HEAT	August 03 2020	Conducted

Financial capacity	technical and financial aspects							
Project Management capacities	Risk Assessment and Mitigation for implementing the 100 E-Bus Trial	✓ identify, analyse and understand risks ✓ define and implement mitigation measures	TJ	Meeting (Pres.+ Q&A)	2 hours	GFA HEAT	August 20 2020	Conducted
Project Management capacities	Knowledge exchange with EMT Madrid and The King County Metro, Seattle	✓ understand roadmaps for E-Bus deployment and charging options learn from other countries on E-Bus implementation challenges and adapt their knowledge in the local context	TJ / Int. Office Bureau / TGUPP	Webinar	2 hours	CFF	August 27 2020	Conducted
External collaboration capacity	Introduction of zero emission vehicles	✓ discuss policies and incentives around e-mobility and how to engage public transport operators ✓ discuss the charging strategy ✓ learn about PLNs roadmap to electricity grid development	TJ, PLN, MEMR, BPPT	Workshop	3 days	ITDP, ADB	August 26-28 2020	Conducted
Technical capacity	Implementation of the first 100 E-Bus Trial project	✓ learn about technical and financial findings ✓ understand the decision-making process for route selection and the chosen financial option	TJ (BoD)	Meeting (Pres.+ Q&A)	2 hours	CFF SPA / GFA HEAT	Septembe r 03 2020	Conducted
Project Management capacities	Implementation of the first 100 E-Bus Trial project	➲ understand the procurement strategy (BTS) and tender support process; ➲ understand the operational interlinkages between bus schedule, charging and	TJ, DKI, PLN, Transport. Agency	Meeting (Pres.+ Q&A)	0.5 day	GFA HEAT	November / December 2020	Instead, consultation and presentations were conducted over the period November 2020 to beginning of

		maintenance and set-up operation plans accordingly						February 2021 with the TJ Team
Technical capacity	Introduction of zero emission vehicles	➲ calculate GHG emissions ➲ assess air quality (tbc)	TJ, DKI	Workshop	0.5 day	C40	February 2021	Learning event type is subject to COVID-19 situation
Technical capacity	Implementation of the 100 E-Bus Trial project	➲ assess the environmental impact ➲ analyse the gender and social impact	TJ, DKI	Workshop	0.5 day	GFA HEAT	December 2020	Learning event type is subject to COVID-19 situation
Further training beyond the scope of the CFF project and consultancy framework:								
Project Management capacities	Conflict management	➲ address conflicting policies	TJ	tbd	tbd	tbd	tbd	Capacity need identified in interview with TJ
Administrative capacity	Implementation of the next phases (introduction of 100+ buses)	➲ learn about carbon trading and how it could be incorporated in the local policies when implementing e-mobility ➲ report on GHG emission reductions to local governmental agencies	TJ	tbd	tbd	tbd	tbd	Capacity need identified in interview with TJ
Technical capacity	Introduction of zero emission vehicles	➲ conduct maintenance of E-Buses ➲ schedule maintenance activities in alignment with charging schedule	TJ, operators	training	tbd	tbd	tbd	Capacity need identified in interview with TGUPP
Technical capacity	Implementation of the next phases	➲ learn about power generation for transport sector ➲ improve knowledge on urban transportation and how to reduce GHG emissions	Transport. Agency	training	tbd	tbd	tbd	Capacity need identified in interview with the Transport Agency

	(introduction of 100+ buses)							
Project Management capacities	Implementation of the next phases (introduction of 100+ buses)	➲ develop project plans	Transport. Agency	training	tbd	tbd	tbd	Capacity need identified in interview with the Transport Agency

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