Project Concept Note
December 2023

Establishment of the Dhaka Transport Operation & Information Center (DTOIC) & Bus Information & Management System (BIMS)

Bus Route Rationalization Piloting Corridors, Circular and Shuttle Bus Services, & Pilot Project

Project Concept Note (PCN)

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Bus Route Rationalization Piloting Corridors, Circular and Shuttle Bus Services

Project Concept Note (PCN)

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1 Title

Project/Programme Title:	Real-Time Bus Information and Management Systems in Dhaka, Bangladesh
Country(ies):	Bangladesh
National Designated Authority(ies) (NDA):	Department of Environment, Ministry of Environment, Forest and Climate Change
Accredited Entity(ies) (AE):	Dr Abdul Hamid, Director General
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2 Front

A.6. Estimated mitigation impact (tCO2eq over lifespan)

630,000 tonnes CO2eq

A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)

2.1 ~5,000,000 – 7,000,000 in Dhaka

25% - 30% of the population of the Dhaka Metropolitan Area

2.2

A.19. Project/Programme rationale, objectives, and approach of program/project (max 100 words)

2.3

2.4 The bus system in Dhaka is currently inconvenient, unsafe, and unreliable frustrating current users. At the same time, the rising economy of Bangladesh will lead to more and more private vehicle ownership; most of these new vehicles will be powered by fossil fuels and will contribute to the worsening traffic situation in Dhaka. Reforms are needed for the Dhaka bus system, and one major component of reforming the bus system will be technological enhancements including a bus information and management system (BIMS) which can significantly increase the efficiency and convenience of the bus system overall, and thus increase ridership/maintain on this sustainable transportation mode.

3 Project/Programme Information

B.1 Context and Baseline (3 Pages)

Introduction

Dhaka, the capital and largest city of Bangladesh has experienced rapid population growth in recent decades. The city has a population of more than 21 million people, making it one of the most populous cities in the world. It is also one of the densest, with most estimates of the
3.1 urban area of Dhaka having more than 40,000 persons per square kilometer, which is amongst the highest of any major city in the world. Within this small area, there are somewhere between 4,000 and 10,000 buses (including minibusses) that operate on Dhaka's streets every day, in addition to millions of motorcycles, hundreds of thousands of cars and trucks, tens of thousands of auto-rickshaws (CNGs), and perhaps half a million rickshaws. The government realizes its need to incentivize the use of public transport systems and control the permitted use of automobiles to materialize its mitigation goals and cater to the mobility needs of citizens. In particular, the service quality for public buses should be significantly improved by adopting information and digital technology in its operation and management. Encouraging the use of the public transport system, over the use of private transport, will require making the system more accessible, easier to use, and more convenient for users.

The Transport Situation in Dhaka

3.2 Dhaka is home to numerous public transport modes including a relatively new metro system, cycle rickshaws, taxis, autorickshaws, buses, boats, and a small suburban rail network. From the mobility analysis of the 2015 Rajuk Area Structure Plan for Dhaka, it was concluded that on an average working day **about 21 million trips** take place in the planning area (greater Dhaka), and of those trips, about 0.5 million are external to the Dhaka area to other areas in Bangladesh. Dhaka itself has a high mobility rate due to the high population density, from the modal share data, the highest modal share percentage is for **rickshaws (38%)** and the second
3.3 highest percentage is for the **bus (30%),** followed by walking, auto-rickshaw, cars/motorcycles, and finally rail. These mode shares will undoubtedly change significantly as the metro system is built out, and socioeconomic changes occur in Bangladeshi society.

For now, Dhaka has been characterized as a rickshaw city due to a major prevalence of this non-motorized mode in this city. Indeed, Dhaka is often called the "city of rickshaws", and estimates put the number of rickshaws in the city within the hundreds of thousands, perhaps 500,000. Motorization of the population and the number of cars on the streets is relatively low for a megacity of its size, accounting for less than half a million registered vehicles, with around 800,000 motorcycles.

Vehicle registrations are on the rise, with annual vehicle registrations of motorcycles especially increasing at a rapid rate, with a 126% increase[1] in annual vehicle registrations of motorcycles from 2011 to 2020.

Public Transport

1.1 The Dhaka Metro is a highly anticipated addition to the city's public transportation system.
3.4 The first line, Line 6, was completed in December 2021 with a further extension in November 2023. With a total length of approximately 22 kilometers, this new metro line connects the northern and southern parts of the city, providing residents with a fast and convenient mode of transportation. A full metro network, designed by the Japan International Cooperation Agency (JICA), will eventually be constructed covering the entire city and serving millions of commuters and residents every day. However, it will be the better part of a decade before the system is fully running. As of 2024, buses remain the main form of public transport other than rickshaws in Dhaka. Around 4,000 – 7,000 vehicles fill the streets of Dhaka every day moving millions of passengers. Over each day, bus departures follow the demand patterns in Dhaka, which follow a familiar pattern of higher demand in morning and afternoon peak periods as seen in many other urban areas.

3.5 The Dhaka Transportation Coordination Authority (DTCA) is undertaking a bus reform process to take over the planning of the routes and modernizing the system. A committee was formed to spearhead the project, which was started in 2018. This committee is made up of a variety of stakeholders including members from the City Corporations, BRTA, BRTC, Police, and crucially the Bangladesh Road Transport Owners Association, and Workers Federation. So far, several new policy measures have been implemented, but there remains much more work to be done.

3.6 The use of technology and other enhancements has been identified as a key aspect of bus reform. Based on the experiences of the BRTC with a real-time tracking system, they have noted many benefits including safer driving and more efficient operation. However, a Dhaka-wide system that is universally used by all operators is needed.

3.7 **Telecommunications**

There are more than 180 million mobile subscriptions in Bangladesh, which is a rate per capita of over 1 subscriber per person, indicating that many users have more than one subscription. A very high proportion of households in the country do have access to mobile phones of some kind, at around 97% of households. In urban areas, especially Dhaka, usage of ICT is higher than in rural areas. In Dhaka, 58% of the population had access to the internet, with nearly
3.8 70% of households having access to SmartPhone and 99% having access to a mobile phone of some kind. Women are far less likely to have access to a SmartPhone or the internet than women[2].

Mobile network coverage in Dhaka is generally very good, with all four major mobile operators (Banglalink, Robi-Airtel, Grameenphone, and Teletalk) offering services in the city. 100% of the Dhaka urban area is covered with 2G, 3G, and 4G/LTE networks for all four mobile operators. Mobile phone data is very cheap, with an average price of less than $0.32 per gigabyte.

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[1] Bangladesh Road Transport Authority (BRTA), 2021 Bangladesh

[2] Bangladesh Bureau of Statistics (BBS), 2022 Census (ICT)

GHG Emissions & Baseline

Bangladesh is a country that is vulnerable to the impacts of climate change, with frequent flooding, cyclones, and other natural disasters causing significant damage to the country's infrastructure and economy. As a result, the government of Bangladesh has set several environmental goals to address these challenges and promote sustainable development.

Nationally Determined Contributions (NDCs)

3.9 NDCs, or Nationally Determined Contributions, are commitments made by countries under the United Nations Framework Convention on Climate Change (UNFCCC) to reduce their Greenhouse Gas (GHG) emissions and address the impacts of climate change. These commitments are part of the Paris Agreement, which is an international treaty signed by

3.10 countries around the world to combat climate change.

Bangladesh is a signatory to the Paris Agreement, and it has submitted its NDCs to the UNFCCC. In terms of mitigation, Bangladesh has developed two scenarios for NDCs (unconditional and conditional). Transport is forecasted to account for a 32.89 Mt $CO2_e$ reduction (12.30% unconditional) and 26.56 Mt $CO2_e$ reduction (10.23% conditional). According to the NDCs, policies that will reduce the GHGs from a change in fuel, and the introduction of the metro system. However overall and to date, few transport projects or policies have been identified that will contribute. New policies and projects that will increase the attractiveness of public transport and avoid more traffic congestion are needed.

Dynamics of the Bus Sector in Dhaka

3.11 Bangladesh currently lacks the funds and technical ability to implement such a solution. Since the bus system in Dhaka is mostly run by private operators. Many operators operate small fleets of just a few buses and routes, but there are some large ones too, with 30 operators (or 23%) providing a total of 50% of all daily service hours.

3.12 The private operators will not be able to invest in such systems on their own, and there is no guarantee of profitability for them if they do. Therefore, government intervention, and consequently funding is needed to implement and manage the system. Technologies

3.13 themselves have been developed and widely used around the world. Systems developed in Korea, for example, or well established and simple to export.

Furthermore, private operators almost certainly lack the technical knowledge to implement a system, which requires the establishment of set bus stops and routes that are rigorously used with no deviations. As the being undertaken by DTCA continues, the bus operation system will

3.14 become increasingly more planned and governed by central authorities. which will allow the system to be more useful. This centralization will allow for a coordinated implementation of the BIMS and avoid a situation where 10 different incompatible systems have been implemented by 10 different groups, all with different applications and standards, etc.

With funding in place, the BIMS can be implemented methodically and universally with all operators under the control of a central system.

B.2 Project/Programme Description (3 pages)

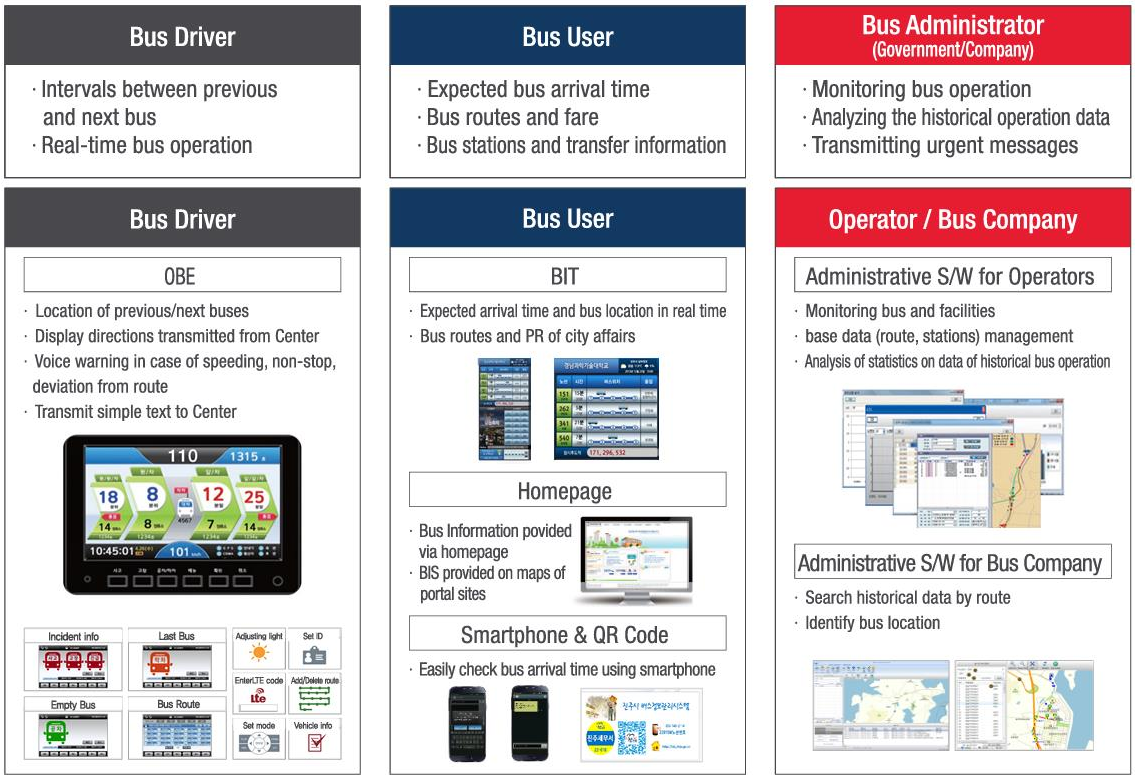
Overview

BIMS is made up of two distinct but related technology systems, the Bus Management Systems (BMS) and Bus Information Systems (BIS). BMS are systems and technologies that are generally used by the bus operator. They include tracking devices, management systems, and software. BMS can be used by bus operators or government agencies to significantly improve efficiency in operation and manage headways, and drivers, monitor for accidents and

3.15 incidents, and have many other benefits. BIS refers to the systems, technologies, and devices that communicate the location of buses to customers.

BIMS can provide information to many different groups: bus drivers, customers (passengers), bus operation companies, and management authorities, see below.

3.16



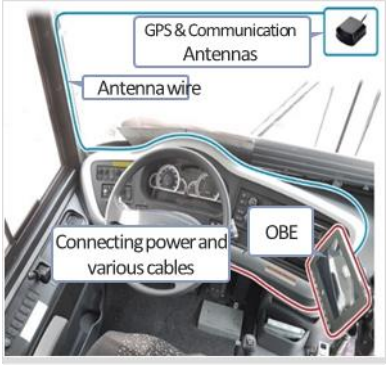
3.17

Image source: ITS Korea

3.18

Equipment needed will include hardware, software, and other systems.

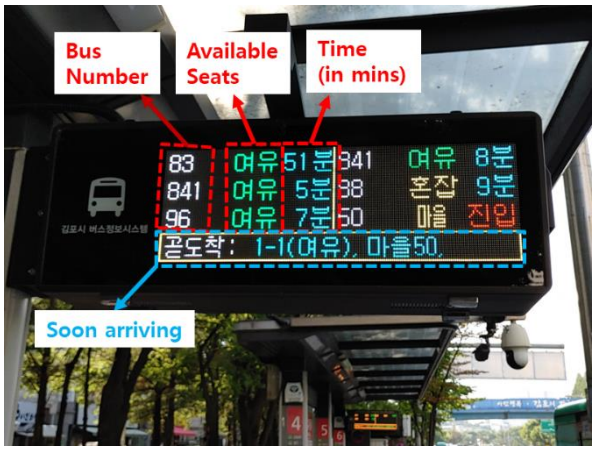
On-Board Equipment



On-board units (OBUs) are the devices that are installed in vehicles to enable real-time tracking and monitoring of their location and other important parameters. OBUs may be small devices with no Human-Machine Interface (HMI), meaning there is no way for the driver to interact with it, to larger units with screens that can provide the operator with additional driving features, as well as the ability to receive messages from a central dispatch (known as Computer-Aided Dispatch, CAD). The bus location tracking method uses a

Global Positions System (GPS) and communication via existing wireless network infrastructure. The OBUs continuously measure longitude, latitude, and altitude generally reporting this information to a central management center every 20-30 seconds.

Bus Stop Equipment



3.19 Bus stop equipment consists of devices used to communicate information about the buses and their schedules to passengers who are waiting for the bus. The most important item is the Bus Information Terminals (BIT), which are electronic information displays that can provide real-time or scheduled information on bus schedules, routes, and arrival times at bus stops. While there are many ways to provide bus information to customers including with physical infrastructure at bus stops, equipment within the buses themselves, via the internet, websites, text message, or by ARS. However, the BIT is the most convenient and accessible way to provide information to public transport users, as it can easily be used by anyone, even if they do not have access to a SmartPhone or the internet.

Hardware / Management Center

3.20 A high-quality management center is crucial for a bus operating management company to efficiently oversee and coordinate its bus operations center. The management center must be outfitted with high-quality hardware and act as the central communication node to connect with the software, communication network, and hardware in the center itself. Several hardware pieces will be required, especially servers and operation/monitoring terminals. A total of eight different servers within the management center would be required, each with specific functions. In addition, some office space and subsequent renovations will be needed to build out the management center.

3.21 *Software*

Software for BIMS is complex and consists of numerous systems and subsystems including software for data collection, server operation, data processing, and analysis in addition to the three most important functions are **dispatch** (for operations) and monitoring and **management** (for management/planning agencies), and **information provision** (for passengers and operators). The former is known as real-time passenger information (RTPI) or simply passenger information and the latter is computer-aided dispatch (CAD).

3.22

Rationale

Today, according to many sources, most users are unsatisfied with the bus system and essentially only use it because it is their only option. In the future, this situation will change dramatically as the economy is forecasted to increase, and so too with the ability of the average Dhaka resident to invest in their private transport, a phenomenon that has happened in countless other developing nations. The current levels of motorization in Dhaka are very low but have the potential to be enormous if unchecked. Private transport will mostly be fossil-fuel-powered and will increase the GHG being emitted by Bangladesh overall. Further, the

traffic in Dhaka is currently considered to be amongst the worst in the world and will only get worse as more cars and motorcycles fill the streets.

3.23 By increasing the actual and perceived convenience of the public bus transport system, the overall system becomes more useful, and people who would have otherwise switched to private transport will continue to use public transport, and potentially people who have access to private transport may choose not to use it if the bus system is convenient enough. This could result in a reduction in Greenhouse Gases (GHGs). Specifically, GHG reductions may come from (1) a modal shift, that is, people who previously used fossil fuel-powered private vehicles will instead switch to public transport, thus reducing the overall vehicle-kilometers traveled (VKT) in the region and consequently the amount of fuel burned (which produces GHGs); and (2) a reduction in operating distances of buses due to an increase in operating efficiency (and therefore also reducing fuel burn).

3.24 Total reductions could amount to 63,000 tonnes annually or 0.63 Megatonnes of CO2e over 10 years. This could account for approximately 1.9% of the required total 32.89 Megatonnes of CO2e (conditional) reduction in emissions from transport identified as NDC.

Undertaking the Project

3.25 With outside help from Korea, the **Dhaka Transportation Coordination Authority** (DTCA) is well placed to manage the installation and management of the system. The bus operators themselves cannot install and monitor these systems themselves. DTCA has been leading the efforts to reform the bus systems in Dhaka, including better planning of new routes, and new operating structures. DTCA is the most experienced entity in Dhaka to govern and operate a centralized system like a BIMS. DTCA will require aid and expertise from private companies based in Korea who are in the business of using and installing these systems.

Risks

3.26 Operationally, there are some risks to investing in a system like a BIMS.

1. BIMS required strong oversight and governance by a central authority, which currently does not exist in Dhaka.
2. BIMS is only useful if the bus systems are overhauled and reformed, specifically the routes must be numbered, routes must be followed exactly, and critically buses must only stop at designated bus stops, none of which is the case today in Dhaka.
3. DTCA or other organizations do not have experience with BIMS and therefore must learn to operate the system.

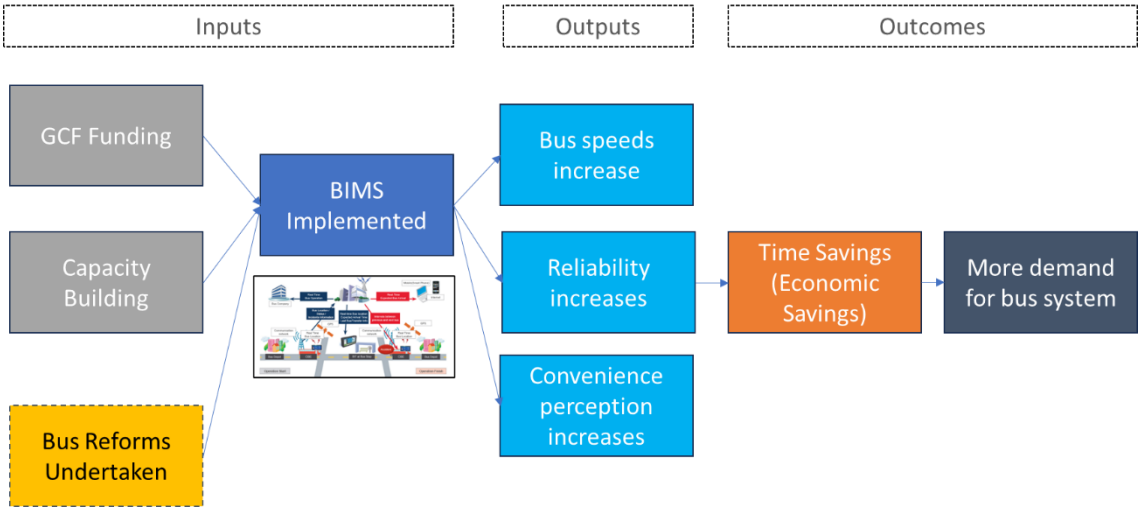
All these risks are mitigable with good planning, oversight, and capacity building which requires funding to undertake.

B.3 Expected project results aligned with the GCF investment criteria (3 pages)

Benefits from a BIMS

Due to the enormous daily ridership on the Dhaka bus system, if fully implemented, the system could save an equally enormous amount of time and therefore have a large benefit, with knock-on economic effects as individuals have more time to put towards other economic activity. The following table shows the potential perceived/actual savings in hours, Taka, and USD. The implementation of a BMS could potentially have a hypothetical socioeconomic value

3.27 of around USD 210m annually, for bus customers alone. Additionally, BIMS can significantly increase operational efficiency, thus allowing for cost savings for operators as well. In many cities around the world (large and small), BIMS is simply an essential part of the public transport system. **The socioeconomic benefits of BIMS in the Dhaka case are likely to far outweigh the costs associated with implementation.**



3.28 The theory of change with a BIMS is straightforward: by increasing the actual and perceived convenience of the public bus transport system, the overall system becomes more useful, and people who would have otherwise switched to private transport, will continue to use public transport and potentially people who have access to private transport, may choose not to use it if the bus system is convenient enough. This could result in a reduction in Greenhouse Gases (GHGs). Specifically, GHG reductions may come from (1) a modal shift, that is, people who previously used fossil fuel-powered private vehicles will instead switch to public transport, thus reducing the overall vehicle-kilometers traveled (VKT) in the region and consequently the amount of fuel burned (which produces GHGs); and (2) a reduction in operating distances of buses due to an increase in operating efficiency (and therefore also reducing fuel burn).

3.29

Item	Hours	Value ($ USD 2023)
Time savings, daily	256,536	$0.7m
Time savings, annual	76.7 million	$210m
Time savings, 10-year	769 million	$2100b

The main benefit for bus users is an increase in information and convenience which causes them to experience better, more enjoyable, and more reliable journeys. Individuals who have used passengers' information actually or perceive that they save an average of 2.5 minutes per journey on average (the average bus journey length is 43 minutes in Dhaka according to

reported values). Therefore, the time savings is significant (5-6% on average). This may result in a reduction in GHGs. Specifically, GHG reductions may come from (1) a modal shift, that is, people who previously used fossil fuel-powered private vehicles will instead switch to public transport, thus reducing the overall vehicle-kilometers traveled (VKT) in the region and consequently the amount of fuel burned, which in turn produces GHGs. And (2) a reduction in operating miles due to an increase in operating efficiency (and therefore fuel burn).

The total GHG reductions are summarized in the table below. Total GHG reductions could amount to just over 200 tonnes of CO2e per **day** of operation.

3.30

Reductions from passenger activity	180	54,000	0.54
Reductions from operator activity	30	9,000	0.09
Total	**210**	**63,000**	**0.63**

B.3 Indicative Financing/Cost Information (3 pages)

Component/Output	Indicative cost (USD)	GCF financing		Co-Financing		
		Amount (USD)	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions
Management Center	4.3m					
On-board equipment	27.4m					
Bus stop equipment	2.8m					
Total	34.6m					
Indicative total cost (USD)						

C.2 Justification of GCF funding request (max. 1 page)

The imperative for seeking Green Climate Fund (GCF) financing f**or the BIMS in Dhaka**, stems from the distinctive challenges associated with climate change adaptation in the public transportation sector. The complexities faced by both the public and private sectors underscore the need for external support to initiate and successfully implement the proposed Project/Programme.

3.31 **Public Sector Constraints**

The public sector in Bangladesh confronts financial constraints due to competing national priorities, limited fiscal capacity, and the ongoing need to allocate resources across various sectors. While recognizing the urgency of climate-resilient transportation systems, the government's financial resources are insufficient to fully fund the comprehensive tracking and
3.32 monitoring activities outlined in the Concept Note.

Private Sector Challenges

Private sector entities, particularly those in the transportation industry, encounter challenges in investing significantly in climate-related initiatives. These challenges include perceived risks
3.33 associated with the implementation of new technologies, uncertainties in returns on investment, and longer payback periods. The private sector may be hesitant to commit substantial resources without external support.

Alternative Funding Options and Barriers

3.34 Other funding instruments are being considered: funding could be obtained from the Korean government through their various overseas cooperation funds and loan programs or self-funding through various state-owned companies.

Concessional Justification

3.35

The level of concessionality requested from the GCF is justified by the need to overcome market barriers, stimulate private sector involvement, and ensure the successful implementation of the proposed activities. Concessionality is crucial for encouraging transformative change in the transportation sector and fostering long-term sustainability.

3.36

Passing on Concessionality

Concessionality provided by the GCF will be passed on to end-users and beneficiaries through mechanisms **such as increased operational efficiency and central management of data from operators**, lower **operator** costs for transport operators, and **free** access to real-time data **for all bus users**. This ensures that the benefits of the project are accessible and inclusive, particularly for the end-users of the public transportation system.

Ccontrol Information

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