Multidimensional Multi-Phase Impact Evaluation of Urban Transport Infrastructure

Senegal Country Brief | July 2025

Country overview

Themes: Urban Mobility, Climate, Jobs

Coverage: Dakar

Partners: Executive Council for Sustainable Transport (CETUD), Road Management Agency (Ageroute), University Center for Mobility Research and Study (CUREM), Air Quality Management Center at the Ministry of Environment (CGQA)

Timeline: 2017 – Ongoing

Introduction

Low and middle-income countries face growing urban mobility challenges due to rapid population growth and urbanization. Despite substantial infrastructure investments, broader research on the impact of these investments is limited. To bridge this gap, the Executive Council for Sustainable Transport (CETUD) and the World Bank's Development Impact group initiated a **multidimensional impact evaluation of Dakar's Bus Rapid Transit (BRT) and Regional Express Train (TER) projects**. The program seeks to capture a wide range of outcomes by establishing dedicated data systems early in the project cycle. The initiative can provide valuable insights to inform urban transport projects in Sub-Saharan Africa and similar contexts globally.

Key milestones

Inception Phase [2017 - 2018]

- Impact evaluation **incubation workshop** and **proof of concept** using telecom data

Set-up [2019 - 2020]

- First **Randomized Controlled Trial (RCT) on low-cost training** for TER construction workers
- Pilot low-cost air pollution sensors and data scraping
- Baseline surveys:
  (I) Dakar households
  (II) BRT low-skill construction job applicants

Construction Phase | Data Acquisition [2021 - 2023]

- **Air pollution** monitoring scale-up
- City-wide **congestion data** dashboard
- **BRT construction workers** RCT (hirings) and high frequency follow-ups

Construction Phase | Analysis [2024]

- Capacity-building workshop on air pollution
- First knowledge products, including **air pollution** blogs and policy brief, **TER construction workers** paper, and **BRT workers** baseline report
- First **tax dataset** and **satellite data pilot** for housing

Capacity Building and Operation Phase Data Acquisition [2025]

- Mid-project **dissemination** workshop
- **Trainings** with stakeholders
- New knowledge products, including **technical and academic articles and datasets**

Bus Rapid Transit (BRT) Project and Regional Express Train (TER) in Dakar: A Unique Learning Opportunity

The BRT and TER projects in Dakar represent a valuable opportunity for learning about the impacts of large-scale urban transport infrastructure investments. **The Dakar BRT is the first BRT in West Africa and the first 100% electric BRT in Africa**. Similarly, the scale of the **TER project offers a unique context for studying the effects of modern rail infrastructure**.

CETUD, supported by the World Bank Transport Global Practice and the Development Impact group, has adopted an innovative approach by integrating economic impact assessment methods. This collaboration focuses on designing a multidimensional impact evaluation and establishing the necessary custom data systems before the full operationalization of the infrastructure, allowing for the rigorous measurement of impacts during the construction and operational phases.

The evaluation aims to measure:

Direct effects on the population's access to goods, services, and employment, as well as the broader socio-economic outcomes for households.

Indirect effects on city-level indicators like traffic, air pollution, and housing prices.

Transitory effects during the construction phase, including job creation and pollution.

The comprehensive measurement system combines **various data sources, including administrative data, web-scraped data, regulatory and low-cost air pollution monitoring data, satellite imagery, remote sensing, and survey data**. This detailed data collection and analysis will provide valuable insights for policymakers and project implementers (See the intermediary results report here).

Overview of Studies: Understanding the BRT and TER Impacts

Direct effects

HOUSEHOLDS: A baseline survey in Dakar used a satellite-based survey technique with randomly sampled grid cells **to measure characteristics related to economic status, demographics, asset ownership, mobility and accessibility of almost 4,000 households.** This facilitates comparing areas within and further away from the BRT zone, enabling the use of the difference-in-differences method to isolate the BRT's impact. An endline survey will follow up with the same households.

Households reported distance as the first barrier to accessing health centers, markets, city halls, banks, and transport hubs.

Indirect effects

CONGESTION: The team uses real-time traffic data automatically extracted from the web using an application programming interface (API) on over 80 road segments since 2018. This data, collected every half hour, allows for **studying the evolution of congestion in the city, before, during, and after the projects**.

AIR POLLUTION: To measure the BRT's impact on air quality, **the team combined satellite data with a network of low-cost monitors and the existing regulatory air quality measurement stations**. Insights from our data system reveal how transport interventions affect air pollution:

25% decrease in air pollution due to the COVID-19 mobility-restricting policies

A new bridge improved traffic flow and reduced congestion, leading to a 10% reduction in local air pollution.

HOUSING PRICES: A data system combining administrative data on rental and real estate values with web-scraped data from online platforms has been designed to monitor and quantify the BRT's effects on housing prices.

Baseline and endline household survey data will also be used to analyze resident relocation and housing price changes.

Figure 1. Map of the Dakar region and communes showing the road segments where data on travel time is being collected automatically and the BRT and TER lines.

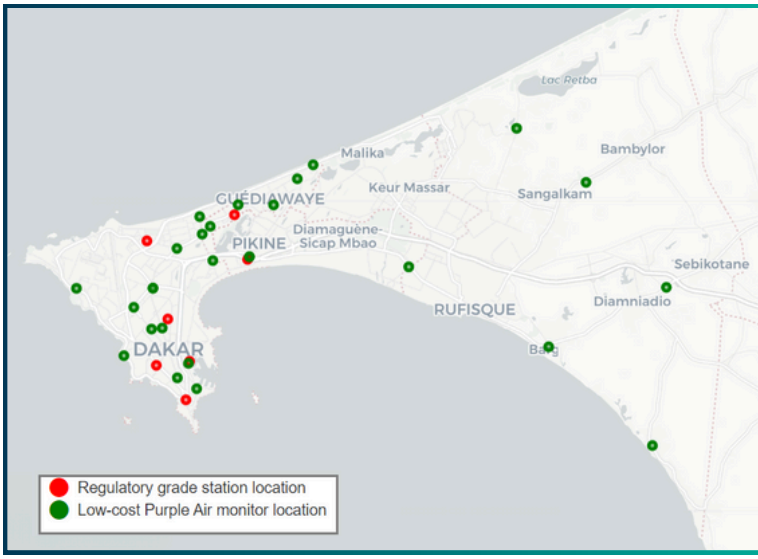

Figure 2. Map of the Dakar region showing the location of regulatory air pollution measurement stations (CGQA) and low-cost monitors (Development Impact group) (See the air pollution paper here and the brief here).

Transitory effects

CONSCIENTIOUSNESS TRAINING: Leveraging the TER construction, a study tested the impact of a **low-cost training intervention focused on soft skills (conscientiousness) on workers' future jobs and earnings** (See the conscientiousness training paper here). Results indicate:

Soft skills training increased workers' job retention by 10% and earnings by 22.7% compared to the control group.

CONSTRUCTION JOBS: As part of an RCT study focused on low-skill jobs generated by the BRT construction, the team surveyed over 1000 candidates before potential recruitment and throughout construction. The study aimed to answer **whether construction jobs created by large transport infrastructure investments can improve the welfare of those employed** (See the construction jobs brief here). Baseline survey findings reveal:

Low-skill job applicants often experience employment insecurity and skills mismatches.

Future Directions

- The team will finalize the analysis of the **BRT's construction phase** and continue **monitoring its early operational impact**.
- Learnings from the BRT impact assessment will be disseminated to various audiences, **focusing on capacity building for local government agencies and ministries**.
- This impact assessment model for transport infrastructure offers a **valuable example for policymakers and project managers** to conduct more comprehensive and rigorous evaluations.
- **Conducting such evaluations generates context-specific lessons**, allowing for project adaptation, enhancing effectiveness, and more impactful future investments, thereby **maximizing returns on public resources**.
- Detailed data from **the impact evaluation can inform future transport decisions**, such as the restructuring of the bus network and future phases of the BRT in Dakar, and mobility policies in secondary cities.

The ieConnect for Impact program is a collaboration between the World Bank's Development Impact group and the Transport Global Practice. This program is part of the Development Impact Fund (DIF) multi-donor trust fund and is funded with UK International Development from the UK government and the European Union (EU). For more information about the ieConnect for Impact Program, visit the ieConnect Webpage or contact ieconnect@worldbank.org.