

CitiME Develops Travel Demand Model to Improve Public Transport in Greater Cairo Region

Bentley OpenPaths™ CUBE™ Provides Predictive Multimodal Transportation Modeling and Simulation, Supporting Sustainable Urban Mobility

IDENTIFYING PUBLIC TRANSPORT INVESTMENT NEEDS

Egypt's Greater Cairo region (GCR) is a megacity with potential for enormous social and economic growth. However, these opportunities were limited by the area's current transport network infrastructure, causing congestion, pollution, and unequal access to amenities. To address public transportation inefficiencies and support sustainable urban development, World Bank appointed a consortium in 2020, including CitiME, to implement a study to understand GCR mobility needs. Known as the GCR Mobility Assessment and Public Transport Improvement Study (MAPTIS), the program would assess mobility needs of Greater Cairo Region, identify infrastructure projects and policy measures to strengthen transport sector performance and support Egypt's SDG Vision 2030, and advise on solutions to streamline transport data collection, management and use.

With an aim to build a robust digital foundation for analytics on mobility, MAPTIS integrated network data and mapped routes with travel demand, patterns, and behaviors to support strategic investment for sustainable transport that can deliver a step-change improvement. To understand gender-based travel needs and differences in accessibility, as well as assess the performance of the network to serve future demands of men, women, and marginalized groups, the program embraced smart data techniques and advanced technology for surveying, data management, and predictive modeling. "CitiME's role was to develop the travel demand model called MAPTIS Transport Model (MTM), which [can be] used to identify, develop, and assess opportunities to improve public transport provision in GCR," said Alberto Brignone, director at CitiME.

ADDRESSING DATA INTEGRATION AND MULTIMODAL SERVICES

The project involved modeling and managing multiple complex scenarios, and integrating multisourced, multimodal transport data of varying quality and age into a unified platform. "The project needed to take into account all available modes, considering that MAPTIS has private vehicles, taxis, and a range of public transport services, such as bus, minibus, metro, trains, and, in the future, bus rapid transit," said Brignone. For all these various public transport modes, CitiME had to assess current and future travel demands and provisions, considering population and economic growth, gender accessibility gaps, and network infrastructure to identify the best investment opportunities for transport improvement projects.

They had to test different transport scenarios that support social and economic sustainability and improve transport options for women and the indigent, while also strengthening transport management and operations, reducing carbon emissions and environmental impact, and ensuring realistic infrastructure improvement and delivery solutions. To achieve these objectives, CitiME needed flexible digital modeling technology that could integrate the voluminous, complex, and multisourced data within a single, accurate visual model.

LEVERAGING BENTLEY OPENPATHS CUBE FOR TRANSPORTATION MODELING AND ANALYSIS

Already familiar with Bentley's applications, CitiME selected Bentley OpenPaths CUBE to develop the MTM, visualizing and testing different transport scenarios to compare potential benefits and uncover any unexpected consequences prior to making final

PROJECT SUMMARY ORGANIZATION

CitiME Consultancy LLC

SOLUTION

Rail and Transit

LOCATION

Cairo Region, Egypt

PROJECT OBJECTIVES

- ◆ To conduct a mobility assessment for the Greater Cairo region.
- ◆ To develop a travel demand model to assess opportunities to improve public transport and anticipate future travel demands.

PROJECT PLAYBOOK

Bentley OpenPaths CUBE

FAST FACTS

- ◆ MAPTIS was implemented to assess mobility needs in the Greater Cairo Region and was delivered in June 2022.
- ◆ As part of the program, CitiME used Bentley OpenPaths to develop a predictive travel demand model.
- ◆ The model provided strategic investment support for investment in sustainable public transport projects.



“Bentley OpenPaths CUBE can be used to visualize and test different transport scenarios, to compare potential benefits and become aware of unexpected consequences.”

– Alberto Brignone, Director, CitiME

decisions regarding infrastructure investments. Bentley's interoperable predictive transportation modeling and simulation software supported forecasting, GIS mapping, and multimodal movement of people and vehicles with the ability to customize the model as necessary to offer the most accurate, in-depth analysis to determine the best plan for more sustainable public transport in the GCR. “Bentley OpenPaths CUBE is very customizable, allowing us to more readily model a city with high public transport mode share such as Cairo,” said Brignone.

Using Bentley OpenPaths, CitiME developed a proportionate and strategic transport model by incorporating and balancing a range of datasets, including data for mobility assessment and census data, as well as non-traditional data, such as road network vehicular traffic volume from GPS sources. The MTM includes a number of sub-models or applications with inputs, outputs, and loops. The flexibility and robust modeling capabilities of Bentley OpenPaths enabled CitiME to create traditional transportation models along with sophisticated and bespoke applications. The software used a macroscopic approach for strategic and multimodal modeling that accurately demonstrated in a visual platform the interaction between demand and offer to identify GCR mobility trends and principles to consider when making investments in transport initiatives.



A birds eye view of Cairo City, Egypt.

PREDICTIVE MODELING ADVANCES URBAN MOBILITY AND SUSTAINABILITY

Using Bentley OpenPaths provided a flexible user-friendly platform, integrating data and engaging stakeholders in visualizing and understanding changes in travel demand, mobility barriers for marginalized groups, and the root causes of inefficient service in the public transport sector to identify strategic investment opportunities for advancing urban mobility and sustainability in GCR. “Overall, the model captured sufficiently the impact of public transport improvements with respect to patronage and economic benefits arising from travel time savings, since the flows of passengers and the average length of public transport trips are well replicated,” said Brignone. The model facilitated digital data management and analysis, providing insight into mobility trends to invest in transport projects that will deliver socially inclusive green development that boots economic opportunities.

The team used the predictive model to assess mobility and the causes of mobility challenges, as well as analyze numerous scenarios to propose transport investment measures that support sustainability, accessibility, and deliverability. “The MAPTIS model results helped identify investment opportunities to improve transport in Greater Cairo region,” said Brignone.



Night life in Cairo City.