

METHODOLOGY FOR DEVELOPING AN EFFECTIVE PASSENGER TRANSPORTATION SYSTEM FOR KABUL CITY

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Urban transportation in Kabul, the capital of Afghanistan, faces numerous challenges that stem from rapid population growth and inadequate urban planning. The transportation infrastructure in Kabul struggles with issues such as severe traffic congestion, inefficient use of existing public transit routes, and the need for an integrated and sustainable system. Addressing these concerns requires a strategic re-evaluation of the current passenger route network to optimize efficiency and accessibility while minimizing environmental impact.

The city's public transportation system is overburdened due to increasing demand, insufficient planning, and a lack of comprehensive data-driven route design. The existing network does not adequately serve the needs of a growing population, resulting in inefficiencies like overlapping routes, significant wait times, and increased reliance on private vehicles. The absence of an integrated public transportation system also exacerbates air pollution and creates further economic strain on residents. Kabul's unique urban geography and socio-political dynamics add additional complexity to solving these problems.

The methodology combines qualitative and quantitative approaches, utilizing spatial data analysis, transportation modeling, and optimization techniques. Data was collected from various sources, including current traffic patterns, population density maps, and passenger demand analysis. Key parameters such as travel time, route length, and accessibility were evaluated to design an improved route system that maximizes efficiency.

The proposed system employs a strategic approach to reorganize and rationalize existing routes. This involves minimizing route redundancies, balancing the distribution of transit coverage across the city, and designing feeder lines to integrate with main routes. Advanced transportation models, including Geographic Information System (GIS) mapping and flow simulation, were utilized to predict and visualize the potential outcomes of the restructured system. Key outcomes include reduced total travel time, more predictable service intervals, and greater connectivity to underserved areas.

The rationalization of Kabul's passenger route system presents several benefits. First, it decreases overall congestion by providing more efficient public transportation options, encouraging residents to reduce the use of private vehicles. Second, improved route design shortens travel time for passengers, increases reliability, and enhances the accessibility of key areas such as business districts, educational institutions, and healthcare centers. Additionally, by optimizing bus frequencies and routes, the plan aims to reduce fuel consumption and mitigate environmental impacts.

Simulations conducted to test the proposed system showed significant improvements in both passenger satisfaction and traffic flow. By modeling different scenarios, the study demonstrated that a well-designed network could accommodate future population growth and adapt to changing urban dynamics.

The rationalization of transportation systems has far-reaching implications. Environmentally, an optimized route network reduces greenhouse gas emissions by decreasing the number of cars on the road and promoting the use of public transit. Economically, it lowers commuting costs for residents and boosts productivity by reducing the time spent in traffic. Socially, the new system enhances equity by ensuring that all parts of the city, including economically disadvantaged neighborhoods, have reliable access to public transportation. Improved connectivity fosters social cohesion and can lead to broader economic development.

Despite the potential benefits, the implementation of the new transportation system is not without obstacles. Kabul's urban infrastructure is underdeveloped, and political instability can hinder large-scale projects. Additionally, securing the necessary financial investment and public buy-in remains a challenge. The transition phase, where current routes are modified or replaced, may lead to temporary inconveniences for residents, requiring careful planning and communication.

Recommended a phased approach to implementing the new system, beginning with pilot projects in high-density areas. Collaborations with local government agencies, international urban planning experts, and community stakeholders are crucial to ensure the project's success. Investment in modern transportation technologies, such as real-time tracking systems and automated route management, can further enhance the efficiency of the network. Public awareness campaigns should be conducted to educate residents about the benefits of the new system and how to navigate it effectively.

The rationalization of Kabul's passenger route system represents a transformative step toward a more sustainable and efficient urban transportation network. By addressing critical issues such as congestion, environmental degradation, and unequal access, the proposed system has the potential to significantly improve the quality of life for Kabul's residents. Continued research, stakeholder engagement, and adaptive planning are essential to ensure that the new system remains resilient and responsive to the city's evolving needs.

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PICK-UP POINTS OPTIMIZATION FOR A DEMAND-RESPONSIVE SCHOOL BUS SERVICE BASED ON WALKING DISTANCE AND DEMAND POINTS

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Abstract: This paper presents a pick-up point optimizing method for demand-responsive school bus service. In the case of a school bus service, minimizing the walking distance is especially important in order to reduce the traffic safety and security risk of vulnerable users (aka students). The method developed is based on a demand-sensitive approach, where demand points are known. The method focuses on a clustering procedure that iterates demand points into units based on the acceptable walking distance. Pick-up points can be explicitly assigned to demand point units. A case study in Szentendre, Hungary, found that the allocation method significantly reduces walking distances compared to conventional transport systems, while the low number of pick-up points may ensure service efficiency.

Keywords: demand-responsive school bus, pick-up point, walking distance, clustering procedure, optimization algorithm.

1. Introduction

In general, a demand-responsive transport (DRT) service offers a solution to increase the competitiveness of public transport in areas with low mobility demand [1]. A DRT service operates small-capacity buses and flexible routes and/or timetables, adapting to actual demand. The low mobility demand areas are usually detached house areas in a city agglomeration or in smaller villages. In these areas, school-age children are usually transported by their parents, which increases the car traffic in the calm neighborhood, resulting in higher traffic safety risks, as well as noise and air pollution. For school buses, the location of pick-up points (PU) is key to safe transport [2]. Demand-responsive school bus (DRSB) services may offer an alternative to car