

Bridging the Gaps of Clean Mobility and Transport through Engineering Interventions

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Abstract: Transportation plays a significant role in sustainable development, civilization, industrialization and commercialization in many countries around the globe. This paper looked into bridging the gaps in clean mobility and transport through engineering interventions and other innovative ideas. Salient issues affecting clean mobility and an effective transport system were highlighted and possible solutions were suggested. The methodology includes a literature survey and consultation of environmental experts. A deeper understanding of the gaps between mobility and transportation management can provide insightful information into how cities must be structured. Clean mobility refers to all forms of transportation that do not require the use of fossil fuels exclusively. Mobility specializes in making ground-breaking solutions that enable mobility and industry to attain zero-emissions status. It was concluded that engineering interventions and other innovative ideas can be used to bridge the gaps in clean mobility and transport. Monitoring climate change and reduction of environmental pollution are very vital for the sustainable green environment in African urban communities. There is a need to strengthen digital advancements for integrated solutions in infrastructural development and transportation networks. Proper planning, adequate funding and sustainable development are very crucial for bridging the gap and attaining of a cleaner environment.

Keywords: Climate Change, Clean Mobility, Engineering Interventions, Sustainable Green Environment, Transport System

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1. Introduction

Engineering intervention, sophisticated technology and environmental engineering can be applied to solve the problem of transportation for the realization of clean mobility, environmentally friendly transport system and sustainable development. Mobility may conjure up images of something your grandfather rides around on, a socioeconomic opportunity. People in the United States are more likely to use the terms transportation and mobility interchangeably to describe people and commodities moving around, and mobility to indicate electric scooters for the elderly or social ambition. However, the term transportation has recently been superseded by the concept of movement. Transportation is the act of moving commodities or people. Mobility refers to the ability to move or be moved freely. The term

"ability" makes a big impact in this case. Mobility (capacity to move) refers to a person's ability to move or be moved, whereas transportation refers to the act of moving someone or something. To put it another way, transportation is something you do, while mobility is something you possess. The goal of this study is to use engineering to bridge the gap between clean mobility and transportation.

The healthcare sector's automation is a key factor that contributes to the effective implementation of care services. Government agencies should endeavour to provide mobile technology, such as internet-enabled communications devices, to healthcare hospitals across the country as a way of linking healthcare professionals with patients for better-increased accessibility to health information, and concluded that with those interventions in place, we would be able to provide equal and efficient treatment to all (Ndwiga, 2019). Gap exploiters are third-

party organizations that create value by recycling current items. While the gap exploiter strategy for extending product life is potential in the transition to a circular economy, viable business models and policies are still required (Whalen et al., 2018).

Adequate architectural design, building codes and engineering standards must be strictly for a better environment. Effective power generation, energy and security are essential requirements in smart cities (Ghosh, 2018). Important public health improvements have been achieved over the past decades, but new challenges are emerging and progress cannot be taken for granted. Urban settlements house the bulk of the world's population, and yet they all pose several risks. Through the consumption of resources, location of the project, and green areas, the urban environment seems to have an impact on global warming and public health. In construction curricula, there is a limited amount of time allocated to health, and vice versa. Acknowledgement of the advantages of teamwork and cross-fertilization between the public health and planning workforce is desperately required from local to international levels (Azzopardi-Muscat et al., 2020). CO₂ generated by vehicular traffic is a major source of global warming and this needs to be reduced drastically for a healthy environment. Climatologists say the world cannot wait 20 years for alternative fuels to start reversing the global warming trend-line since by then considerable climate alteration and coastal damage will be manifest (Adams and Brewer, 2004).

2. Methods

This review paper has been prepared by analyzing the literature available from different databases and search engines including Scopus, Web of Science, Science Direct and Google Scholar. Keywords like "Climate Change", "Clean Mobility", "Sustainable Transport", "Green Environment" and "Transport System" were used to collect the relevant literature for the study. Also insights of environmental experts have been covered in the study.

3. Results and discussion

In recent years, significant advancements in public health have been made, but new difficulties are arising, and progress cannot be taken for granted. The risk that this success can be reversed is real. The scope and nature of public health challenges are fast altering in a period of increased urbanization, globalization, digitization, ageing populations, development of non - communicable disease, and climate change, and large modifications are both critical (Azzopardi-Muscat, 2018; Capolongo et al., 2018; Capolongo et al., 2019; Marsh et al., 2020). Current project measures are insufficient to address the problem. Organizational structures and methods for supplying and financing social housing provide a potentially excellent framework for dealing with catastrophe risk at the institutional level (Wamsler, 2007).

Nigeria, like other modern countries, highly depends on automobiles for social and economic functionality. The automobile is at the heart of labour mobilization, crucial commodity and service access, and the urban development and lifestyle choices that we've come to anticipate. Currently, the car is responsible for at least 80% of 'car as driver' journeys (Khan, Kruger and Travedi, 2007), with many people considering it as a method to create personal space, maintain autonomy, and perform identity roles (Mann and Abraham, 2006). Nevertheless, it is generally believed that we are reaching a critical point in terms of sustainable transportation, a series of worries compromising the autonomy of cars. Concerns about peak oil and rising fuel prices are pushing up the cost of driving as well as the cost of food, services, and commodities (Hirsch, Bezdek and Wendling 2005; Deffeyes, 2005; Monbiot, 2006; Moriarty and Honnery, 2007; Garnaut, 2008).

Travelling by rail, tram, bus, or motorcycle does not provide the same flexibility, capacity, or convenience as driving a car. Regardless, public transportation in some of Australia's largest cities is already struggling to meet demand (Fyfe and Sexton, 2008), and motorbikes are seen as a potentially dangerous option because they are neither widely distributed nor densely populated enough to provide enough coverage (Currie and Senburgs, 2007). Alternative modes of transportation are unlikely to alleviate vehicle emissions concerns, even if a complete transformation were possible (Moriarty and Honnery, 2007).

Human-powered movement, such as cycling and walking, on the other hand, is energy efficient but has its own set of constraints. Both are somewhat slow, limit the distance that can be travelled comfortably, Weather protection is not provided, and physical safety is not considered. Individuals with physical limitations are also not permitted to fill out these papers. If electric pedal-assist bicycles, electric-powered three-wheeler automobiles, mopeds, and tiny cars were readily available, they could give feasible solutions to some of these problems. If they become widespread, all of these possibilities may need to be evaluated to promote the growth of socially and environmentally sustainable transportation as well as system efficiency (Rose, 2008). The automobile was examined objectively, providing an outline of its inefficiencies, before arguing that personal mobility solutions are needed to bridge the gap between automobiles and human-powered means of transportation.

The vehicle is a renowned invention that allows us to transport massive amounts of cargo at incredible speeds. Its extensive modern history is easily understood within the context of twentieth and twenty-first-century civilization and metropolitan surroundings. The automobile has had a great effect on the development of our cities and townships, as well as communication, transportation, and social integration. Automobiles have been so established in our culture, psychology, and egos that they are just accepted as part of the landscape. The automobile's inefficiencies, on the other hand, are

becoming increasingly evident at a time when efficiency has become more important.

Furthermore, a car's average daily distance travelled is 35 kilometres, with a 9.44-kilometre average route length (Transport and Population Data Centre, 2004). The vehicle has exceptional capabilities, capable of reaching high speeds of over 140 km/h, accelerating from 0 to 100 km/h in less than 14 seconds, and carrying a payload of up to 5 passengers plus luggage in urban areas where speeds are limited to 80 km/h (excluding freeways where speeds of over 100km/h can be reached). The ability to transport up to four additional passengers on occasion needs a greater spatial footprint as well as structural strength and weight than is required for the majority of excursions.

There is a strong rationale for designing energy, space, and freight efficient cars when analyzing the motor car objectively; however, the case is even stronger when considering environmental, social, and financial factors. The next section discusses some of these issues and argues that they are likely to undermine the autonomy of the typical automobile.

Urban environments, transportation networks, and vehicle designs will need to be more efficient, diversified, ecologically conscientious, and socially inclusive to become more sustainable. Social, financial, and environmental imperatives do not appear to be pressing enough to encourage the general public to adopt the many alternative vehicles accessible at this time. Understanding the societal and individual elements that influence people's lives and, as a result, how people make lifestyle decisions, including travel decisions.

Individual travel is declining for a variety of reasons, but broader social factors such as the changing nature of work, having children later in life, and attending university have all had an impact. Affordability, accessibility, safety, reliability, and habit are all essential issues for individuals. Travel habits are changing, particularly among young people. According to preliminary data, car ownership and use among young cohorts is lower than in the past.

Individuals' transportation costs are exacerbated in areas where public transportation is less accessible and costs are greater. Where people live has an impact on each of these factors. For example, providing effective transportation services to low-density suburban areas has historically been difficult, but this is where the poorest people are increasingly likely to dwell. As a result, their lifestyle choice - where they live - has an impact on their travel habit. The way people travel varies a lot depending on where they are. This research considers possible solutions that could be effective in urban, suburban, and rural settings, based on the possibilities of new technology and business models. To achieve significant change and inspire modifications in habitual travel behaviour, both harsh and soft measures are likely to be required.

Mobility is overlaid and interacted with by broader social trends, such as the UK's expanding and ageing population, adding to the complexity. Active transport (walking and cycling, for example) tends to decline as people get older, but car use rises. This is compounded by

the difficulty of maintaining the elderly population healthy and living independently for prolonged periods. The fact that the population is ageing faster in rural areas, where access to amenities, including public transportation, is limited, adds to the reliance on automobiles. This limitation on travel options has consequences for one's well-being and social capital.

People's reasons for using public transportation are also changing, which has ramifications for the system. Shopping is currently the most prevalent cause of personal travel, followed by commuting. However, social changes have an impact here as well, and transportation links play a role once again. As more people shop and order meals online, the high street has suffered. As a result, home deliveries have increased. This, together with the surge in service vehicles, could explain the considerable increase in van usage. Heavy-goods vehicles, which are more highly regulated, have less freedom than these vehicles. However, the increased use of vans has environmental consequences, such as increased emissions and traffic congestion.

Freight is an important aspect of the transportation system, yet it is sometimes disregarded when land-use planning is done. Cost and accessibility tend to dictate decisions, with flexibility being prioritized - hence the dependence on road freight, which offers the most flexibility in terms of route and schedule. In comparison to passenger transportation, this sector offers fewer options for government intervention (which is under greater public control). Government regulation, pricing, and taxing of road and rail freight, however, continue to have a significant impact on its use and popularity.

Making the correct policy decisions will be critical in meeting today's transportation issues, such as lowering traffic and pollution while offering the smooth, user-centric services that people and businesses want and demand. In the future, increased data usage and connectivity will play a bigger role. There is an opportunity to use data to rethink how infrastructure is planned and operated. Aside from infrastructure, the amount of privately owned data is increasing; people are already taking advantage of it, but wider social advantages may not be realized unless local governments have access to it.

This era of social transformation and new technologies, from self-driving cars to e-scooters, presents numerous options. As we have seen in our scenarios, the government is crucial in comprehending these issues and shaping new technology's rollout, as well as its location and influence. Scenario planning, on the other hand, can assist decision-makers in exploring how policy choices will play out in many futures and in making policies more resilient. This study created four scenarios to analyze the most significant areas of uncertainty. Trends Unmodified depicts a world in which change is primarily incremental and reactive, highlighting the dangers of idleness. Technology Unleashed, on the other hand, envisions a future in which technology is developed and provided in a highly permissive environment. Individual Freedoms envisions a future in which this environment is heavily

regulated as a result of growing public concern about corporations' handling of personal information of their private data.

Finally, Greener Communities envisions a future in which transformation is aimed at achieving positive social and environmental effects.

To build probable futures, each scenario incorporates government decisions and external forces. They show how policy choices affect outcomes and let policymakers test whether their ideas are sound in a range of scenarios. Scenarios can also be used to define a vision for a specific region, and then evaluate how vehicles can help to realize that goal.

Addressing the issue of transport sustainability is dependent on the relevance of the criteria used, which is one of the most critical points of the many techniques

available to derive decision-making solutions. The selection of criteria and the sequence of steps in the analysis of transport sustainability is a challenging process. The approach to the solution of transport sustainability includes several steps, of which the first is the identification of the sustainability assessment criteria. Computer simulation is often used in this process. The next indicator was the time of the vehicles' passage through the transport hub. It was another set of data describing whether the vehicles would not pass slowly within the individual variants, which would have bad environmental impacts. The final monitored indicator was the delay of vehicles at the intersection. It was the time that included, in addition to driving time, the waiting of vehicles at a transport hub due to traffic congestion.

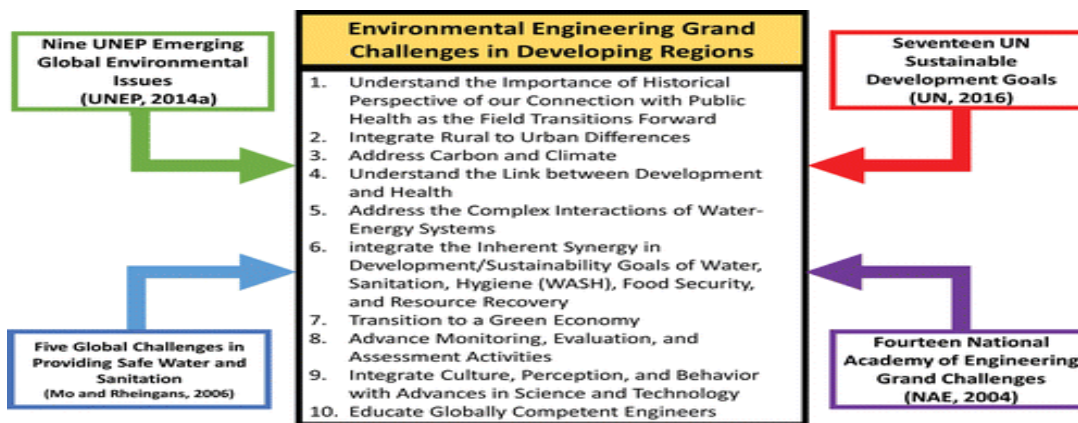


Figure 1: Challenges in developing countries and global environmental issues

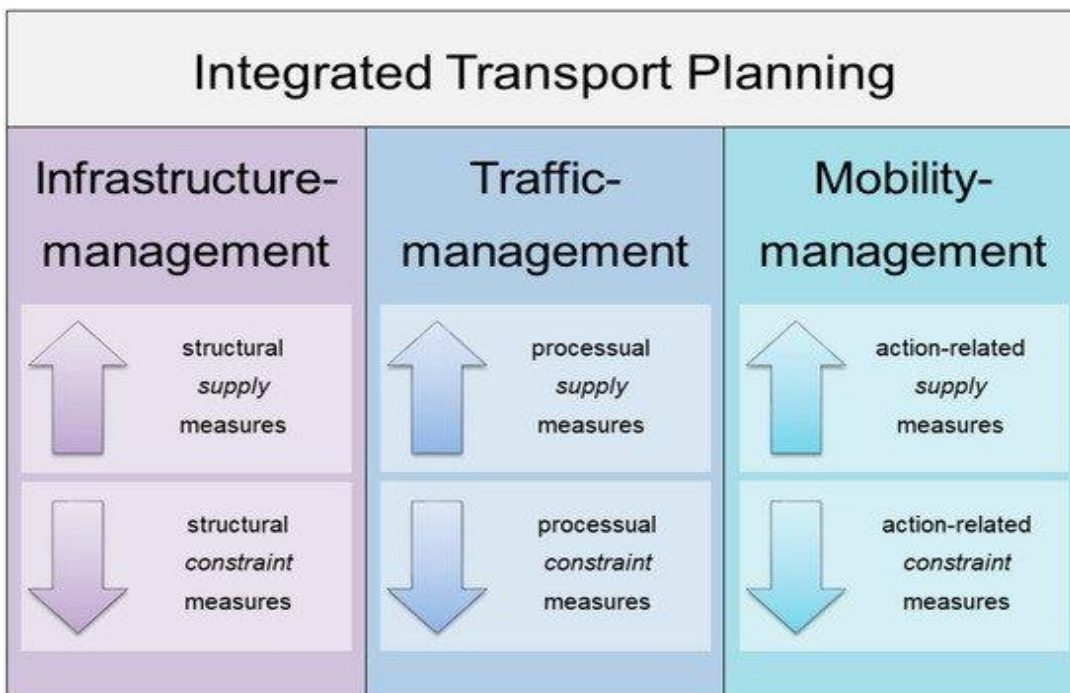


Figure 2: Integrated transport planning and management



Figure 3: Typical road network for effective mobility

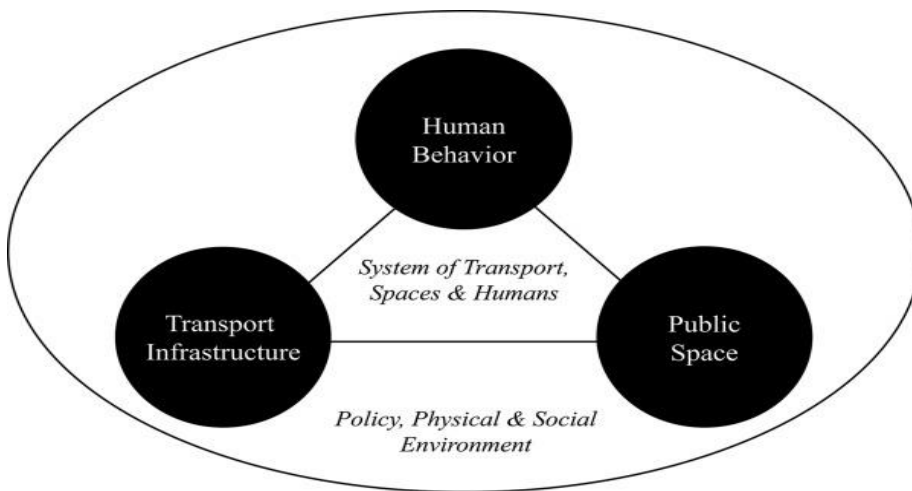


Figure 4: Description of the system of transport, spaces and humans

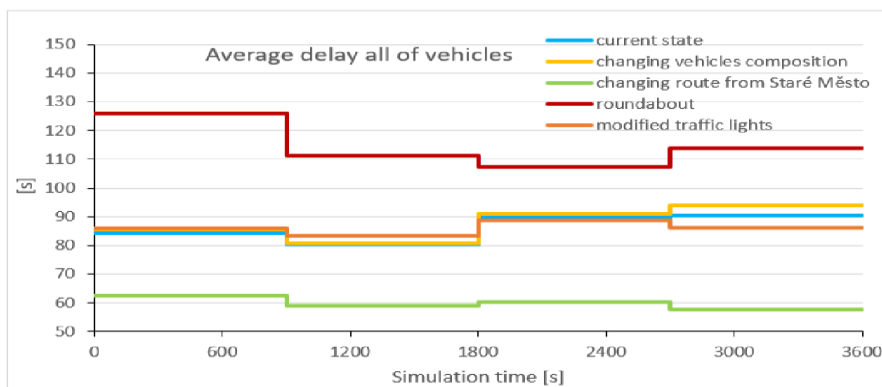


Figure 5: Average delay of all vehicles

4. Conclusion and recommendation

Engineering interventions and other innovative ideas can be adequately deployed to bridge the gaps in clean mobility and transport. Monitoring climate change and reduction of environmental pollution are very vital for the sustainable green environment in African urban

communities. Policy and design initiatives that are effective should be combined and coordinated, and they should be based on behaviour analysis. Concerns about climate change, rising fuel prices, traffic, car storage, and household financial restraints are pressuring automobile manufacturers to rethink their product portfolios. In addition, a slew of new projects, networks, industries, and products are launched that promise to provide efficient and cost-effective forms of transportation. Individuals are

likely to consider utilizing smaller, lighter, more efficient means of personal transportation for everyday short to medium distance commuting as a result of community-based projects and government initiatives aimed at reducing the need for large car ownership. In broad objective terms, the privately operated conventional motor vehicle will most likely be scrutinized more closely. Except the apparent pollution concerns, present vehicle platforms are space and functionally constrained, as they are designed to do a wide range of duties for the widest potential market reach - a one-size-fits-all approach. However, when constructed properly, a larger system of transportation options can deliver much more. Car-sharing services might provide individuals with access to a variety of vehicles with various seating capacities and functionality, as well as create a market for smaller alternative automobiles to be utilized daily.

There is a need to strengthen digital advancements for integrated solutions in infrastructural development and transportation networks. Proper planning, adequate funding and sustainable development are very crucial for bridging the gap and attaining a cleaner environment. The introduction of self-driving cars will eventually aid in traffic congestion reduction. Engineering efforts can be supplemented by social interventions like community communication and cultural context study. Decision-makers and policy-makers can use a toolbox that includes multidisciplinary research to help them create project goals, manage projects effectively, and make efficient policies. Computer scientists that have a good understanding of the relevant urban challenges will also assist.

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