



Investing in Transportation: An Effective Road Map to Sustainable Economic Growth

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Abstract: Transportation as the bedrock of all human activities transcends beyond the basic purpose of moving goods and services from one place to another. There exists a strong relationship between transport investment and economic growth having a whole lot of economic roles. Transportation investment provides direct and indirect impacts on any nation's economy. The direct impacts are the connection and accessibility that transport facilities can provide to the markets by saving time and money. The indirect impacts are the economic multiplier effects when the prices of goods and services increase with diversification. The paper provides a review of the economic roles, the direct and indirect economic impacts of transport investment and the supply and demand for transport. The review further highlights the operational mechanisms of improving and sustaining transport facilities for sustainable economic growth.

Keywords: Transportation Investment, Market Forces, Economic Development, Sustainability.

1. INTRODUCTION

Transportation forms the basis of all human activities and an integral part of any functioning society. It ensures a close interaction with the way of life, the range of activities and the location of goods and services for human consumption [1]. According to Encyclopedia Britannica, transportation is described as the “movement of goods and persons from place to place and the various means by which such movement is accomplished” [2]. Adequate transportation system provides accessibility to businesses, markets, and for both freight and personal movements such as access to place of works, schools, social, recreational, communities, medical facilities, and leisure activities [3]. The act of allocating resources “usually money” from public and private sectors to develop the modes of transportation including land, air, water, and pipelines describes the term “transportation investment”. Such financial commitment is aimed at improving the efficiency of the modal choices and to generate income or profit as a return-on-investment. Economic development improves the quality of life and enlarges capacities to realize the potentials of individuals, firms, communities, and nations [4].

Transportation Investment increases the quality of life and improves the economy in terms of productivity and wealth generation [5]. Virtually all developed countries around the world have for long adopted transportation as essential to the economic propagation. In the United States (US), transportation has been a major driver of the economy, year 2020 report of the US Department of Transportation shows that the contribution of transport investment was about \$1,489.7 billion amounting to 8.9% of the Gross Domestic Product (GDP). The return prompted the increment of the capital stock for transport investment in 2017 to \$7.7 trillion dollars with 4.2 trillion coming from the public and the remaining 3.5 trillion from the private sector [6]. China, having the most extensive transport system and the second largest economy in the world has experienced rapid economic growth through adequate transport investment. China keeps recording annual growth rate of 9.5% in the real time with the rate doubling on the average every eight years [7]. In the year 2020, groundbreaking analysis by the American Public Transportation Association (APTA) measures the economic productivity of transportation investment for the first time. Investment could yield 49,700 jobs per \$1 billion invested and offers a 5 to1 economic return [8]. Investment in transport and digital connectivity increase access to markets resulting from reduced transport and transaction cost as well as improved ability of workers to find jobs [9].

As a nation develops and population increases, there is always a growing need for people to have better access to their businesses and activities which can be best achieved through adequate investment in transportation. Essentially, some developing countries across the world are still reluctant in fostering transportation as a roadmap to economic development. This act of negligence can drastically hold back the economic prosperity of any country even with development potentials. The paper provides a review of literature on the economic roles and impacts of transport investment, how transport can be supplied in response to demand and how transport development can be sustained for sustainable economic growth.

2. REVIEW OF LITERATURE

The roles and impacts of transportation investment has generated a lot of interest in research, studies, and academic cycles. Array of studies have been carried out by researchers on the economic development that can be achieved through adequate investment in transportation facilities. The chapter provides a review some of the past studies with focus on the forms and roles of transport investment, economic impact of investing in transportation, demand, and supply of transport facilities and how transport can be sustained for sustainable economic growth. As displayed in Fig. 1, the review considers thematic approach to identify and simplify the key themes of the discourse, the concepts and ideas in a more subjective and interpretative way that further provide a better understanding of the existing knowledge.

2.1. Forms of Transportation Investment

The relationship between transportation and economic development transcends beyond the basic purpose of moving people, goods, and services from one location to another [10]. In the decision-making process, policymakers are equipped with adequate data and information necessary to determine the interaction between transport investment and economic productivity. Investment in transportation takes the forms of capital expansion and capital enhancement [11].

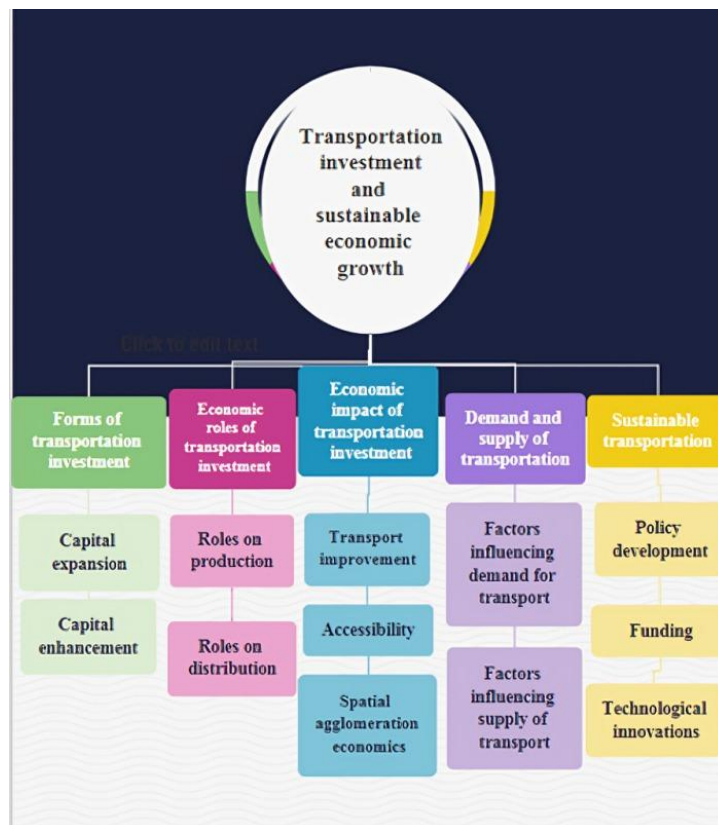


Fig1. Thematic Framework

2.1.1. Capital Expansion

Capital expansion of transportation system involves the construction of new roads, inter-state, and intra-state highways, excluded bus lanes on major roads across the city centers and connecting rail lines that cut across every part of region. More so, establishment of more runways in airports,

pipelines to convey crude oil, provision of facilities for pedestrians and cyclists, and construction of bus terminals using the modern methods of construction techniques, materials, and equipment. In addition to this, capital expansion includes the provision of more public buses, increased production of private vehicles, airplanes to serve places, more trains are put into operation and pipelines are constructed in safe and reserved locations [11].

2.1.2. Capital Enhancement

Capital enhancement in transport development involves the creation of technology and innovative ideas that promote the usage of the existing transportation facilities and the new ones to that support the varying needs of the users [11]. Examples of this innovations include, geographic positioning systems, intelligent highways system, instrument landing system, intermodal freight facilities, landscaping, and other scenic beautification, among others. The innovative ideas have corresponding effects on economic development that emanates from adequate transport system delivery and efficient management and use of the scarce resources [1], [5].

2.2. Economic roles of Transport Investment

Transportation plays an important role in the economic +concern of production, distribution and consumption of goods and services [12]. Investing in transportation is one of the most powerful ideas of stimulating or fostering the economy of any region. Though developing infrastructure is expensive and it requires huge amount of money from the yearly budget and financial plan of the decision makers. Despite this, transportation investment is a productive expenditure, it provides economic benefits largely when there is adequate access to services and both inter-regional and intra-regional trades are made possible [13].

2.2.1. Roles on Production

In the production phase, adequate investment in transportation broadens the market and ensures the easy movement of raw materials, equipment, fuel, and other transferable materials to the production location [14]. Transportation investment plays a vital role in the reduction of the travel time and distance thereby increasing labor pool from which industries and companies can draw from [15]. Even in industrial locations, adequate transportation system aids the movement of raw materials, equipment, and labor within and around the industries.

2.2.2. Roles on Distribution

In the distribution of finished goods and services, the diversification and the development of both inter-regional and intra-regional trades have been made realistic as a result of effective transportation routes [16]. Adequate transportation investment provides time and space utilities through inbound and outbound utilities including the storing and delivering of goods and services. In developed countries across the world, locational distribution of goods and services has been made easier using zip codes, functioning address and transportation enhancement applications that show the direction and location of places within space [17].

2.3. Economic Impacts of Transport Investment

Economic impacts of transportation investment can be obtained by accessing the measurable changes in the flow of money that are diverted on transportation which includes both spending and productivity effects [18]. The impact can be direct, indirect, or induced. Economic impacts of transport investment can be analyzed based on three factors which are travel improvement, accessibility, and other economic impacts measure [19].

2.3.1. Travel Improvement

Transportation investment has direct impact on travel time, by saving travel time and travel costs, and improves reliability and safety [20]. When transportation services are improved through more direct routes and frequent services, it saves the time of the users and allows people to accomplish their economic activities within the shortest period [4]. Even in congested urban areas, people can choose among varieties of transportation modes such as rails or other exclusive bus lanes to avoid traffic congestion that could delay varying human activities. There is always a change in the structure of transportation fare “travel cost” when new transportation services are provided, or the old ones are improved. Such changes can lead to a reduction in the cost of mobility from one place to another and

expansion of business for economic productivity [16]. More so, when several transportation routes are established, there is improvement in the reliability and reduced congestion and collusion [5]. In the presence of several modes of transportation, commuters can choose from varieties of choices and freights can be moved from one location to another with ease. Reliability as a direct impact also improves productivity, product, and service delivery. In terms of safety, transportation investment enhances safety by reducing collision which further reduces associated insurance and emergency response costs. By this, the market becomes more accessible to the buyers and sellers for economic development [18].

2.3.2. Accessibility

Economic productivity develops when transportation routes and modes are expanded [18]. Investing in transportation improves mobility, access to market and the spatial agglomeration economies [15]. Mobility in its shortest form can be described as “the potential for movement” and accessibility as “the potential for interaction” [21]. Accessibility improvement can increase market size for economic activities and reduce job search by potential job seekers. Accessibility takes two forms; they are access to market and spatial agglomeration economies. Adequate transportation system improves access to market “mobility” and ensures accessibility to places of works, markets, educational institution, social spaces, recreational and relaxation areas. Within the economic impact model, accessibility to places of works and businesses has increased economic productivity in terms of workers’ buyers’ and sellers’ productivity resulting from broader and more diverse transportation system [15]. Such economic impact is also reflected in the economies of scale ensue from more buyers’ and sellers’ accessibility to more and larger markets, workers’ accessibility to their various places of works and employers’ accessibility to both skilled and unskilled labor to effectively carry out the varying economic functions.

2.3.3. Spatial Agglomeration Economics

Spatial distribution of transportation system supports economic development by the concentration of economic, educational, recreational, institutional, religious, and social activities around transportation routes most especially within the city centers [16]. The clustering of activities however improves the efficiency of the cities and reduce the cost of labor and infrastructure, improve communication and interaction with businesses with similar attributes or characteristics. Agglomeration of economic activities provides an easement of physical interactions and improves labor accessibility that provides the much-expected economic outcome [22], [23], [24].

2.4. Demand and Supply of Transportation

Transport investment considers the supply of transport facilities to meet the demand of the users [12]. There exists an interdependence relationship between transport infrastructure and mobility. Infrastructure becomes irrelevant if there is no mobility and in the absence of infrastructure, mobility will not efficiently occur [25]. The interdependent relationship can be accessed using the concept of transport demand and supply. There is a reciprocal but asymmetric relationship between demand for transport facilities and their supply. However, demand for transport may not occur where there is no corresponding supply of transport facilities, meanwhile, supply can exist without a corresponding demand for it [19].

2.4.1. Demand for Transportation

Demand for transport can be described as the need for transport. It is the totality of transport services required or needed which can be purchased at a particular price over a particular period [10]. The supply need can be expressed in terms of the number of people, volume, tons per unit of time and the distance whether the need is satisfied partially fully or not. Demand for transport is often and frequently initiated by the economy which includes the people, economic institutions, and industries [19]. Demand for transport as a term in economics is a derived demand, that is, the demand for a particular good or services occurs because of demand for another [26]. Users’ demand for transport facilities not only because of the direct benefit they derive from it but also because they have desire to access other services [27].

There are different reasons for which movement of people and goods occur at different times. Such reasons could be attributed to those factors influencing demand for transport. The factors include

personal characteristics, trip characteristics and the trip system [28]. The highlighted and distinguished factors can be categorized as direct and indirect. Direct factors of transport demand are demography and nature of economic activity while the indirect factors are technology, public policy, environmental policy, and contestability of freight. However, fuel and operation strategy have both direct and indirect factors [20]. The demography of the people residing in a particular place is another direct factor that determines the demand for transport basically for macroeconomic activities. The more the people, the more the need to access food, fuel, consumer goods and services. Labor force is also required to provide, cultivate, and extract the freight readily available and needed to be transported. Private vehicles could be considered economical while public transit is more accessible and affordable [1].

Economic activities through production of goods and high transport demand relative to the weight, size or distance are also other identified significant factors that describes demand for transport [20]. Some freights are best moved by rail, some by air, and some can only be by water. For instance, crude and refined oil are best transported through pipelines. Globalization has also improved economic efficiency and wealth creation as other direct factors. The freight industries have experienced a shift as a response to the growing technological advancement across industries. Computer applications and advanced telecommunication equipment are incorporated as a network system to enhance operational management. There has occurred a maximum optimization of the freight vehicles such as aircraft and trucks, shipments can be easily tracked and sorted by the air carriers, manufacturers, and retailers [28]. This transport enhancement has a corresponding improvement on the level of service, reliability, and just-in-time method of delivery [20].

Public policies promoting international trade agreements are set aside to initiate consistency in the regulations of government and for promoting the traffic along the border. For instance, the cross-border agreement between United States and Mexico has initiated a lot of economic investment activities between the two countries. Such agreement has led to increasing demand for transport to access the competitive advantages of the countries [20]. The percentage of operating expenses expended on fuel by some commonly used mode of transportation such as cars, trucks, public vehicles, and private car are becoming exorbitant each day. As a result of this, a lot of users directly consider mode switching to a more affordable, faster, and accessible ones. An increase in the price of fuel can also affect the economic activities of the people. When consumers pay more on fuel, they are less able to save money for other things which indirectly reduces the level of consumption and the economy holistically [10].

2.4.2. Supply of Transportation

Transport supply can be described as the amount of transport services, that are provided by the government, private investors, or individuals to meet the demand of a defined population at an agreed price [28]. Transport supply is the capacity of transport infrastructure and modes to serve the needs of the people within a location at a given period. Transport supply can be expressed in terms of the infrastructure “capacity”, the networks “coverage” and the services “frequency” [29]. The factors influencing the supply of transport can be the types and characteristics of goods, the cost of freight, the origin and destination, the journey distance, urgency, and reliability of delivery. Characteristics such as size, weight, type and the value of goods and services has a corresponding influence on the type of transport to be supplied or needed for each good. For instance, vehicles, ships, other heavy objects, loads are mostly shipped from one location to another on water. Such transportation mode has made inter-regional trades a lot easier. Ships have the capacity and space to accommodate bulky loads and heavy equipment. The cost of moving goods and commodities or cargo in bulk by ship, aircraft, truck, or train has influence on the supply of transport. In some cases, a particular mode of transportation might not be economically efficient, users can choose among other alternatives based on the financial capacity, distance, urgency, and reliability. For instance, it may be faster but costlier to transport goods on air, whereas it may be slower but cheaper by water. Also, if a particular good or commodity does not have a static mode of transportation, individual’s demand for transport mode may vary based on the price [28].

The origin of goods and commodity to be transported and their anticipated destination point influence the supply of transport. Crude oil that has just been extracted is mostly transported to the refinery through pipelines. Another instance is the transportation between American regions and the African

Regions which can only be made possible by air, and water. The two continents are connected by large ocean and transportation of goods and services can only be made possible through air and water. Proximity from one location to another is another important factor that influences the supply of transport. People prefer to use cars, motorcycle, or bicycle to access places around them. Some people may also choose to trek within the neighborhood. Inter-regional, Trans-Ocean movements can be best accessed by air or water. Urgency, convenience, efficiency of travel and reliability are other important factors that influence the supply of transport. Users demand for efficient and reliable transport modes basically for convenience and to meet the urgent needs [28].

2.5. Sustaining Transport for Sustainable Economic Growth

Sustainable transport is an important driver for sustainable economic and social development [25],[28]. According to the United Nations “sustainable transport is the provision of services and infrastructure for the mobility of people and goods, advancing economic and social development to benefit the today and the tomorrow in a manner that is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts”. Improving sustainable economy through sustainable transport will require advancement in three major areas [29],[30]. They are policy development and implementation, financing, and technological innovation.

2.5.1. Policy Development and Implementation

The proper designing and implementation of policies depends on some integrated institutions, improved frameworks for governance, short and long-term planning and business case for sustainable transport and development, capacity building, inclusion of relevant stakeholders and monitoring and evaluation. To achieve an integrated approach needed by policy makers, individuals, and economic actors, two approaches are required to integrate the complex space of transport with its varying implications for a wide range of sections and population. The approaches are horizontal integration among the institutions, modes and sections and vertical integration among the various levels of jurisdiction and authority [27], [31]. Policy development is capacity building approach to enhance safety and access. The rate of urbanization in cities across the world keeps increasing at alarming rate and more than half of the urban lands are yet to be developed. As cities develop, private ownership of vehicles keeps increasing. Policies are developed and implemented to balance the trend and enhance a diversified land use and public transport system to meet the needs of the people, and to ensure equitable access, reduced air pollution, cases of accidents, and improved quality of lives [23], [31], [32].

In the policy making process, stakeholders including the government, financial institutions, transport authorities and operators, community organizations, businesses and enterprises, research institutions and professional experts all form the decision-making body [25]. Public input is also essential to capture the varying demands in the decision-making process [28]. The monitoring, evaluation, and tracking framework for sustainable transport system including all modes of transportation and freight transport has not really been accessed even in developed countries. Data on existing and anticipated travel demand, land use and their interactions should be well assessed for sustainable transport system [31], [32].

2.5.2. Funding

The provision of transport infrastructure is of no doubt capital intensive and consumes substantial percentage of the annual budget “financial plan” of the decision makers. Policy makers, financial institutions, regional banks, and other multi-lateral development banks all play a major role in providing finances, sufficient to meet the need for transport investment. Government at all levels are required to provide appropriate framework for adequate financing that will be required for sustainable transportation development. Funding can come from different sources which are government funding, private financing, fiscal and market-based measures, and international financial institutions. Majority of infrastructure not excluding transport are often funded by the government. Such funding is often generated from taxpayers and other internally generated revenue. Government at all levels plan for transport for both short and long term by providing funding for transport planners and other technical crews to develop and implement a high-quality sustainable transport plan [5], [31].

The private sector plays important role in transport financing. Transport funding requires public-private partnership. This is a process whereby government collaborates with private investors to

invest and set up a framework for the modality of operation. The public-private partnership provides an opportunity for innovations, financial resources and to leverage on expertise. The interest of the private investors and the government are not completely in alignment. Private investors are more focused on profit making as a return on their investment, meanwhile, it is a statutory function of government to provide adequate infrastructure for the populace. To foster this public-private partnership, risks attached to the collaboration must be critically assessed and acceptable to a certain level. Also, functioning policy or framework are established to create an enabling environment that supports investors at the federal, state, or local levels [31].

Sustainable transport investment can be generated from several fiscal and market-based measures such as innovative user charges and fiscal instruments. Such methods of generating revenue provides an opportunity for infrastructure user charges that reflects the marginal social cost of travel, the ownership and vehicle registration charges, tax on fuel, carbon pricing, parking regulations and fees. The opportunities as well include, land value capture, social impact investments, high occupancy tolling on high traffic roads and public-private partnership that contribute to sustainable transport financing. Aside the effort of the government and public-private partnership in providing funding for transport investment, the intervention of the international, multilateral, and bilateral financial institutions is as well important especially in developing countries that still found financing of sustainable transport a challenge or too enormous to tackle all alone. World bank and regional development banks provide adequate funding to finance sustainable transport infrastructure. The financial institutions also assist countries in the process of implementing recommendations on transport transformative projects through adequate and innovative finance mechanism; through capacity development and the application of best professional practices in the implementation process [31], [33].

2.5.3. *Technological Innovations*

Technology contributes enormously to sustainable transport development. It improves safety, affordability and enhances accessibility. Enhancement in technology spurs innovations and improved opportunity for sustainable and environmentally friendly transport system. Advancement in technology also drives the economy positively in the travel time, cost, and safety. Technology companies engage in innovative research often funded by public institutions and monitoring public infrastructure that are required to integrate technology into the enhancement of transportation systems [13], [31], [33].

3. CONCLUSION

Transport provides the possibility of moving goods and services within space. Reliable transport systems are made available to support the varying and urgent needs of the users. Private and public involvement in transport development improves accessibility, mobility, capital productivity and accelerates economic growth. Public-private investors collaborate to develop and implement sustainable transport by combining expertise, resources, and funding and to leverage on the potentials of the private sector, government, and the public. Transport investment takes the forms of capital expansion and capital enhancement of transport facilities to improve the efficiency of the transport modes and ease of use. Such capital inputs contribute to travel time and distance with a corresponding impact on accessibility, connectivity, and increased access to labor pool from which companies and industries can draw from. Economic roles of transport investment on distributions of freights provides time and space utilities through inbound and outbound utilities including the storing and delivering of goods and services. Transport development provides direct, indirect, and induced economic impacts aided by travel improvement, accessibility, and other economic impact measures. The direct impact of travel time and travel cost improve reliability and safety. Reliability as a direct impact improves productivity, product and service delivery, reduction in safety cost, improved access to market and spatial agglomeration economics.

The need for transport is the totality of the transport services required which can be purchased at a particular price over a particular period and the desire to access other services. Personal characteristics, trip characteristics and trip system are direct and indirect factors influencing transport demand. Demography of the users and the nature of economic activities have direct impact on supply need while technology, public policy, environmental policy, and contestability of freight are the

identified indirect factors. The amount of transport services provided to meet the demand of the population at an agreed price describes the term transport supply and are expressed in terms of capacity of infrastructure, the network coverage, and the frequency of services. Supply of transport can also be defined by the cost of freight, origin and destination, the journey distance, urgency, and reliability of delivery. Users choose reliable transport modes for convenience and to support the varying urgent needs. Ensuring sustainable economy through sustainable transport development in a manner that is safe and efficient requires advancement in the areas of policy development and implementation, financing, and technological innovations.

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Before his transition to the United States for further academic and career progression, he had experienced working in both the public and private sectors to produce architectural designs, urban designs and to deliver some other urban planning and environmentally related activities. Mojeed Authored Viability of Zoning Reform in Tackling Urban Inequality in Louisville in year 2023, Perception of Town Planners on Town Planning Regulations and Standards in Lagos State and Contributions of International Organizations to Urban and Regional Development in Nigeria. Mr. Oladele is currently a member, Urban Affairs Association, Member, American Institute of Constructors and currently a Life Member, The National Society of Leadership and Success.

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