Fostering Sustainable Transport and Infrastructure in Africa

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Abstract

The paper critically discusses the progress made towards fostering sustainable transport and infrastructure in Africa. It argues that sustainable transport and infrastructure can help Africa meet its climate and development targets. It explores some of the initiatives adopted towards embracing sustainable transport and infrastructure in Africa and challenges thereof. The paper further offers solutions towards fostering sustainable transport and infrastructure in Africa for sustainability.

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1.0 **Introduction**

Transportation systems including roadways, public transit systems, airports, train stations, bus stations, ferry terminals, pipelines and warehouses ensure safe transport of people and goods and form a critical part of thriving, modern economies[1]. It has been pointed out that inland transport networks and nodes of international importance such as roads, railways, waterways, terminals, ports are instrumental to ensuring market access for people and goods[2]. Transportation plays an essential role in countries' competitiveness, balanced and liveable urban spatial development, access to water and energy, and food security, and is critical for social inclusion and improved quality of life[3]. It confers mobility and impacts on the development and welfare of the population through employment and income creation, connecting and providing to businesses and vital services, and therefore enhances economic development and growth[4]. Further, infrastructure plays a huge role in driving national growth, employment, and better quality of life in emerging markets and developing economies[5]. Despite the importance of the transport and infrastructure sector in the development agenda across the world, it has righty been observed that the industry comes at a huge cost since it may cause adverse planetary and environmental changes if left unchecked[6].

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[1] Flinders. M., 'How to Build more Sustainable Transportation Infrastructure.' Available at https://www.ibm.com/blog/transportation-infrastructure/ (Accessed on 08/11/2023)
[2] United Nations Economic Commission for Europe., 'Climate Change Impacts and Adaptation for Transport Networks and Nodes.' Available at https://unfccc.int/sites/default/files/resource/2.12UNECE-WMO_CCImpact_Transport.pdf (Accessed on 08/11/2023)
[3] Okoro. C., Musonda. I., & Agumba. J., 'Validity and Reliability of a Transportation Infrastructure Sustainable Performance Framework: A Study of Transport Projects in South Africa.' *Construction Economics & Building*., Volume 19, No. 2 (2019)
[4] Ibid
[5] Brickstone., 'Low-Carbon Infrastructure in Curbing Climate Change.' Available at https://brickstone.africa/low-carbon-infrastructure-in-climate-change/#:~:text=Urban%20transport%20projects%2C%20such%20as,emissions%20compared%20to%20fossil%20fuels (Accessed on 08/11/2023)
[6] Ibid

According to the International Energy Agency, transport accounts for more than a third of global carbon dioxide emissions from end-use sectors[7]. This is due to the fact that motorised transport on land, sea and air remains dependent on internal combustion engines that generally run on fossil fuels[8]. The International Institute for Sustainable Development further posits that transport is at the center of many economic and social development challenges, accounting for approximately 64% of global oil consumption, 27% of all energy use, and 23% of the world's energy-related carbon dioxide emissions[9]. The United Nations Environment Programme (UNEP) further reports that infrastructure is responsible for nearly 79% of all greenhouse gas emissions and 88 % of all adaptation costs[10]. Transport and infrastructure systems therefore produce emissions that contribute to air pollution and climate change and have serious impacts on ecosystems[11]. The sector is also responsible for many deaths as a result of emissions and accidents especially on roads[12].

As a result of the foregoing concerns, it has been argued that there is need to rethink and revamp transport and infrastructure systems in a manner that is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts[13]. It has further been pointed out that there is need for radical changes in infrastructure planning, delivery and management in order to achieve key climate and development targets as envisaged under the Paris Agreement and Sustainable

[7] International Energy Agency., 'Transport.' Available at https://www.iea.org/energy-system/transport (Accessed on 08/11/2023)
[8] Ibid
[9] International Institute for Sustainable Development., 'The Road to Sustainable Transport.' Available at https://www.iisd.org/articles/deep-dive/road-sustainable-transport#:~:text=Transport%20accounts%20for%20about%2064,directly%20attributed%20to%20vehicular%20pollution. (Accessed on 08/11/2023)
[10] United Nations Environment Programme., 'New Report Reveals how Infrastructure Defines our Climate.' Available at https://www.unep.org/news-and-stories/press-release/new-report-reveals-how-infrastructure-defines-our-climate (Accessed on 08/11/2023)
[11] International Institute for Sustainable Development., 'The Road to Sustainable Transport.' Op Cit
[12] Ibid
[13] Ibid

Development Goals[14]. Sustainable transport and infrastructure has therefore been suggested as a tool of enhancing low carbon development for sustainability[15].

The paper critically discusses the progress made towards fostering sustainable transport and infrastructure in Africa. It argues that sustainable transport and infrastructure can help Africa meet its climate and development targets. It explores some of the initiatives adopted towards embracing sustainable transport and infrastructure in Africa and challenges thereof. The paper further offers solutions towards fostering sustainable transport and infrastructure in Africa for sustainability.

2.0 **Sustainable Transport and Infrastructure in Africa: Opportunities and Challenges**

It has been argued that in order to curb the negative environmental impacts associated with transport and infrastructure systems while maintaining transport and infrastructure as a priority sector for climate action, and national growth in general, governments need to radically rethink how transport and infrastructure is planned, delivered and managed in order to make it suitable for a low emission and resilient future[16]. Sustainable and low-carbon transport and infrastructure development is therefore necessary in enhancing low carbon development since it generates fewer carbon emissions than traditional infrastructure and helps build resilience in vulnerable countries while protecting against exposure to extreme climate change events[17]. Sustainable transport and infrastructure is seen as an important tool of enhancing low carbon development for sustainability[18].

Sustainable transport and infrastructure has been defined as the provision of services and infrastructure for the mobility of people and goods—advancing economic and social development to benefit today's and future generations—in a manner that is safe,

[14] United Nations Environment Programme., 'New Report Reveals how Infrastructure Defines our Climate.' Op Cit
[15] Muigua. K., 'Enhancing Low Carbon Development for Sustainability.' Available at https://kmco.co.ke/wp-content/uploads/2023/09/Enhancing-Low-Carbon-Development-for-Sustainability-.pdf (Accessed on 08/11/2023)
[16] Brickstone., 'Low-Carbon Infrastructure in Curbing Climate Change.' Op Cit
[17] Ibid
[18] Muigua. K., 'Enhancing Low Carbon Development for Sustainability.' Op Cit

affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts[19]. According to UNEP, sustainable transport and infrastructure adapts to future uncertain climate conditions; contributes to the decarbonization of the economy; protects biodiversity and minimizes pollution[20]. UNEP further posits that sustainable transport and infrastructure is the only way we can ensure that people, nature and the environment thrive together[21].

It has been argued that the transport and infrastructure sector should be sustainable in four dimensions: environmental, social, institutional and economic[22]. Environmentally sustainable transport and infrastructure is planned, designed, constructed, and operated with the aim of increasing their level of climate resilience—which includes mitigating climate impact, protecting biodiversity, and minimizing pollution; socially sustainable transport and infrastructure systems considers the external effects on vulnerable populations, preserve cultural heritage, protect human rights, improve quality of life, increase the level of inclusiveness, and make transport services accessible; institutional sustainability focuses on transport and infrastructure's alignment with its country's overall objectives, such as specific paths toward decarbonization; and economic sustainability covers the transport and infrastructure's long-term financial viability and its contribution to job creation and economic growth[23].

It has correctly been observed that resilient and sustainable transport and infrastructure systems can withstand climate shocks, recover and resume operations while adapting to

[19] International Institute for Sustainable Development., 'The Road to Sustainable Transport.' Op Cit
[20] United Nations Environment Programme., 'New Report Reveals how Infrastructure Defines our Climate.' Op Cit
[21] Ibid
[22] Milani. L., Mohr. D., & Sandri. N., 'Built to Last: Making Sustainability a Priority in Transport Infrastructure.' Available at https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/built-to-last-making-sustainability-a-priority-in-transport-infrastructure (Accessed on 08/11/2023)
[23] Ibid

change and are thus crucial for a more inclusive world and shared prosperity[24]. It is therefore important to enhance the sustainability and resilience of transport and infrastructure services.

Sustainable transport and infrastructure is also at the heart of the United Nation's 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs)[25]. The 2030 Agenda for Sustainable Development seeks to achieve sustainable transport systems; and quality and resilient infrastructure[26]. SDG 11 seeks to foster sustainable cities and communities through measures such as providing access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons[27]. SDG 9 further seeks to promote resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation[28]. Among the targets under SDG 9 is Developing quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all; and facilitating sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing states[29]. It has been asserted

[24] United Nations Conference on Trade and Development., 'Resilient and Sustainable Transport is a Pre-Condition for an Inclusive World of Shared Prosperity.' Available at https://sdgpulse.unctad.org/sustainable-transport/ (Accessed on 08/11/2023)
[25] United Nations., 'Transforming Our World: The 2030 Agenda for Sustainable Development.' Available at https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf (Accessed on 08/11/2023)
[26] Ibid
[27] Ibid, SDG 11.2
[28] Ibid, SDG 9
[29] Ibid

that infrastructure, including transport infrastructure, directly and indirectly influences the attainment of all the SDGs, including 92 % of the 169 individual targets[30].

Fostering sustainable transport and infrastructure is an important agenda in Africa. Climate change is already posing a serious threat to Africa's economic and social development[31]. It has been pointed out that many African countries are already among the poorest on earth; if anthropogenic climate change continues, economic conditions will deteriorate significantly, dashing millions of people's hopes for a better life[32]. Sustainable transport and infrastructure can help the continent attain economic growth and social progress while confronting climate change through reduction of greenhouse gas emissions[33]. It has been argued that as African economies continue to grow and expand, the transport and infrastructure sector becomes even more critical for promoting a people-centered, socio-economic development agenda[34]. Planning for affordable, safe and clean transport systems is a smart and cost-effective way to address people's needs and the impact of rapid urbanization across Africa[35].

The World Bank correctly notes that Africa's development is highly dependent on adequate, reliable and sustainable transport and infrastructure including road systems[36]. It advocates for the development of climate-resilient transport and infrastructure systems in Africa in order to meet the continent's economic, social and environmental

[30] United Nations Conference on Trade and Development., 'Resilient and Sustainable Transport is a Pre-Condition for an Inclusive World of Shared Prosperity.' Op Cit
[31] Muigua. K., 'Reflections on Confronting Climate Change in Africa.' Available at https://kmco.co.ke/wp-content/uploads/2023/08/Reflections-on-Confronting-Climate-Change-in-Africa.pdf (Accessed on 08/11/2023)
[32] Hochfeld. C., & Bongardt. D., 'Leapfrogging to Sustainable Transport in Africa.' Available at https://www.international-climate-initiative.com/fileadmin/iki/Dokumente/Publikationen/Projekte/16_I_203/2023_Leapfrogging-to-Sustainable-Transport-in-Africa_EN.pdf (Accessed on 08/11/2023)
[33] Ibid
[34] The World Bank.,' Sustainable, Safe and Efficient Transport for the People of Africa.' Available at https://www.worldbank.org/en/news/press-release/2013/12/10/sustainable-safe-and-efficient-transport-for-the-people-of-africa (Accessed on 08/11/2023)
[35] Ibid
[36] The World Bank., 'Enhancing the Climate Resilience of Africa's Infrastructure: The Roads and Bridges Sector.' Available at https://www.worldbank.org/en/topic/transport/publication/enhancing-the-climate-resilience-of-africas-infrastructure-the-roads-and-bridges-sector (Accessed on 08/11/2023)

development goals[37]. It has been pointed out that the transport sector has an important role to play in the reduction of the continent's emissions with Africa still highly reliant on petroleum which accounts for around a quarter of Africa's energy supply and is the most important energy source on the continent[38]. For example, Africa has all the raw materials needed for vehicle electrification, its potential for generating renewable electricity is immense, many cities and urban quarters have yet to be built, and the population is young and open to digital technologies – all which are viable conditions for creating modern, net-zero mobility[39].

Africa Union's *Agenda 2063*[40] acknowledges the importance of sustainable transport and infrastructure in Africa's economic development. Agenda 2063 identifies that infrastructure gap remains a key constraint to Africa's development and provision of basic services[41]. It seeks to expand Africa's infrastructure including railway and road networks, port facilities and other transport infrastructure to enhance connectivity, spur trade and economic growth and create jobs and putting in place the appropriate funding arrangements and instruments[42]. Agenda 2063 further seeks to ensure that every citizen in Africa has affordable and sustainable access to quality transport and other services[43]. It further seeks to ensure that all urban mass transport will operate on renewable and low to zero emissions fuels[44].

However, it has been asserted that the sustainability of transport and infrastructure in Africa is hampered by factors such as inadequate finance, governance and policy

[37] Ibid
[38] Hochfeld. C., & Bongardt. D., 'Leapfrogging to Sustainable Transport in Africa.' Op Cit
[39] Ibid
[40] Africa Union., 'Agenda 2063: The Africa we Want.' Available at https://au.int/sites/default/files/documents/33126-doc-framework_document_book.pdf (Accessed on 08/11/2023)
[41] Ibid
[42] Ibid
[43] Ibid
[44] Ibid

problems, planning inefficiencies and limited technical capacity[45]. Further, it has been asserted that many African countries and cities are now growing without a proper urban transport and infrastructure development plan which results in little emphasis on public or mass transport, a sprawl of urban slums, a massive influx of imported cars on a limited and weak infrastructure, paralyzing congestion, widespread pollution, high rates of car accidents and fatalities, and less road safety for pedestrians[46]. Further, greenhouse gas emissions from the transport sector in Africa are growing at a fast rate due to high urbanization rate, quantity of imported cars per year, and low standards for acceptable vehicle emissions[47]. It is therefore imperative to embrace sustainable transport and infrastructure in Africa.

3.0 **Way Forward**

There is need to embrace sustainable and low carbon transport and infrastructure in Africa. Low-carbon transport and infrastructure systems are critical to creating a more equitable, resilient and healthy future[48]. Further, sustainable transport and infrastructure can enhance better compliance with environmental, health and safety regulations, lower fuel costs, promote more reliable and efficient maintenance procedures and increase asset availability, better asset performance and longer asset lifespans[49]. It has been asserted that fostering low carbon transport can be achieved through avoiding demand by transportation, shifting transportation towards cleaner modes and adopting efficient technologies[50]. Achieving these goals requires policies that address all emission sources associated with transport and infrastructure[51]. It has also been asserted that transformation towards sustainable transport and infrastructure calls for integrated

[45] Okoro. C., Musonda. I., & Agumba. J., 'Validity and Reliability of a Transportation Infrastructure Sustainable Performance Framework: A Study of Transport Projects in South Africa.' Op Cit
[46] The World Bank.,' Sustainable, Safe and Efficient Transport for the People of Africa.' Op Cit
[47] Ibid
[48] Brickstone., 'Low-Carbon Infrastructure in Curbing Climate Change.' Op Cit
[49] Flinders. M., 'How to Build more Sustainable Transportation Infrastructure.' Op Cit
[50] United Nations Economic Commission for Latin America and the Carribean., 'Towards Low-Carbon Transportation Infrastructures.' Available at https://repositorio.cepal.org/server/api/core/bitstreams/23644ccf-39a8-44b6-a99b-9e2abc732b94/content (Accessed on 09/11/2023)
[51] Ibid

approaches that bring together multiple stakeholders around shared objectives[52]. Such approaches should promote holistic, end-to-end analysis of different dimensions, including vulnerability risks and environmental impacts, that can help in the systemic identification and development of integrated solutions towards sustainable transport and infrastructure[53].

One of the key ways through which this can be achieved is through scientific advances and the rapid deployment of new technologies and innovations in the transport and infrastructure sector which are essential for the transition to sustainability at the scale and speed required[54]. Scientific advances and technologies such as built-in safety features, environmentally friendly fuels and engines, widespread digitalization, apps that process real time information, autonomous vehicles and intelligent transport systems have become central features of the transport and infrastructure innovation landscape[55]. Such advances have enabled low carbon infrastructure projects such as railway infrastructure; urban transport projects including metros and light rail projects which reduce car usage; and renewable energy projects including solar, wind, and hydropower which are essential in transitioning the transport and infrastructure sector towards sustainability[56]. It has been asserted that the transport sector in Africa and other parts of the world can embrace sustainability through the use of low and zero emission, energy efficient, affordable modes of transport, including electric and alternative fuel vehicles, as well as domestic fuels[57]. Science and technology can revolutionize the transport and infrastructure sector in Africa through the development and adoption of hybrid electric vehicles, battery electric

[52] United Nations., 'Sustainable Transport, Sustainable Development. Interagency Report for Second Global Sustainable Transport Conference. 2021.' Available at https://sdgs.un.org/sites/default/files/2021-10/Transportation%20Report%202021_FullReport_Digital.pdf (Accessed on 09/11/2023)
[53] Ibid
[54] Ibid
[55] Ibid
[56] Muigua. K., 'Enhancing Low Carbon Development for Sustainability.' Op Cit
[57] Office of the Energy Efficiency & Renewable Energy., 'Sustainable Transportation and Fuels.' Available at https://www.energy.gov/eere/sustainable-transportation-andfuels#:~:text=Sustainable%20transportation%20refers%20to%20low,as%20well%20as%20domestic%20fue ls. (Accessed on 09/11/2023)

vehicles, solar electric vehicles, fuel cell vehicles, improved diesel vehicles, alternative fuel technologies, material substitution technologies, smart traffic infrastructure/intelligent transport systems and the use of information technologies for traffic management[58]. There is need to embrace science and technology in order to foster sustainable transport and infrastructure in Africa.

In addition, sustainability can be enhanced in the transport and infrastructure sector through the use of sustainable construction materials. It has been pointed out that materials such as net-zero carbon dioxide concrete elements, carbon dioxide free steel with improved corrosion resistance, or fit-out materials with reduced volatile organic compound emissions are preferable and can enhance the sustainability of transport and infrastructure systems[59]. Further, an increased adoption of green construction materials including fly ash based bricks, Reinforced Cement Concrete (RCC) blocks, cellular lightweight concrete, bamboo-based materials and bagasse boards; efficient lighting system; and adoption of nature-based infrastructure can aid in the reduction of greenhouse gases and improved efforts towards tackling climate change toward sustainability in Africa[60]. Further, it also imperative that transport and infrastructure projects should be awarded to bidders with proven track record in areas such positive sustainability impact, energy efficiency and environmental standards, efficient use of natural and renewable capital, and employment local workers in order to enhance sustainability[61]. There is also need to enhance the reuse and recycling construction waste in order to foster sustainability[62].

[58] Verma. R., 'Role of Science, Technology and Innovation in addressing Climate Change.' Available at https://thesciencepolicyforum.org/articles/perspectives/role-of-science-technology-and-innovation-inaddressing-climate-change-a-perspective/ (Accessed on 09/11/2023)
[59] Milani. L., Mohr. D., & Sandri. N., 'Built to Last: Making Sustainability a Priority in Transport Infrastructure.' Op Cit
[60] Verma. R., 'Role of Science, Technology and Innovation in addressing Climate Change.' Op Cit
[61] Milani. L., Mohr. D., & Sandri. N., 'Built to Last: Making Sustainability a Priority in Transport Infrastructure.' Op Cit
[62] Ibid

Further, it is important to enhance the resilience of Africa's transport and infrastructure systems including roads and bridges. It has been correctly pointed out that such infrastructure is particularly vulnerable to climate stressors such as higher temperatures, increased precipitation, or flooding[63]. Climate-related damage to road, bridges and other vital infrastructure in Africa often causes frequent disruptions to the movement of people and goods, with direct consequences on economic productivity[64]. It is therefore necessary for African countries to enhance the climate resilience of their infrastructure through measures such as adequate maintenance and investing in sustainable and long lasting infrastructure[65].

Finally, there is need to address structural, legal, policy and capacity challenges which hinder the adoption of sustainable transport and infrastructure in Africa. It has been asserted that the sustainability of transport and infrastructure in Africa is hampered by factors such as lack of finance, governance and policy problems, planning inefficiencies and technical capacity[66]. The United Nations observes that these challenges have resulted in large gaps between developed and developing countries and between urban and rural areas in embracing sustainable transport and infrastructure which gaps could widen unless deliberate efforts are made to close them[67]. It advocates for measures such as increased scientific and technological cooperation between developed and developing countries, innovations in governance at the institutional and policy levels, effective legislation and regulation at the national and sub national levels, capacity building, sustainable procurement and international agreements and standards[68]. There is also need

[63] The World Bank., 'Enhancing the Climate Resilience of Africa's Infrastructure: The Roads and Bridges Sector.' Op Cit
[64] Ibid
[65] Ibid
[66] Okoro. C., Musonda. I., & Agumba. J., 'Validity and Reliability of a Transportation Infrastructure Sustainable Performance Framework: A Study of Transport Projects in South Africa.' Op Cit
[67] United Nations., 'Sustainable Transport, Sustainable Development. Interagency Report for Second Global Sustainable Transport Conference. 2021.' Op Cit
[68] Ibid

for enhanced financing for sustainable transport and infrastructure from a range of sources including multilateral, private and public sources[69].

Through the foregoing among other measures, sustainable transport and infrastructure will be fostered in Africa.

4.0 Conclusion

The transport and infrastructure sector is essential in fostering economic and social development across the world[70]. However, the sector is also a major cause of environmental and social challenges including climate change as a result of greenhouse gas emissions and deaths as a result of accidents especially on roads[71]. Sustainable transport and infrastructure is therefore seen as a means of ensuring that the sector is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts associated with transport and infrastructure[72]. However, the sustainability of transport and infrastructure in Africa is hampered by factors such as inadequate finance, governance and policy problems, planning inefficiencies and technical capacity[73]. Measures that can be adopted towards fostering sustainable transport and infrastructure in Africa include embracing low carbon transport and infrastructure, fostering science, technology and innovation; use of sustainable construction materials; enhancing the resilience of Africa's transport and infrastructure systems; increased scientific and technological cooperation between African countries and developed countries; effective legislation and regulation; capacity building and enhanced financing for sustainable transport and infrastructure[74]. Fostering Sustainable Transport and Infrastructure in Africa is necessary, and possible.

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[69] Ibid
[70] Okoro. C., Musonda. I., & Agumba. J., 'Validity and Reliability of a Transportation Infrastructure Sustainable Performance Framework: A Study of Transport Projects in South Africa.' Op Cit
[71] International Institute for Sustainable Development., 'The Road to Sustainable Transport.' Op Cit
[72] Ibid
[73] Okoro. C., Musonda. I., & Agumba. J., 'Validity and Reliability of a Transportation Infrastructure Sustainable Performance Framework: A Study of Transport Projects in South Africa.' Op Cit
[74] United Nations., 'Sustainable Transport, Sustainable Development. Interagency Report for Second Global Sustainable Transport Conference. 2021.' Op Ci

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