Investment Opportunities in Smart Infrastructure in an Uncertain World

Defining Smart Infrastructure:

Royal Academy of Engineering: Smart Infrastructure: the future: Smart infrastructure' responds intelligently to changes in its environment, including user demands and other infrastructure, to achieve an improved performance.

A smart system uses a feedback loop of data, which provides evidence for informed decision-making. The system can monitor, measure, analyse, communicate and act, based on information captured from sensors. Different levels of smart systems exist. A system may:

- collect usage and performance data to help future designers to produce the next, more efficient version;
- collect data, process them and present information to help a human operator to take decisions (for example, traffic systems that detect congestion and inform drivers);
- use collected data to take action without human intervention

There are examples of each level of smartness already operating, but the same principles can be applied far more widely across interconnected and complex infrastructures.

UNCTAD: Smart infrastructure provides the foundation for all of the key themes related to a smart city, including smart people, smart mobility, smart economy, smart living, smart governance and smart environment. The core characteristic that underlies most of these components is that they are connected and that they generate data, which may be used intelligently to ensure the optimal use of resources and improve performance.

Principles of smart infrastructure

- **Data**

Data are at the heart of all smart technology. As smart infrastructure is rolled out into different areas of our society, there will be a vast explosion of data generated and data ownership will become increasingly important.

- **Analysis**

Selective sampling of this information, careful fusion of data and interpretation through robust mathematical modelling will provide highly reliable decision-making tools to benefit individuals,organisationsandgovernmentsalike.

- **Feedback**

Smartness is about gathering information on the way an asset is used and using that information to improve the way that system operates. The data feedback loop is fundamental to any smart system.

- **Adaptability**

There will be huge gains from making smart systems that can meet future needs and absorb future technologies with much less replacement and expensive re-engineering. Redundancy is currently built into systems because assumptions about what may go wrong have to be made. If data can be collected to enable a system to be well maintained, designs that are more efficient can be developed.

African context and perspective:

What does it mean for Africa? Why smart infrastructure? So many opportunities in:

- **Climate change**
- **Structural transformation through Industrialization – smart industries for green economy**
- **Agriculture- smart agriculture**
- **Urbanization – smart cities – our cities are clogged**
- **Transport**
- **Energy**
- **Communication**

Energy: Grid or renewable energy or both?

For the National Grid, smartness is all about the timely use of information – getting that information at the right time and place so that informed decisions can be made. YAKA- in uganda

Water, sewage systems and waste management:

Smart water systems are important in delivering more integrated and resilient water, wastewater and flood protection infrastructure to meet the current and emerging global sustainability and climate change challenges.

Transport: land, sea and air:
Transport being smart does not necessarily solve all problems because the infrastructure operators have no control over when people want to use the network – smartness needs to reach user level.

Is it about Self driven cars?

Maritime Transport:
The strongest benefit smartness has brought marine transportation systems is the deep integration of vessels at sea into transportation systems ashore.

Communication:
Most communications devices and networks are relatively smart already, however other smart infrastructure depends upon communications.

- Mobile banking in Africa:
- Discoveries of Applications that can be used by the rural masai pastoralists
- An app to determine a counterfeit medicine from the original

For starters, can elected officials justify using scarce public resource to build low-carbon, climate-resilient infrastructure?

The SDGs chart a path for eliminating poverty and securing a better life for all by 2030 on the other hand Africa's Agenda 2063 *"a global strategy to optimize use of Africa's resources for the benefits of all Africans"* envisions *"an integrated, prosperous and peaceful Africa, driven by its citizens and representing a dynamic force in the international arena"*.

Both Agenda's are synchronized and both call for social and economic structural transformation of Africa through commodity or resource based Industrialization that will lead to inclusive growth and sustainable development. It's is this demand for sustainability that we need to focus on.

While the two agendas are for using on achieving sustainable development, the Paris accord seeks to stabilise global carbon emissions by the second half of the century, through a rapid move away from high-carbon energy, transport, housing and land use towards efficient, low carbon, climate-resilient alternatives.

However, the window for making such choices is narrow because the existing and projected carbon emissions show the urgency of implementing the Paris commitments the infrastructure projects are time-consuming and long-lasting.

Power plants, for example, take from five to 15 years to plan and build and can then last for half a century. And 70% of the forecast increase in emissions from developing countries is expected to come from infrastructure that has yet to be built.

This means that infrastructure decisions that will be made in the next few years could cement the ability to meet the Paris goals – or condemn the world to a future in which global temperatures rise well above 2C. In the latter scenario, environmental conditions could be so hostile that development goes into reverse, leading to rising poverty and social conflict.

Urbanization: Rapid urbanization is a global phenomenon. In 2008, for the first time in human history, there were more urban dwellers than rural. Current estimates suggest that by 2030, over 60 per cent of the global population will be living in cities, increasingly concentrated in Africa, Asia and Latin America.

We know some countries such as Kenya and now Tanzania are thinking of building new or satellite cities, is this a wake-up call?

Industrialization:

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On the other hand, Commodity based industrialization requires high productivity of the in the commodity based sectors particularly mining.

Unfortunately, infrastructure planning is largely disconnected from industrialisation and climate change agendas for many governments and the current economic downturn threatens to widen this disconnect.

Africa suffers from low agricultural productivity levels, partly as a result of inadequate rural infrastructure, especially roads, energy supply and irrigation. This also impacts heavily on mining and although we have seen a surge in Resource based corridors, these have their predicaments and in most cases need to well negotiated to serve multi-purpose and multi-user needs

- **On average, 60% of the rural people in middle-income countries live within two kilometres of an all-season road.**
- **The figures in Africa are much lower.**
- **In Kenya, for example, only about 32% of the rural people have the same level of access.**
- **The statistics for Angola and Malawi are 31% and 26% respectively.**
- **For Tanzania, it is 24%, 18% for Mali and 11% for Ethiopia. Agricultural development in these countries is heavily influenced by access to rural infrastructure.**

However, the window for making such choices is narrow. As nations set out to reflect these commitments in planning and budget processes, they face difficult choices: **What choices can be made to achieve these bold resolutions?** especially for Africa that still needs to industrialise using its huge untapped resources:

- Which energy?- is it coal or renewables?
- Transport?- Highways or public transport?

- Urbanization: Suburban sprawl or compact cities?

What can be done by Africans to overcome this in the current uncertain scenario?

Potential to take a **Giant Leap** –Africa can leapfrog and doesn't have to follow the same path the industrialized nations took that has brought us where we are- **smart infrastructure** is the right path to achieve green economy, inclusive growth and sustainable development. This however requires huge resources: capital. Human, technology, innovation etc.

Main challenges encountered in the implementation of smart infrastructure projects, (a) localization of smart infrastructure; (b) skills gaps; (c) lack of finance; (d) application of a suitable governance as well as business model; and (e) inclusivity among others.

The AU Heads of State underscore the urgency of Africa to put in place adequate infrastructure that is needed to achieve the Agenda 2063 and SDGs. They recently endorsed a "**High Speed Train**" project as one of the Agenda 2063 flagship projects to complement the longer-term Programme for Infrastructure Development of Africa (PIDA) alongside commodity strategy for industrialization. However this requires accompanying bold decisions:

High-speed rail in South Korea was designed to help the country build up the associated engineering and managerial capabilities. One of its outputs was the creation of the Korean Rail Research Institute, set up in 1996 to develop railway transportation and enhance competitiveness in the sector.

In his Vision Statement, as a Candidate for President of the African Development Bank, Dr. Akinwumi Adesina offered to implement an "***Integrated smart-infrastructure for productivity growth and competitiveness: to target and focus infrastructure projects by considering the entire development ecosystem for operational effectiveness, scale, socio-economic, and environmental impact, while ensuring green growth".***

Could this be a starting point to get African leaders to rally behind him? This will require a strong political commitment in taking bold decisions to put in place a set of key prescriptions including policy, legislation, regulations (regulatory frameworks), public investment to leverage foreign investments, to mention but a few

Policy prescription: Infrastructure projects are inherently technological in nature. They represent bundles of scientific and technical knowledge embodied in both equipment and human capabilities. Taking full advantage of infrastructure's technological potential requires a more sophisticated approach to policy, procurement practices, and project design. The first

step is recognising the magnitude of the challenge and the associated opportunities.

The design, construction and maintenance of infrastructure projects involves considerable accumulation of knowledge and capabilities – not mentioning boosting of domestic industries through application of "local or Regional Content" .

Policymakers must recognise the potential to tap this knowledge to benefit the wider economy. ***Unfortunately, the design of such projects in Africa tends to focus most on awarding contracts to the lowest bidder, not seeking to maximise technological capacity.***

Ironically, this vision existed in much of colonial Africa. When the British built the Kenya-Uganda rail in the late 19th century, they included a technical facility for repair and maintenance. Over the years, African infrastructure projects have increasingly been delinked from their technological content and are therefore underperforming.
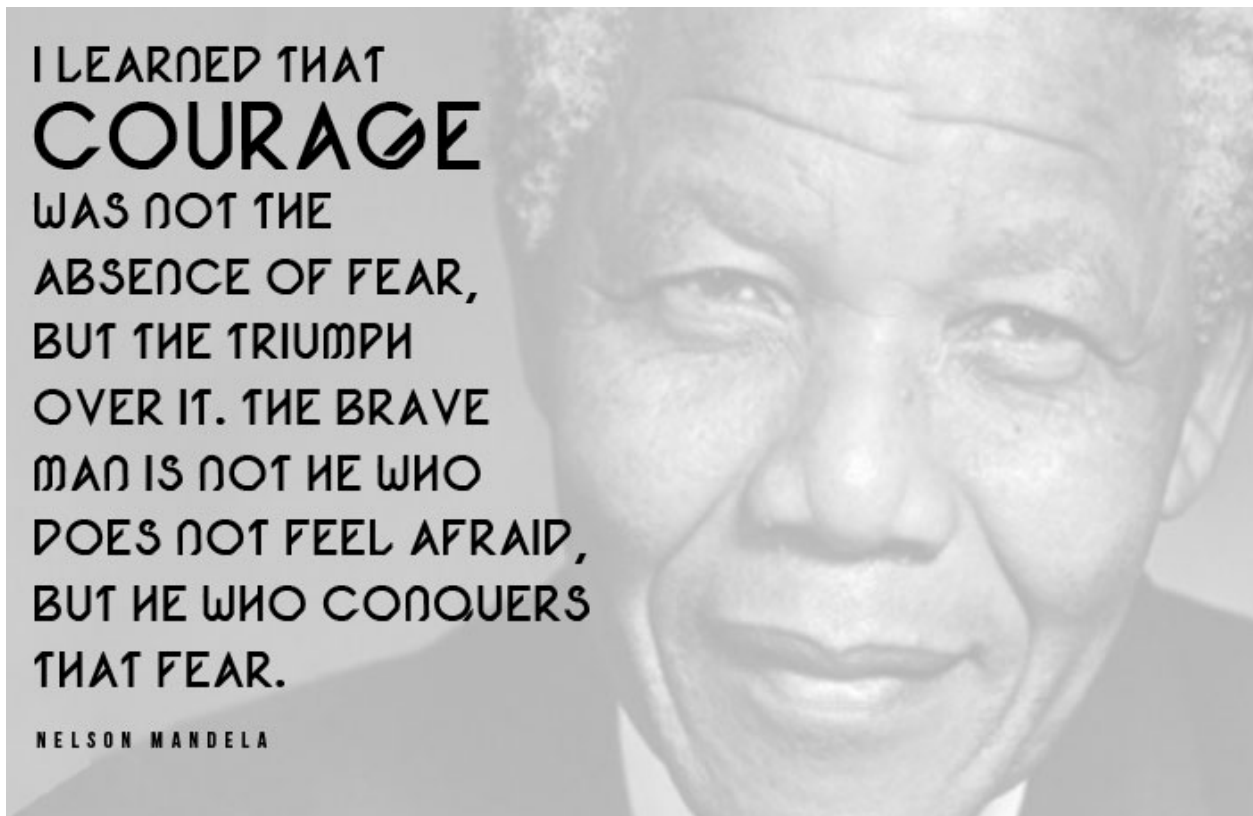
Legislation Regulatory framework:: A well though out and clear legislation embedded into the country's laws and regulatory frameworks is key for governance to ensure there is low oust and efficient way of doing business. Reduce bureaucracy and red-tape but above all protection of property rights including IPR in designing and innovation. Protection of investments is key to attracting long-term investments into the Infrastructure.

Public investment to leverage foreign investment: The African Development Bank has estimated that Africa will need to invest **$93 billion annually over the next decade to meet its infrastructure needs**. The estimate for Nigeria alone is **$15 billion** a year. South Africa envisages investing nearly **$462 billion from 2012 to 2027**.

A large part of this investment will come from overseas but will require that African countries put their own resources to leverage this external resources. Most of the domestic public investment could be towards soft Infrastructure such as generation and analysis of data as well as skills required for smart infrastructure in order to attract foreign investments.

Indeed, Africa's growing trade with China includes building infrastructure projects. Most of this has been in transport. The recent creation of the China-led Asian Infrastructure Investment Bank (AIIB) will strengthen the country's role as a source of funding not only for Africa but also for many other regions of the world, including in the industrialized countries.

In this regard let me conclude with a wise saying from Mandela

In the presence of the storm, thunderbolts, hurricane, rain, darkness, and the lions, few of existing infrastructure such as TAZARA were build against all odds. So we, are blessed to have all the necessary technology to mitigate all the risks of the unknown or uncertainty.

Africa still has huge opportunities for investment and we are better placed today that then and time to act is now not tomorrow, for who knows what tomorrow will bring?

Thank you