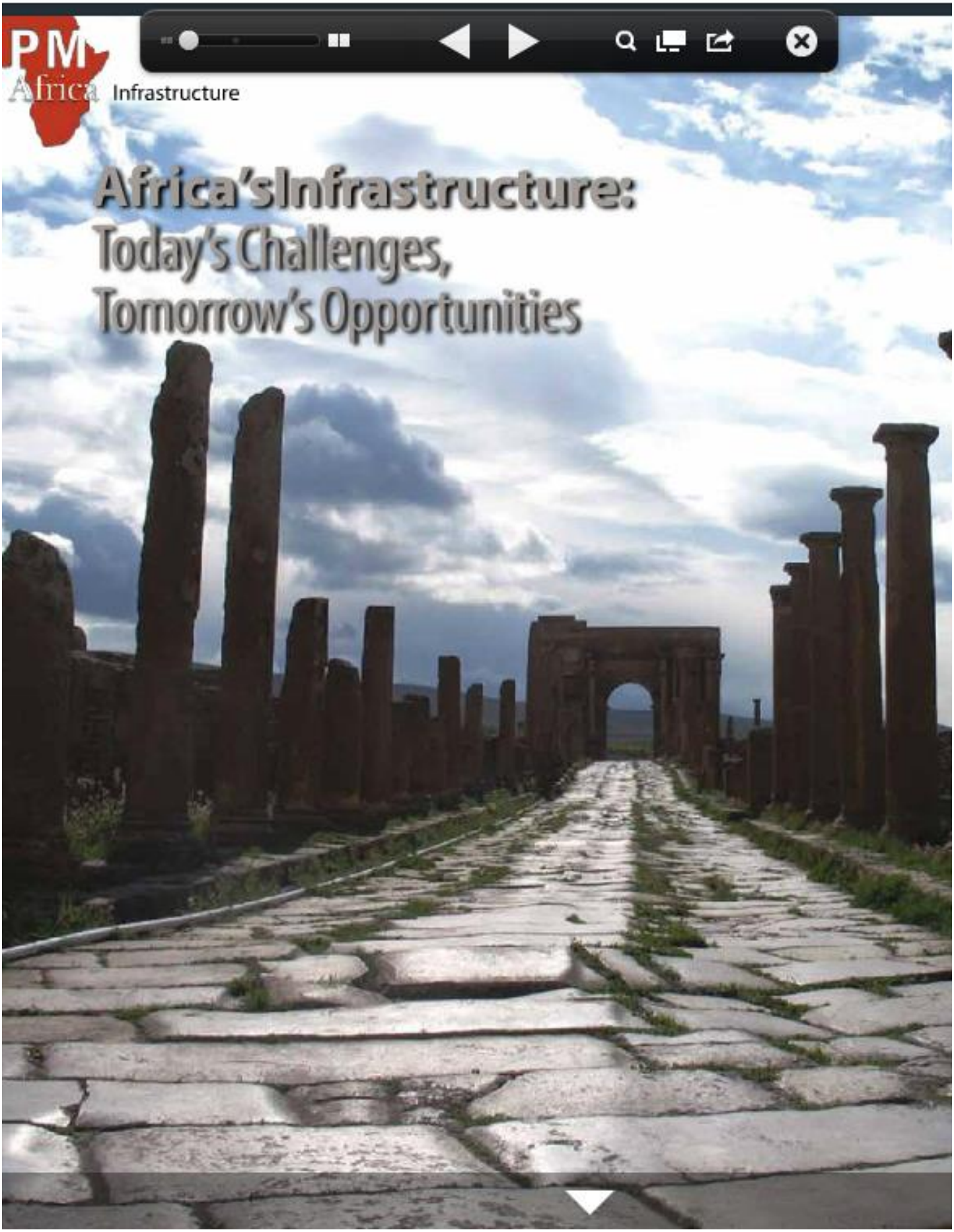
Africa's Infrastructure: Today's Challenges, Tomorrow's Opportunities



The history of Rome suggests that classical Romans used many different forms of "engineering" to create and maintain a relatively complicated infrastructure. For instance, the huge demand for water in the city led Roman engineers to design and erect aqueducts (that reached almost 100 km, a great achievement at that time) to bring over 800 litres of water per day to the average Roman citizen –in comparison, despite nowadays sophisticated lifestyle, residents of modern cities could still enjoy a good life withjust 150 litres per capita per day.

This alone contributed significantly to the improvement of hygienic conditions in the City of Rome; no more excuses for not taking a daily bath as they enjoyed the luxuries of Rome's public baths, and practisingopen defecationwas no longer tolerated as they had public toilets equipped with sinks. Moreover,abundance of running water might have led to the "lifestyle" of enjoying lush gardens adorned with fountains and pools, now a lasting feature of the Roman civilisation that we all are seeking to emulate and replicate in our residences, especially in high-income suburbs.

What could have been the glory of the City of Rome without its aqueducts and roads?Well, this question will possibly resonate with Henry Morton Stanley's declaration at the end of the 19th century: "Without the railroad, the Congo is not worth a penny", stated the famous explorer, whom the locals so aptly surnamed "BulaMatari" (translated, "Breaker of Rocks" or trailblazer).

More than a century later, it appears that up to recently most African countries have not heeded the call of that quote to build sustainable infrastructure that will afford and sustain both decent lifestyle and economic development to their populations, despite all the potentials sogenerously bestowed on Africa.

While most continents have raised their standard of living and economic viability, Africa has not only fallen behind, but has sharply regressed in some specific areas of infrastructure development. A recent World Bank report [Africa Infrastructure Country Diagnostic, 2008] shockingly indicated that Sub-Saharan Africa has dropped from a position of possessing as much as three times power generation capacity per million people (in 1970s) to just a mere half of what South Asia could produce (in 2000s), a six-fold relative decline in thirty years.In fact, the combined electricity generation of 48 Sub-Saharan countries (with a combined 800 million population) is roughly the same as that of Spain (with a 45 million population).

The Merriam-Webster Dictionary defines infrastructure as constituting the structural elements of an economy which allow for production of goods and services without themselves being part of the production process, e.g. railways and roads allow the transport of raw materials and finished products.Thus, as we have already alluded to above, a functioning infrastructure not only raises and sustains a decent lifestyle amongst the population (e.g., ease of transportation with rapid trains; access to electricity, water and sanitation;access to effective medical care;positive change in human behaviour through access to information via internet and television), but it also creates numerous opportunities for economic growth, which if well-directed, will further improve and sustain the living conditions of the same population. This is achievedby suitably developing the infrastructure required to meet socio-economic needs and wants of most portions of a population.

Economic growth is generally supported and/or upturned through economic activities that take place during the "construction phase" of infrastructure projects (e.g., thousands of short-term jobs and substantial supply of services, material and equipment) as well as "post-completion" of the infrastructure (e.g., reduced imports, increased exports, reduction in costs of doing business duetosmart logistics, secure supply of utilities such as electricity, water and ICT services, stable jobs).

To date, inadequate infrastructure still constitutes a major constraint to Africa's economic growth; the oil and mineral commodity boom of 2000s (although now fading) might have given Africa a good boost in terms of improvement in the macro-economic environment of many countries. But this growth performance (which buoyed a marked advance in the penetration of mobile telecommunication services) was dimmed by a relentless deterioration in the quantity and quality of power infrastructure over the same period; for instance, in 2010, only 20% had access to electricity, but 53% had access to mobile phones– hence, the ironic scenario of housewives in rural areas of Sub-Saharan Africa still travelling for kilometres to fetch water, while their kids trek in the opposite direction to the next town to have their mobile phones battery-charged for a fee.

The same World Bank Report (cited above) suggests that in most African countries, infrastructure emerges as a major constraint on doing business (and sustaining economic activities) and is found to depress firm productivity by around 40 %, with even more detrimental effect to the economy than crime, red tape, corruption, and constraints in the financial market. Well, in South Africa, the recent spate of load-shedding (supply interruptions, in simple English) coupled with a chronic drop in quality of supplyof electricity (e.g., erratic voltages) has negatively affected many businesses and put a noticeable blight on one of the most advanced power utilities on the continent, to the extent that the World Economic Forum currently ranked South Africa well below other Sub-Saharan countries for quality of electricity supply.

As if woes often come in pairs, according to household surveys, around 40 to

65 % of those connected to electricity and water utilities services do not appear to be paying for them, partly due torelatively high charges (e.g., above 5% of income). Secondly, there is an overwhelming legacy of underfunding for infrastructure maintenance (which usually attracts exorbitant costs for rehabilitating maintenance) – leaving utility companiesdry and unable to maintain their assets.

Just as the City of Rome could not have survived if not for its aqueducts and paved roads, many Sub-Saharan Africa countries face a simple choice: catch up with infrastructure development to sustain a modern lifestyle or else dig out caves to cater for an alternative lifestyle, while they still can – future generations will certainly not thank them for choosing the latter.

For instance, a 2013 KPMG Report suggests that the increase in annual water demand in Sub-Saharan Africa may reach 440 Billion m3by 2030, a staggering 283% if compared to 2005 – while China or India will only increase demand in volume, therefore in infrastructure capacity, by ± 60%.The excessively high rate of urbanisation in Sub-Saharan countries is the main contributor here; rural areas are not able to offer citizens the kind of lifestyle they hear is only found in big cities. Africa has experienced the highest urban growth during the last two decades at 3.5% per year and this rate of growth is expected to hold into 2050, with up to 65% of "urban" population in Sub-Saharan countries classified as slum dwellers – the highest in the world.

How do we even begin to breach an infrastructure gap of such continental proportions? We may need to consider our infrastructure challenges in terms of areas of deficits and inefficiencies. It is commonly accepted that Sub-Saharan countries have infrastructure deficits in the following areas:

- Road Connections (31 km of paved road per km¬2of surface area compared to 134 in other low-income countries, LICs);
- Telephone Line Density (10 lines per thousand population, compared to 78 in other LICs, the gap being much less with mobile telephones at 55 versus 76);
- Power Generation Capacity (37 MW per million population, compared to 326 in other LICs);
- Electricity Coverage (16 % of population, compared to 41% in other LICs);
- Improved Water (60 % of population, compared to 72% in other LICs); and
- Improved Sanitation (34 % of population, compared to 51% in other LICs).

The World Bank in 2010 estimated the total infrastructure needs of Sub-Saharan countries to almost US$ 93 billion per annum, a third of which accounting for operating and maintenance costs, with power supply carrying the biggest bowl at US$ 40.8 billion per annum and water supply, sanitation and transport combined tagging US$ 40.1 billion per annum. Assuming the published figures of US$ 48.1 billion per annum for current infrastructure investment are true, we might need to deal with an infrastructure gap of US$ 30.7 billion per annum.

The good news, however, is that infrastructure expenditure in Sub-Saharan Africa is expected to increase by 10 % a year from US$ 70 billion last year to US$ 180 billion by 2025, with South Africa and Nigeria accounting for the bulk of this expenditure [Business Report, Dec 3 2014].

Indeed, the PwC's Capital Projects & Infrastructure in East Africa, Southern Africa and West Africa Report confirms that the global economic slowdown since 2008 had not had a major impact on South Africa's infrastructure spending, with investment in infrastructure growing relatively consistently from an estimated US$ 7 billion in 2001 to US$ 22 billion by 2012 – and it is expected that power generation will be the key priority for infrastructure investment, followed by road and rail transportation (likely to grow to just short of US$ 9 billion by 2015) and sanitation services, said the report. This must be music to the ears of many engineers and other projects consultants.

Nevertheless, engineers and project consultants involved in the planning and execution of infrastructure projects in Sub-Saharan Africa (SSA) will have to find ways and means of addressing a number of inefficiencies, and the project management fraternity may take note of the following:

High Price of Infrastructure Development

A fatal combination of inadequate local expertise at national and regional level, an extremely low density of (economically active) population in rural areas, and poor economies of scale (e.g., 21 SSA countries fall below the minimum efficiency scale of 200 MW electricity generation) is making Africa pay US$ 400 per capita for water supply infrastructure compared to half elsewhere, and pay US$ 0.30 per KWh for power production compared to US$ 0.10 (a mere third) elsewhere. African engineers and project managers shall find innovative designs and work methodologies thattacklesuch diseconomies.

(a) High Burden of Infrastructure Investment per GDP

According to the World Bank, SSA required infrastructure spending translates into some 12% of Africa's GDP. A closer examination, however, will suggest that some SSA countries are to devote up to 20 % or even 40 % of their GDP to infrastructure development, operation and maintenance. Project sponsors and managersshall tightly manage issues such as exposure to forex/inflation, construction costs, and procurement inefficiencies to control total capital costs – and securing inexpensive capital from China, India and Arab countries coulddefinitively help.

(b) Over-budgeted Investment and/or Poor Spending

Given the current poor records on capital expenditure (e.g., up to 50% underspend), and the notoriouspilferage of project monies, any form of budgeting more capital than necessaryshall be avoided (*e.g.*, "excess expenditure" is currently estimated at US$ 8 billion per annum).

(c) High Charges for Infrastructure services:

The price of services provided is excessively high by any standard. For instance, power could cost up to 0.46 US$/KWh as compared to 0.05 to 0.10 US$/KWh in other developing regions; water could cost up to 6.56 US$/m3 as compared to 0.03 to 0.06 US$/m3 in similar regions; and Internet access varies from 6.7 to 148.0 US$/monthas compared to 50 in South Africa and 11 other developing regions. It is believed that reducing the cost of financing and of construction, operation and maintenance of the infrastructure by way of design will significantly reduce such exorbitant infrastructure service charges.

(d) Poor Rate of service charge Collection:

SSA countries suffer from inefficient (often bloated) charge-collection administration combined with ill-inspired socialistic policies of free-package schemes that result in "less than 50%"collection rates. This has often resulted in utility companies lacking the financial muscle to operate and maintain the (already expensively-acquired) asset base. Luckily, these are evils only policymakerscancorrect, not engineers and projects managers, except reminding them thatunaffordability of charges due to overpriced designs and execution worsens this situation.

(e) Service Distribution Losses:

Unaccounted losses in most SSA countries are generally estimated at twice as high as best practical – this is a thing design and maintenance engineers could contribute to solving; broken pipes, leaking reservoirs can be fixed … and we are even lucky electricity does not evaporate!

Fellow engineers and project managers in Sub-Saharan countries, those many wickedchallenges are standing in our face – but we shall be glad that opportunities to address such are in our hands!

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