1. Sudan Infrastructure Sector Overview

Disclaimer: Please note that due to succession there is a paucity of studies and data available for Sudan. Much available material dates back to 2011-2012, and many data sets have not been refreshed since 2012. Therefore whilst every effort has been made to provide an accurdate overview of the infrastructure sector in Sudan, further research is needed.

1.1 Economic Opportunity and infrastructure

The US has lifted most of the economic and trade sanctions it first imposed on Sudan two decades ago, however in practice there has not been an immediate rush by western foreign investors into Sudan and most remain wary of business connected with the country. In this vacuum Arab partners, particularly Turkey, Saudi Arabia, Qatar and UAE have stepped in to provide support.

The secession of South Sudan in 2011 and its descent into civil war in 2013 has been economically disastrous for Sudan, severely reducing government revenue and resulting in high inflation and recurring commodity price crises which have led to violent protests and the tightening of authoritarian rule. Sudan holds heavy external debt and debt relief processes are stalled due to conflict in South Sudan. These constraints on borrowing and government revenues mean that infrastructure – both expansion and maintenance – is chronically underfunded.

Immediately prior to the secession of South Sudan, Sudan had invested heavily in infrastructure. Power generation capacity tripled from 800MW in 2005 to 2,687MW in 2007, with a shift toward hydropower. Sudan has the potential to be a major hydropower exporter if additional capacity could be developed and transmission links with neighbouring Nile Basin countries strengthened, allowing for transboundary political challenges. In ICT, Sudan has been successful in liberalising the sector, resulting in the attraction of significant private capital. Sudan's most pressing infrastructure challenges lie in the water and transport sectors, which are major constraints on pro-poor growth in the agriculture sector (80% of employment relies on agriculture). Most of Sudan lacks access to safe sources of water.

Regional connectivity is a challenge. While internal road corridors are developed, connectivity with neighbours is weak. Port Sudan, the country's only major port, is affected by long dwell times, high costs, and capacity constraints. Another challenge is the inefficiency of networked infrastructure in a country with a widely dispersed population. Infrastructure provision is concentrated around Khartoum, which is a hub connecting five important economic areas: Port Sudan, Egypt and North Africa, the Eritrean border, Kordofan and Ethiopia. Across the rest of Sudan infrastructure provision is poor, particularly outside urban areas.

The following opportunities are key to promoting inclusive growth:

- **Growth and job creation:** Sudan invested a significant share of its oil wealth in infrastructure and utilities. The Sudanese road network grew by 80% between 2000 and 2008 and electricity generation doubled over the same period. This strong economic growth was accompanied by an expansion of the public sector. This trajectory was unsustainable, but there remains significant economic potential constrained by poor transport links and inefficient management of water resources in particular.
- **Inclusion and poverty reduction:** Sudan's economic development process has historically been unbalanced and disproportionately concentrated in Khartoum and its surrounding states. The poverty rate is significantly higher in rural areas which lack infrastructure. The polarisation and vast divergence in economic fortunes in Sudan is at least in part shaped by widespread conflicts and civil war.
- **Investment in infrastructure:** Addressing Sudan's infrastructure challenges will require sustained expenditure of almost $4.2bn per year over the next decade, mainly for capital investments (approx. 20% GDP). Sudan's annual infrastructure funding gap is $2.9bn per year (14% GDP), primarily associated with the water and transport sectors, each of which is more than $1bn short of resources.
- **Climate and environmental resilience:** Sudan experiences devastating and recurring droughts and is unable to cope with even current climatic variability. Major adaptation measures – both hard investment and better planning and systems – are required.

1.2 Stakeholder Analysis

Public sector	• Sudan rose to lower middle income status in the 00's due to oil wealth, but oil revenues have since fallen dramatically and the country continues to be marked by deep poverty and inequality. • Before the secession of South Sudan, Sudan had a large debt burden and fiscal deficits, and the economic growth model concentrated on oil wealth to the detriment of other sectors. The loss of oil revenue (50% of government income and 95% of exports) caused deep macroeconomic and fiscal challenges, reducing fiscal space for infrastructure.
Private sector	• Private investment in Sudanese infrastructure is significant, at 23% of total investment, while official development assistance (ODA) in this sector is negligible.

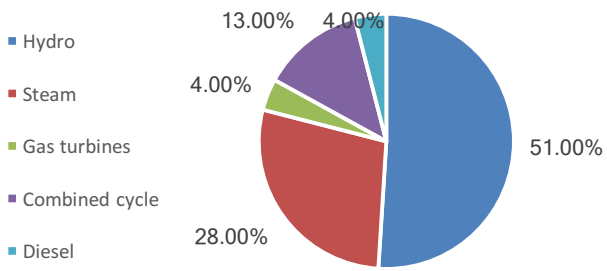
Donors	• US sanctions have been lifted but donors remain cautious (the UK has a policy of 'phased engagement') and Sudan remains suspicious of foreign development activities. • Donor activity in respect of infrastructure is minimal. • Turkish, Suadi and UAE governments are providing significant levels of finance and infrastructure development support.

2. Sectoral analysis

2.1 Energy

Overview

- Sudan has not established a comprehensive power supply for the country. Khartoum uses 87% of the country's energy.
- Only 32% of households have access to electricity (17.8% rural and 62.1% urban)
- Current peak demand is just over 3MW, and capacity is around 3.8MW, however power outages are common with blackouts often lasting 2-3 hours
- Sudan generates 95% of its current electricity supply, with only 5% imported via interconnector
- Peak demand is estimated to rise from 3MW to >8MW by 2030
- Electricity is priced below cost-recovery, resulting in c. $380m for the national utility, while distribution losses are worth $106m annually.
- Electricity generation is dominated by Hydro , generated at Merowe in the north, Upper Atbara and Seteit in the east, Sennar and the Roseires in the south, among others. The capacity of Merowe hydropower plant is 1,250MW. There is potential for small hydro at various sites around the country.
- Traditional biomass provides most of the energy needs of the local population especially those who live in the countryside with no access to electricity.
- Fuelwood and charcoal provide 75% of energy needs. Charcoal produced in 2015 amounted to 1,431 ktoe. The alternative biomass fuel sector is a growth industry with some sugar industries already using bagasse for cogeneration to supply their energy needs.
- Plans for renewable energy (excluding hydro) to represent 30% of installed capacity (13.6% of generation) by 2031
- Installed cogeneration capacity is just over 56MW. There are plans to use the alien invasive Mesquite shrub as a biofuel for domestic energy. In 2009, a bio-ethanol plant was established and in 2013 regulations to guide the biofuels industry were proposed.



Generation mix

Major investments
Hydroelectric

- High Atbara – Sitat – 320MW
- Kajbar – 360MW
- Dagash – 312MW

Thermal

- Port Sudan (Siemens) Open Cycle – 374MW
- Albagir Open cycle – 350MW
- Garri3(Saudi) Open cycle – 340MW
- Neem Project – 400MW

Other

- Nyala HFO Power Plant – 30MW
- Solar Energy Project ,Phase1 (200MW) Phase 2&3 (150MW each) Albagir Open cycle – 350MW
- Alfashir power plant (Diesel) – 15MW
- Ginena and Deian power plant 5 MW each (Diesel) – 10MW

2.2 Transport

Overview - Trade

- Traditionally Sudan has operated through one entry point, the Port of Sudan. strategically location on the centre of the west coast of the Red Sea, 1200km northeast of Khartoum and 260km southwest of Jeddah. The port handles general cargo, livestock, cement, containers, oil products, pesticides, and cars.
- However, corridors are also potentially possible through Ethiopia for both regional procurements and/or consignments coming through Djibouti port.
- Common trade constraints are security concerns and the impassibility of roads during the rainy season (May to October). In most deep field locations, no commercial transport options are available.
- Doing business rating is poor, ranking 170/180
- Costs of importing into Sudan are almost double the regional average -$1,128 vs $643 regional average

Import / Export of goods

Top 5 Exports	Top Destination
Gold	UAE – 99.6%
Crude Petroleum	China – 94%
Oily Seeds	China – 38%
Insect Resins	France – 40%
Dried Legumes	India – 91%

Overview - Transport

- Saudi Arabia, Turkey and the UAE have significant investments in transport and construction, including
- Khartoum International Airport is the primary air gateway to Sudan. $1.15bn Re-construction of, by Turkish construction company Summa is set to commence at the beginning of the coming year and hopes to attract regional passenger volumes
- Other air facilities around the country are 'financially unviable' (AfDB, 2017) and poorly functioning.
- Sudan's road network covers approximately 30,000 km of road, of which 7,000km are asphalted, 4,300km gravelled roads and the remaining 20,000 kilometres are unsurfaced.
- Road density is exceedingly low and traffic along

Unpaved roads are mostly impassable during the rainy season. Gravel roads connect Khartoum with Port Sudan, Atbara, Dongola, and Gedarif.

- Bus connections exist between Khartoum, Port Sudan and Kassala.
- Taxi services are available in big cities, but donkeys and camels are often used in villages.
- Sudan Railways Corporation operates one of the longest railways in Africa: a 4,578km long, single line route from Port Sudan via Atbara to Khartoum.
- Extensions to this line have been made for transportation of oil and access to Marawi Dam.
- The total length of the rail network is theoretically 5,500km. However, because of the conflict in the south and long term neglect, the quality of the rail tracks is very poor and only about one-fifth of the track length is in use. The network is also primarily single-track.

2.3 Digital Connectivity

Overview

- Sudan is one of the largest countries in the region with 55% of its population lives in small towns scattered across rural areas. As a consequence, despite the high competition and big investment, mobile-cellular and mobile broadband penetration are below average.
- The ICT sector has been liberalised and attracted significant private capital. Mobile penetration has improved from 1% in 2000 to 33% in 2009. Recent connectivity to an undersea cable has led to expansions in access, improvements in quality, and reduction in prices.
- The country has a relatively well-equipped telecommunication infrastructure by regional standards, including a national optical fibre backbone, wireless fixed line networks, but very limited fibre to the home connections.
- The launch of mobile and fixed LTE networks by several, competing fixed and mobile operators, the roll-out of an optical fibre backbone network, the expansion of CDMA2000 network in rural areas, and the use of satellite broadband services is expected to strengthen the Sudan ICT position among countries in the region.
- Three transnational operators offer mobile-cellular and mobile broadband services in Sudan: MTN, a Sudatel mobile unit, Sudani, and Zain.
- Unlike other mobile markets in the Arab States, where the incumbent retains a very large market share, none of the three operators in Sudan has a majority of the mobile market. As a result, the Sudan mobile market is very competitive.

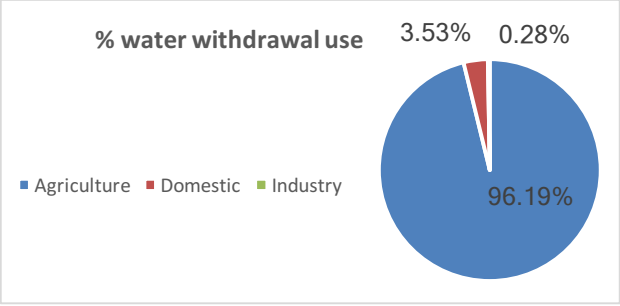
- All three mobile operators offer 3G services
- Sudan has a very competitive mobile market and consequently very low mobile-broadband prices.
- Responsibility for telecommunication policy is vested in the Ministry of Information and Communications (MCIT).
- There are two government bodies with Corporation (NTC), and the National Information Centre (NIC).
- NIC is primarily concerned with the use of ICT in government. NTC was established under the Telecom Act of 2001, which made it responsible for plans, policies and regulation (including regulating tariffs, licensing operators, frequency management and equipment), while the overall objective of NIC is expanding e-Government services in the country. The NTC funded the universal access and universal service projects through the Sudan ICT Fund, which was established in 2004, and has carried out a range of projects during the last 10 years.

2.3 Water and Sanitation

Overview

- Sudan experiences devastating and recurring droughts and is unable to cope with even current climatic variability.
- Over 25% of the population relies on surface water and almost 60% rely on wells and boreholes. higher than for any other country in its peer group.
- Water contamination from open defecation in surface water and leakages from septic tanks is common.
- Access challenges have been compounded by large inefficiencies at the water utilities. Inadequate collection of revenues, large distributional losses. Poor revenue collection has resulted in $120m pa lost revenues.
- Primary goals for the water sector include, increase access to clean water and sanitation systems, and improve efficacy and sustainability of utilities.
- The Dams Implementation Unit (DIU) plan to increase the number of dams from six to nine in order to increase water supply to populated areas of Sudan and provide irrigation systems. However the Niles Basin Initiative advised the DIU against construction, citing evidence from the scientific community that evaporation rates in Sudan are already too high and creating more dams would only increase them.
- Major water infrastructure development projects in Sudan are projected to cost $1bn over the next six years. Encouraging PPPs is vital if this is to be achieved.

Water use and reliance



Agricultural water use

- Primary crops; sorghum, cotton, groundnuts,

- Only 49.23% pop deriving livelihoods from agriculture
- 66% population rural and 55% rural poor
- Cultivated land was 21.25 million ha (9% of the total land area

Water security

- Groundwater is more readily available than other water resources during the long dry season. At least 80% of the population depends almost entirely on groundwater. Away from the Nile basin and other non-Nilotic river wells, groundwater is the only source of water. Available groundwater is 900BCM, with an annual recharge of 1,563BCM
- Harnessing rainwater and floods is not widely practiced and water harvesting is poorly developed. Although the practice is old, it is only carried out on a small scale.

Transboundary dependencies

In addition to the Nile river(s), Sudan shares seven transboundary aquifers with neighbouring countries for which there is no sharing agreement. The largest groundwater aquifer is the Nubian sandstone aquifer system.

2.5 Construction

Overview

- There is almost no publically available data on the construction sector
- What data exists is potentially outdates e.g. Construction was estimated as contributing 4% GDP in 2012
- 2014 reports note that the construction sector continues to grow, driven by the expansion of infrastructure public utilities as part of government commitments under the East Sudan and Darfur (Doha) agreements.
- In addition, the government's commitment to continue reconstruction in other conflict-affected areas, especially in Blue Nile and South Kordofan states, is expected to sustain growth in the construction sector.
- Sudan ranks 133/180 in obtaining construction permits. Time taken averages 270 days (twice the Sub-Saharan average), however building quality control is relatively strong, and permits cost only 2% of build value (5 times cheaper than SSA average)
- According to Sudan's 2011 Labour Force Survey 5.6% of working age people worked in construction (7.3% of male population, and only 0.4% of female). Proportion are dramatically higher in urban areas, where 9.4% of the population work in construction, making it the third largest employment sector in cities after services and trade.

Import of construction imports could improve productivity

- Surveys from an 2012 academic study on Sudanese construction industry performance noted that safety on some 50% of building sites was poor,

2.6 Urban Infrastructure

Overview

- Though the Sudanase population has been growing at high rates over the past 20 years, (c. 2.8% per annum) its urban population has been growing at much higher rates (about double the natural population growth rate).
- For a country of its size Sudan has relatively few large cities, with just 10% of its population living in cities of over 1 million
- Migration from rural areas has instead been focused focused on smaller urban centres
- 55% of its population lives in small towns scattered across rural areas
- This poses a challenge for urban service provision, and government policy has not kept pace with Sudan's rapid urbanisation and urbanisation trends.
- The Government of National Unity's Twenty-Five Year National Strategy (2007–2031) does not address urbanisation as a separate issue. The philosophy underlying this plan is the integration of different neighbourhoods through improved road networks and transport systems. It has been approved by Khartoum's State Cabinet but has already run into problems because of competing and conflicting interests between different parts of government, especially over land use.
- Although decentralisation has given subnational governments powers of taxation, land management, and social service provision responsibility are at times unclear, and significant wealth disparities between region creates challenges in achieving balanced growth and poverty reduction.

Urban Structure

% urbanised	34%
# urban residents	13,464,000
% living in informal settlements (capital)	50+%
Urban employment (%) - Total - Youth	 87.3% national 72.7% national

City size	# Cities	% Nat pop.	Tot pop.
Over 1m	3	10.78%	4,272,728
500k-1m	0	0%	0
100-500k	14	8.31%	3,288,208
50-100k	16	2.57%	1,021,054
20-50k	30	2.47%	978,692

Urban infrastructure overview

Energy	% of urban population with access to electricity Duration of a typical electrical outage	62.1% 2.3hrs
Water	% access to improved water % access to improved all piped water	63% 67%
Solid waste	% households receiving SWM	65%
Sewerage	% access to improved sanitation	23.6%

Dpt / Org	Initiative	£ value
DFID	Responding to Protracted Crisis in Sudan: Humanitarian Reform, Assistance & Resilience Programme	44m
	Sudan Stability and Growth Programme	9m
	Rural Water for Sudan Urban Water for Sudan	30m 20m

3.0 Ongoing x-HMG Engagement