

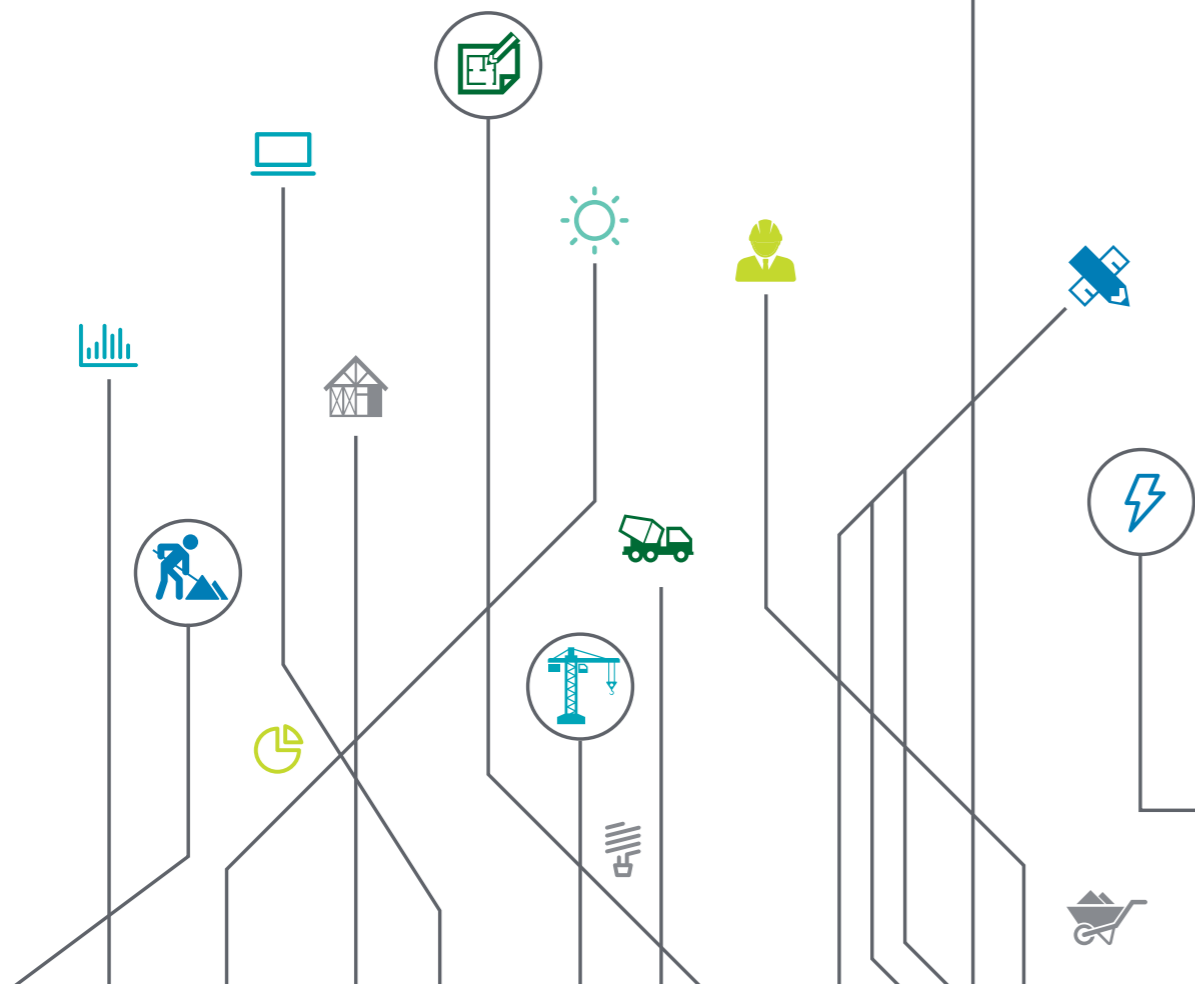


## Capital projects in a digital age

Africa Construction Trends Report  
2019

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# Foreword

The “Digital Capital Project” is more than just the use of automation and technology in capital projects, but a mechanism to fundamentally reshape how a project is planned, designed, constructed, operated and decommissioned.

In this year's *Africa Construction Trends (ACT) Report*, the value of digital transformation experienced by industries and stakeholders is more significant than ever.

At its core, the annual ACT report tracks infrastructure and capital projects activity in Africa. The report includes continental, regional and sectoral trends and also reveals who builds, owns and funds projects with a minimum project value of US\$50m that broke ground by 1 June each year. The analysis is complemented with an economic context section, focusing on Africa's economic outlook and gross fixed capital formation (GFCF) spend by region, and in select economies.

This year's thematic section is focused on capital projects in a digital age and is based on project owners' perspectives of their current digital transformation strategies, readiness and application of digital technologies across the capital projects lifecycle, and contextualising this with global trends.

Digital transformation provides a range of benefits that improve safety, efficiency, Return on Investment (ROI) and assurance that projects will achieve the outlined socioeconomic objectives set out for them from the start. Technology has advanced such that the barriers of high cost of entry and a very physical value chain are no longer protection against disruption. However, unless strategically planned, the investment in digital can be costly, time and resource-intensive and with benefits only attainable several years down the line. Projects require a strong digital strategy and solid data foundation to succeed, as this considers an organisation's current digital maturity and provides an achievable roadmap to adopt and sustain key technologies.

Digital tools and technologies should add value throughout the project journey and should build on previous successful initiatives. It is just as important to develop the team's digital skills as it is to roll out new technology. While the journey can be complex, we know that a successful outcome can be characterised very clearly and simply by:

- A data-driven approach from day one that runs throughout everything and everyone in the project
- An innovation process that tests the value and opportunities of technology in an ongoing and agile way, backed by a sustainable strategy that recognises the evolving nature of technology
- A digital mindset that permeates teams, culture and working practices within capital projects.

Deloitte teams have advised on many of the world's largest and most complex Infrastructure and Capital Projects (I&CP) and have extensive experience in taking our clients through a journey of digital transformation. Our teams advise clients across the lifecycle of an infrastructure asset and other large capital projects, enabling investors, project developers, project owners and operators in both the public and private sectors to take every step with confidence.

With a presence in 34 countries and service to 51 countries, Deloitte Africa is well positioned and understands the nuances of doing business in Africa.

As a team, we welcome your thoughts and considerations on this and on future reports of this nature.

**Mahendra Dedasaniya**

Director & Deloitte Africa Infrastructure & Capital Projects Leader

# Africa construction in focus

The 2019 edition of Deloitte's *Africa Construction Trends Report* includes 452 projects valued at US\$50m or above, that had broken ground by 1 June 2019. In total, these projects are worth US\$497bn.

The number of projects qualifying for inclusion this year decreased by 6.2%, while the total value of projects increased by 5.6% year-on-year. The East Africa region has the largest number of recorded projects across the continent with 40.3% of projects (182 projects), as well as the largest share of projects in terms of value at 29.5% (US\$146bn).

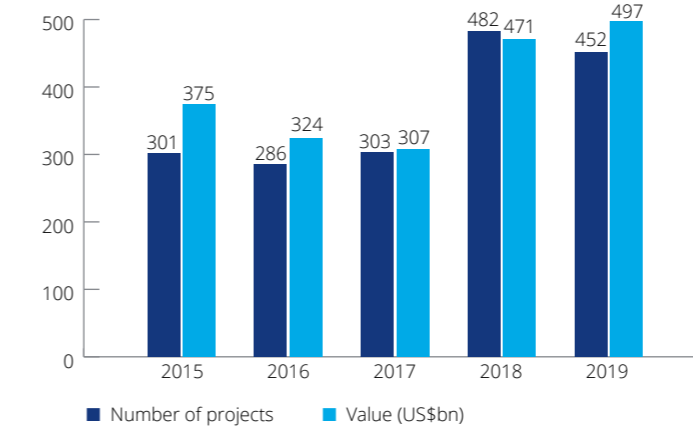
The projects included are spread over 38 of Africa's 54 countries. Kenya and Tanzania have the most number of projects with 51 projects (11.3%) each. Egypt has the most projects in US dollar terms, valued at US\$103bn (20.7% of the continental value), followed by South Africa and Tanzania respectively.

The majority of projects in this year's report lie in the lower value range of US\$50m-US\$500m. A total of 89 projects have a value greater than US\$1.1bn, of which 20 have a value greater than US\$5bn. Difficulties in structuring, financing, and delivering mega projects on the continent are the reasons behind the low number of multi-billion dollar projects.

The top three projects in Africa are made up of one project in the Oil & Gas sector, as well as two projects in the Energy & Power sector. These three projects alone account for a total value of US\$66bn, representing 13.3% of the continent's combined project value.

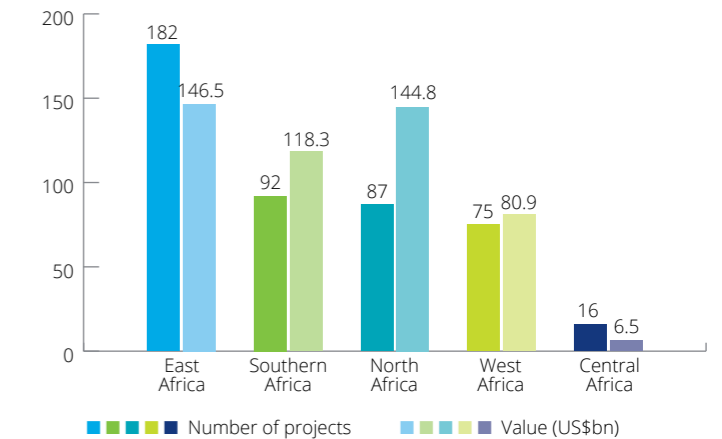


## Continental statistics



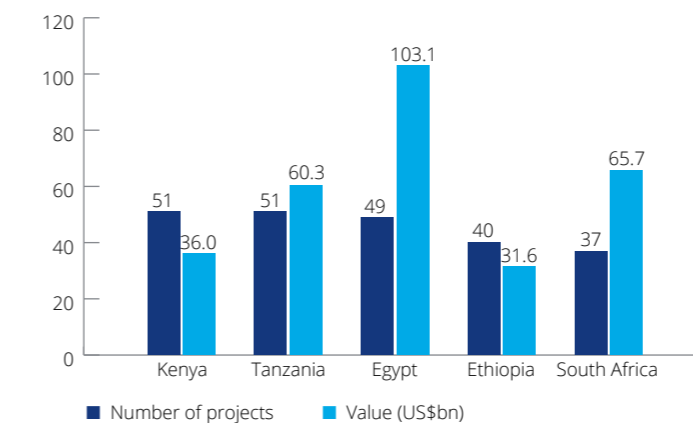
Source: Deloitte analysis, 2019

## Regional split



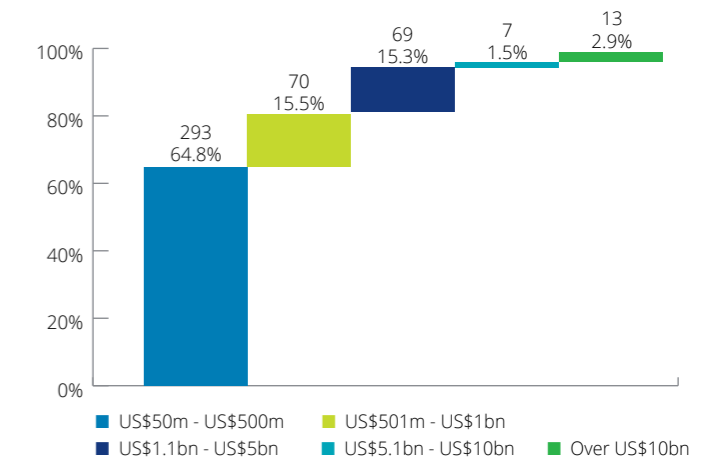
Source: Deloitte analysis, 2019

## Top 5 countries by number of projects

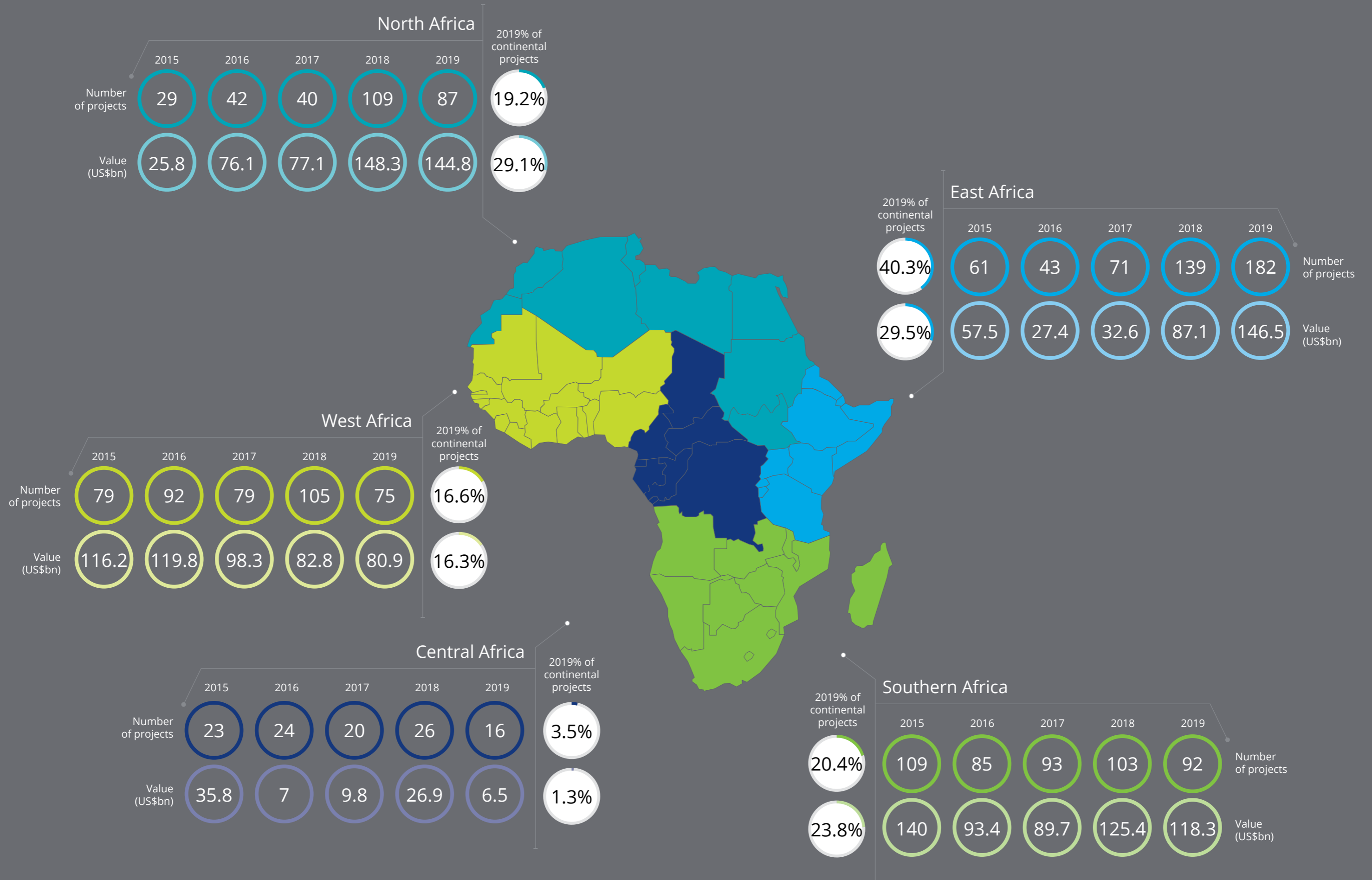


Source: Deloitte analysis, 2019

## Number of projects by value



Source: Deloitte analysis, 2019



Projects by sector	Number of projects	Share of projects by number (%)	Change in number of projects from 2018 <sup>1</sup>	Value of projects (US\$bn)	Share of projects by value (%)	Change in value of projects from 2018 (US\$bn) <sup>2</sup>
Transport	151	33.4%	-35	111.1	22.3%	4.1
Real Estate	99	21.9%	-11	91.0	18.3%	-32.3
Energy & Power	77	17.0%	11	133.6	26.9%	19.0
Shipping & Ports	38	8.4%	2	50.0	10.1%	1.0
Mining	29	6.4%	-3	21.2	4.3%	-8.2
Water	27	6.0%	1	6.8	1.4%	0.5
Oil & Gas	14	3.1%	6	80.2	16.1%	41.7
Healthcare	9	2.0%	-4	1.6	0.3%	-0.1
Other	6	1.3%	6	0.7	0.1%	0.7
Social Development	1	0.2%	-2	0.3	0.1%	-0.04
Education	1	0.2%	-1	0.4	0.1%	-0.1

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding.

The East Africa region witnessed the largest change in the number of projects, with an increase of 43 projects, representing a 40.3% increase from the previous year's count of 139 projects. At the same time, the total US dollar value of projects in the East Africa region increased by 68%. This now, for the first time since Deloitte Africa started to publish the annual *Africa Construction Trends Report*, makes East Africa the region with the largest share of projects by value.

The Central Africa region witnessed the largest decrease in the number of projects marked by a 38.5% decrease from last year (from 26 to 16 projects). This decrease resulted in the total value of projects in Central Africa dropping by 75.8%. This is due to the number of projects in the region being placed on hold, until further notice.

The greatest number of projects fall into the Transport sector (33.4%), followed by Real Estate (21.9%), Energy & Power (17.0%) and Shipping & Ports (8.4%). The Real Estate sector projects tracked are made up as follows:

Real Estate	Number of projects	Value of projects (US\$bn)
Commercial Construction	60	70.3
Industrial Construction	27	13.5
Residential Construction	10	6.9
Cultural Real Estate	2	0.3

Source: Deloitte analysis, 2019

Of the 189 Transport projects featured in this year's analysis, 68.7% (130 projects) represent rail, road, and bridge construction activity. Such connectivity enhancing infrastructure will support the African Continental Free Trade Area (AfCFTA) agreement and continental trade facilitation and economic integration the agreement aims to facilitate.

The Energy & Power sector is the most valuable sector across the continent at US\$133.6bn, representing 26.9% of the continent's total US dollar spend on large construction projects. Reliable power supply across Africa is crucial to unlocking the industrial aspiration of the continent, however such investments require a large capital outlay which often lies beyond the means of national governments.

Large-scale investment into Social Development and Education projects remains low at 0.1% (each) across the continent. Large-scale investment into the education sector will have to increase in line with Africa's growing population and human capital requirements.

Governments across Africa continue to be the main owners of projects with 338 projects (74.8%, slightly down from 75.5% last year). Private domestic firms follow with ownership of 44 projects (9.7%) across the continent, or one out of every 10 projects. Firms headquartered in China (2.4%), the Middle East (2.2%), and South Africa (2.0%) own 11, 10 and 9 projects respectively.

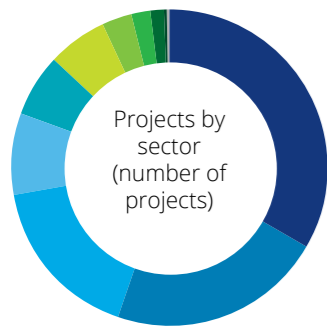
African governments continue to fund the largest share of projects across the continent, financing 103 projects (22.8%, down from 24.5% last year). The majority of government-funded projects on the continent are Transport projects (55.3% of government funded projects), followed by Energy & Power projects (20.4%).

China funds 92 projects or one in every five projects across Africa (20.4%, and up from 18.9% last year), now making it the second-largest funding source after African governments. This is followed by Private Domestic firms with 49 projects (10.8%), and International DFIs with 46 projects (10.2%).

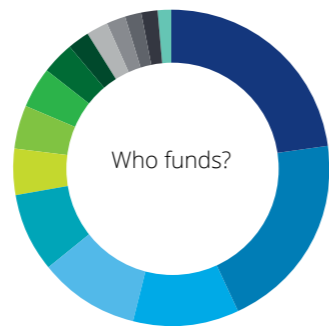
China continues to dominate as the most prolific (and single country) builder of projects across Africa, constructing 140 projects (31%). This is a decrease from 160 projects last year. Private domestic firms follow with 104 projects (23%) under construction. Other notable single-country builders include South African firms constructing projects outside of South Africa, albeit some way behind with 17 (3.8%) projects, and Italian firms with the same number of projects. Projects built by China fall primarily within the Transport sector.

Projects by sector	Share of projects by number (%)				
	2015	2016	2017	2018	2019
Transport	37	34	36	39	33
Real Estate	6	22	22	23	22
Energy & Power	28	21	19	14	17
Shipping & Ports	/	8	8	7	8
Water	8	4	5	5	6
Mining	7	3	3	7	6
Oil & Gas	6	5	4	2	3
Healthcare	1	2	1	3	2
Education	1	1	1	1	1
Social Development	4	1	1	1	1
Other	/	/	/	/	1
Technology, Media and Telecommunications (TMT)	1	/	/	/	/
Mixed Use	1	/	/	/	/
Agriculture	/	/	/	/	/

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding.

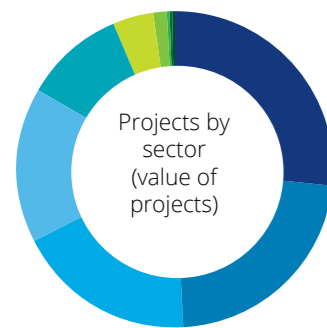


Source: Deloitte analysis. 2019  
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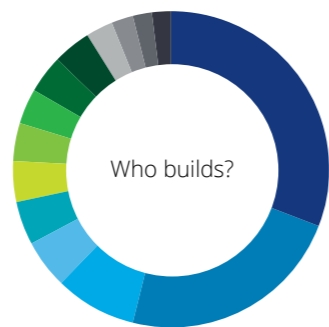


Middle East Countries include Bahrain, Kuwait, Oman, Saudi Arabia, Turkey, and the UAE.  
EU Countries include Austria, Finland, France, Germany, Italy, Luxembourg, Norway, Portugal, and Spain.  
Other African Countries include Angola, Côte d'Ivoire, Ethiopia, Ghana, Malawi, Mali, Mauritius, Morocco, Nigeria, Sudan, and Tanzania.  
Single Countries include Brazil, India, Japan, Korea, Macau, Russia, South Korea, and Switzerland.

Source: Deloitte analysis. 2019  
May not total 100% due to rounding

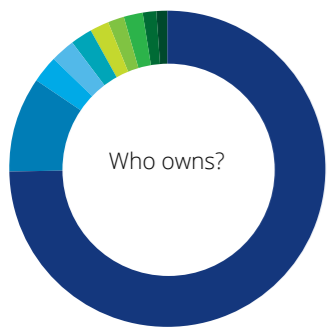


Source: Deloitte analysis. 2019  
May not total 100% due to rounding



Other EU Countries include Austria, Cyprus, Denmark, France, Germany, Norway, Portugal, Spain, and Sweden.  
Middle East Countries include Kuwait, Saudi Arabia, Turkey, and the UAE.  
Other African Countries include Burkina Faso, Egypt, Ethiopia, Ghana, Côte d'Ivoire, Kenya, Mali, Mauritius, Morocco, Mozambique, Nigeria, Tanzania, and Tunisia.  
Single Countries include Brazil, Canada, Iceland, India, Singapore, and Switzerland.  
Other Asian Countries include Japan, Macau, Russia, and South Korea.

Source: Deloitte analysis. 2019  
May not total 100% due to rounding



Middle East Countries include Bahrain, Kuwait, Turkey, and the United Arab Emirates (UAE).  
Single Countries include Cyprus, France, India, Macau, the United Kingdom (UK), and the United States (US).  
Other African Countries include Angola, the Democratic Republic of the Congo (DRC), Ethiopia, Ghana, Mauritius, Nigeria, and Zimbabwe.

Source: Deloitte analysis. 2019  
May not total 100% due to rounding





# Africa's economic prospects in the digital age

## Economic overview and outlook

The global economy is currently facing exogenous and endogenous risks. These risks range from trade tensions between the United States (US) and China, to macroeconomic pressures and economic slowdowns in major economies that arise from fluctuating commodity prices.

According to projections of the International Monetary Fund (IMF), global growth is forecast to slow to 3% in 2019, down from an estimate of 3.6% recorded in 2018. This is the lowest growth forecast since the global financial crisis. However, global economic growth is expected to pick up again in 2020, owing to improved global financial markets, thus reaching a growth rate of 3.4%.<sup>3</sup>

In Sub-Saharan Africa (SSA), gross domestic product (GDP) growth is forecast to climb from 3% in 2018 to 3.5% in 2019. Further projections state that this growth momentum is expected to continue into 2020<sup>4</sup>, and will be driven mainly by the region's improvement towards a more macroeconomic policy stance, structural reforms, as well as spill over effects from improved global financial and commodity markets. Despite these lower growth projections, SSA continues to be second fastest growing region after South Asia at 6.8%.<sup>5</sup>

Looking at Africa's three largest economies:

- **Nigeria** – Africa's largest and most populated country is projected to grow by 2.5% in 2020, a slight increase from the 2019 expected growth rate of 2.3%.
- **South Africa** – Africa's second largest economy is forecast to grow by 1.1% in 2020, up from an expected 0.7% in 2019.
- **Egypt** – The country has shown steady growth in the past years and is projected to grow by 5.9% in 2020, slightly up from the expected 5.5% in 2019.<sup>6</sup>

The East African region remains more resilient to economic shocks given its lesser dependence on volatile commodity markets. Even so, economic growth in East Africa is expected to moderate from 6.7% in 2018 to 6.4% in 2020. Despite these declining growth forecasts, East Africa continues to outperform other African regions with a record average growth expectation of 6.3% for 2019-20.<sup>7</sup>

Africa's fastest-growing economies remain in that region: Ethiopia, Kenya, Rwanda and Tanzania. Real GDP growth in the sub-region's leading economy, Ethiopia, is forecast to moderate to 7.4% in 2019 and slow to 7.2% in 2020. Rwanda is forecast to reach 7.8% in 2019 and surpass Ethiopia in 2020, reaching 8.1%. Economic growth in these two countries has been fuelled by progress in the industries and services sectors. The service sector has also been the main driver of growth in Tanzania and Kenya, followed by the agricultural sector.<sup>8</sup>

The North African region has had a notable recovery following the Arab spring in 2010. North Africa's growth rate is expected to expand by 3.2% in 2019 and 4% in 2020, stemming from stable growth in North Africa's largest economy, Egypt. Real GDP in Egypt is forecast to reach 5.9% in 2020 due to the country's stable economic performance in the past few years.<sup>9</sup> Morocco is forecast to grow by 3.7% the same year. Despite these growth projections, growth in North Africa remains erratic due to Libya's rapidly changing economy, while lack of peace and stability in certain countries, such as Sudan, also continue to be a hurdle for the region's growth trajectory.

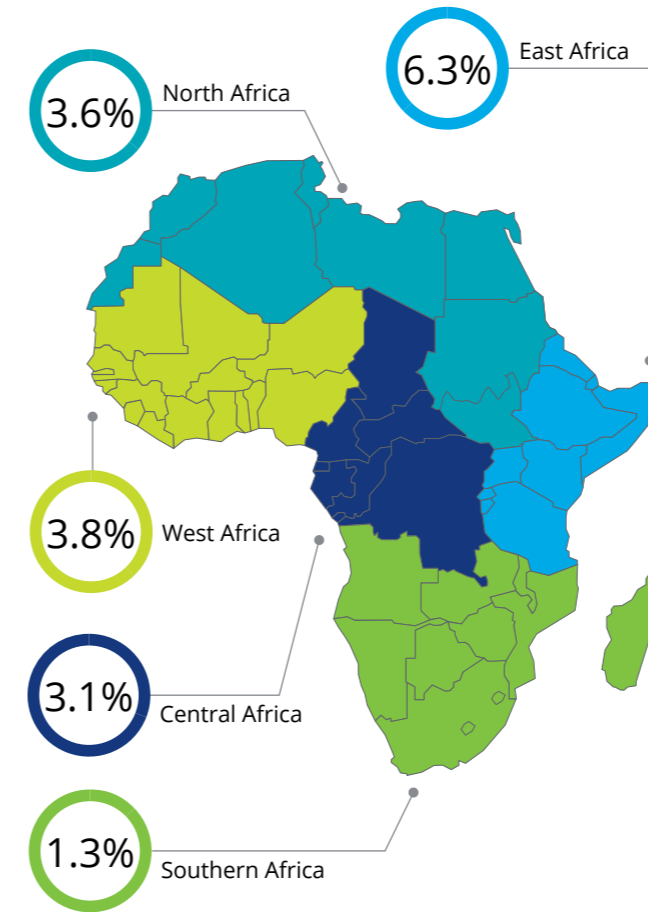
The Central African region has been experiencing numerous economic and political challenges, ranging from conflict, poverty, poor governance and fluctuating oil prices. Central Africa recorded a GDP growth rate of 2.7% in 2018 and is forecast to accelerate to 3.2% in 2020. Despite these growth forecasts, Central Africa continues to be Africa's least physically integrated region. This is mainly due to the region's poor infrastructure and insufficient economic diversity. The sub-region's largest economy, the DRC, contributes 32% towards Central Africa's economic growth, followed by Cameroon with 27% and Gabon with 12%.<sup>10</sup>

On a regional scale, Southern Africa recorded the lowest GDP growth figures at 1.2% in 2018. This low growth stems from poor economic performance in Southern Africa's largest economies, South Africa and Angola, placing pressure on neighbouring countries. GDP growth in Southern Africa is expected to decline to 0.8% in 2019 and rebound to 1.7% in 2020,<sup>11</sup> with South Africa struggling to kick-start its economy above 1% growth. South Africa is expected to marginally expand by 0.7% in 2019 and 1.1% in 2020, while oil-rich Angola is expected to contract by -0.3% in 2019, recovering to 1.2% in 2020.<sup>12</sup>

Real GDP growth in West Africa is forecast to climb from 3.3% in 2018 to 3.8% in 2019 and 2020. This is expected to be driven by the outstanding growth performance of Côte d'Ivoire and Ghana, which are both anticipated to grow by 7.5% in 2019. Several other West African countries such as Mali, Niger, as well as northern parts of Nigeria, however, continue to face major economic and political risks, including fragility, violence, drought and terrorist attacks.

Although Nigeria contributes about 70% towards West Africa's GDP,<sup>13</sup> the country's poor economic performance – resulting from lower commodity prices and low oil production – has dampened regional performance. Considering the implementation of the Economic Recovery Growth Plan initiative which aims to support industrialisation through industrial clusters, its GDP growth is projected to rise to 2.3% in 2019 and 2.5% in 2020.

## Regional real GDP growth outlook (%) 2019e-20f



Source: Deloitte Africa analysis based on IMF, October 2019

Africa as a continent has taken steps towards stimulating more sustainable regional growth. This has been seen with the recent launch of the African Continental Free Trade Area (AfCFTA) agreement.<sup>14</sup> The AfCFTA came into force this year and is expected to boost economic integration, liberalise trade in goods and services (through reducing tariff, but mostly non-tariff barriers to trade) and increase intra-Africa trade by 60% in the next three years.<sup>15</sup>

Trade integration encourages specialisation of goods production, spreads skills and technology and improves regional supply chains. The newly formed trade area could be an economic game changer for the continent in the medium to long term by boosting intra-regional trade and growth outlooks, with various studies estimating notable potential welfare gains for African countries.<sup>16, 17</sup>

Larger diversified economies and those with improved infrastructure and logistics are expected to reap greater benefits from cross-border trade with other countries. Nonetheless, smaller countries with limited access to the market are also expected to see significant gains. African countries with lesser developed infrastructure and logistics can consider introducing structural reforms in addition to trade policies to increase productivity and also benefit substantially from the trade integration. These developments are set to contribute towards the regional growth projection of 4% in the medium term, up from an estimate of 3.5% in 2018.<sup>18</sup>

## Africa's infrastructure investments

A key part of the AfCFTA is creating a more connected Africa, and investing in road, rail, ports and power infrastructure.<sup>19</sup> Investing in infrastructure is essential for promoting diversified and inclusive growth in Africa. Africa's infrastructure networks remain unsatisfactory, partially as a result of weak regulatory frameworks and lethargic investments which coexist with weak economic performance. Limited physical connectivity across borders has also contributed to lower intra-regional trade in Africa, compared to other regions. This is seen through Africa's intra-regional trade, which is only 17%, while Europe and Asia stand at 69% and 59%, respectively.<sup>20</sup>

There is a clear gap in quality infrastructure across Africa. The continent's growth objectives should be linked to bridging this gap. The World Bank has stated that by closing the infrastructural gap, Africa can increase its GDP per capita by over 2% annually.<sup>21</sup> However, the SSA region has found it challenging to close this gap due to underspending and current account deficiencies. Currently SSA spends only about 20% of GDP on investments.

Infrastructure investments have the potential to stimulate rapid growth in developing economies. On a global scale, developing countries that invest over 30% of their GDP have been among the fastest growing.<sup>22</sup> This is also seen in SSA's fastest growing economy, Ethiopia, which has invested about 38.4% on land, machinery and construction in 2017.

Based on the continent's robust infrastructure project pipeline, it is evident that infrastructure investments have become one of the continent's priorities.

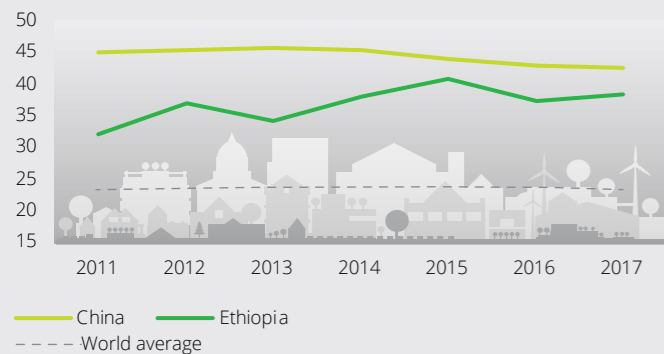
### The power of infrastructure spend – lessons from Ethiopia

Ethiopia has become the fastest-growing economy in SSA, thanks to government investments in infrastructure projects which have enabled manufacturing and other industries. The country's rapid growth has been guided by the introduction of the Growth and Transformation Policy (GTP), a framework mainly focused on creating a conducive macroeconomic environment.<sup>23</sup> It has also been supported by close alliances with Chinese firms including financial support from Chinese banks.

Although Ethiopia's robust GDP growth has averaged 9.9% over the past ten years to 2018, it moderated to 7.5% in 2018,<sup>24</sup> somewhat owing to policy alterations, civil unrests and political instability. Underpinning the high growth figures has been the construction sub-sector which expanded by 16% in 2018 and is also the largest industrial sub-sector in the country accounting for 71.4% of the industries sector.<sup>25</sup>

For the past few years, Ethiopia has sustained its GFCF as a share of GDP spending above 30%,<sup>26</sup> making it one of the top economies globally in terms of capital formation spend as a share of economic activity. Based on the country's robust infrastructural projects pipeline, the construction industry is projected to grow further in the medium term, with Ethiopia's forecast to become the fastest growing construction market in SSA.<sup>27</sup>

#### Countries with the highest GFCF as % of GDP



Source: World Bank, 2019

It has been noted that reliable infrastructure helps to boost economic activity as it enables production and thus attracts FDI.<sup>28</sup> Ethiopia's infrastructure investments have been coupled with growth in FDI inflows, up from US\$344m in 2007 to US\$3.3bn in 2018.<sup>29</sup> This makes Ethiopia one of Africa's top five FDI recipients, with China being the largest investor.

Several African countries are expected to increase their infrastructure investment spending in the near future (see figures overleaf). In Egypt, GFCF is forecast to reach 22.1% in 2023, stemming from rapid developments in the hydrocarbons sector. Senegal and Ghana are projected to increase their investment spend to 35% and 24% respectively by 2023. This boost in GFCF spend is expected from both ongoing and planned investment projects in Transport and Energy & Power.

Considering the region's ongoing and upcoming infrastructure projects and subsequent funding needs, the region has inclined to find alternative ways to attract private investment. In the past few years, private investment commitments in SSA infrastructure have been on a growth trajectory, largely driven by a surge of renewable-energy projects in South Africa as well as infrastructure projects in Cameroon. The World Bank's Private Participation in Infrastructure (PPI) report stated that SSA investments almost reached a threefold increase in 2018, recording the largest investments since 2014.<sup>30</sup>

Of concern though is that, while the 'infrastructure basics' are often still needed in many of Africa's economies (53% of roads are unpaved and 47% of countries have no electricity coverage - below the world average of 82%),<sup>31</sup> the world is rapidly investing in digital infrastructure. Africa's digital infrastructure continues to lag behind, due to its poor quality and expense.

The World Economic Forum's (WEF) *Global Competitiveness Report* ranks 17 of the 34 SSA economies analysed in the report in the bottom 20 of 140 countries. SSA as a region, registered a low average score under Innovative Capability (28.4 out of 100) and Information and Communications Technology (29.6 out of 100).<sup>32</sup> Promisingly though, the overall number of tech hubs in Africa has increased by over 50% since 2016 to 442.<sup>33</sup> But clearly more needs to be done. African economies will need to rethink digital infrastructure requirements as the 4IR takes hold globally, further eroding the competitiveness of countries that are not investing in digital.

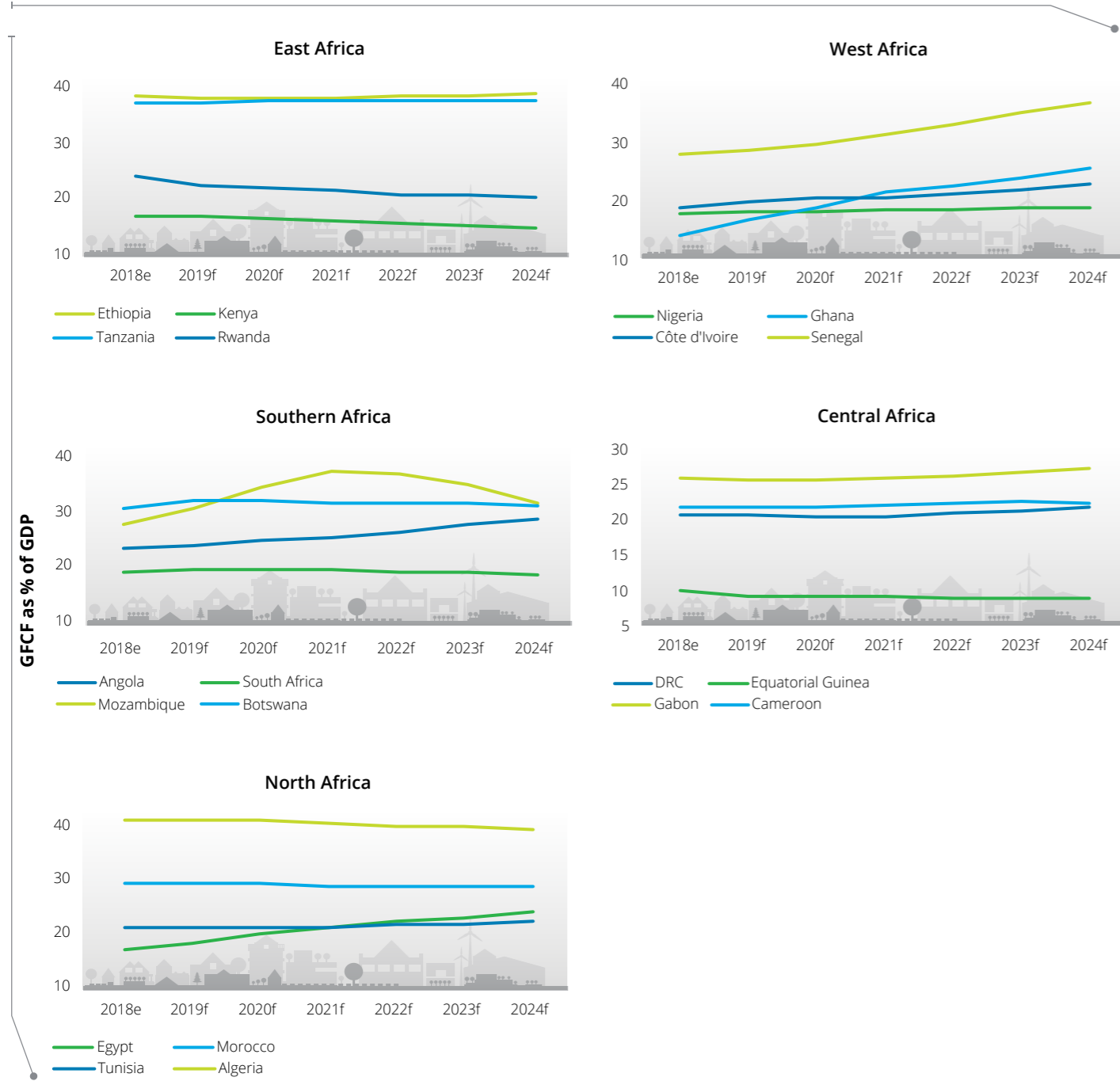
#### GFCF as a % share of GDP of key regional countries, 2011-17



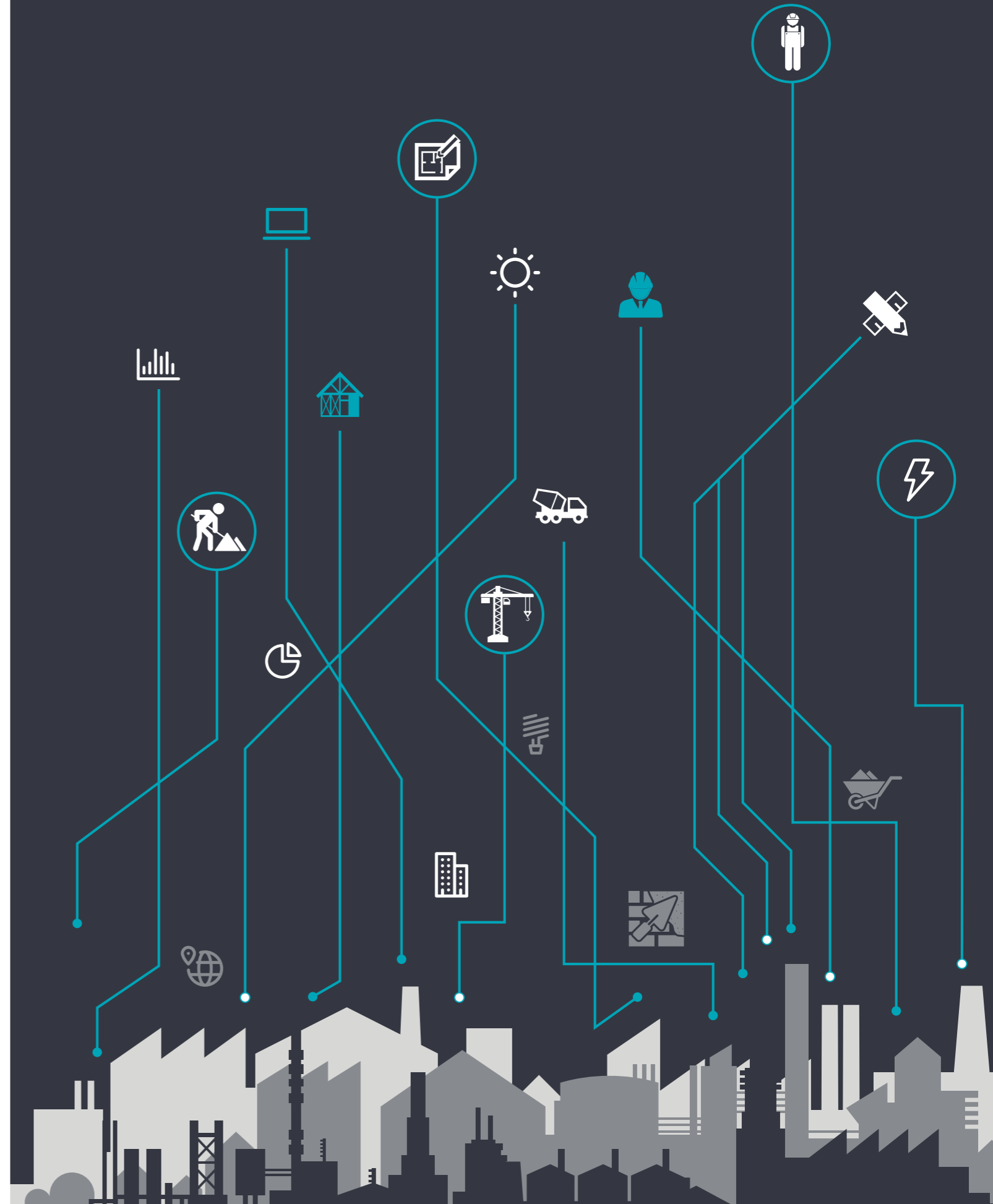
Source: World Bank, 2019



GFCF as a % share of GDP - forecasts by regions, 2018e-24f

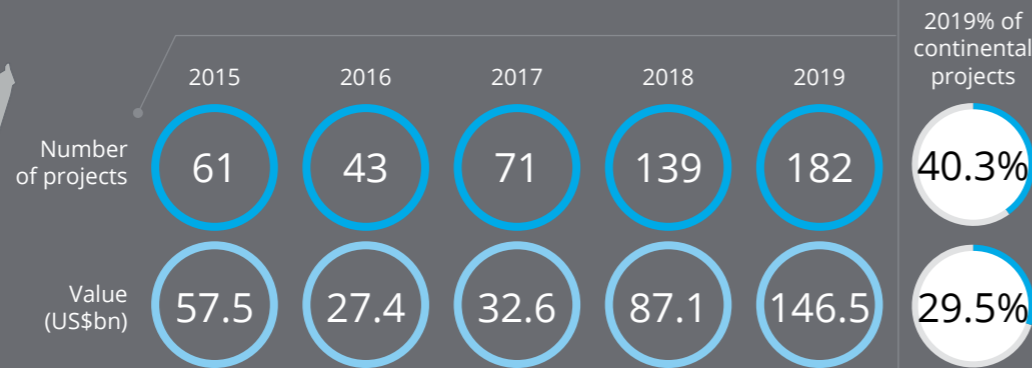


Source: Fitch Solutions, 2019



# Regional construction in focus

## East Africa



The East African region comprises of Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Seychelles, Somalia, Tanzania and Uganda.

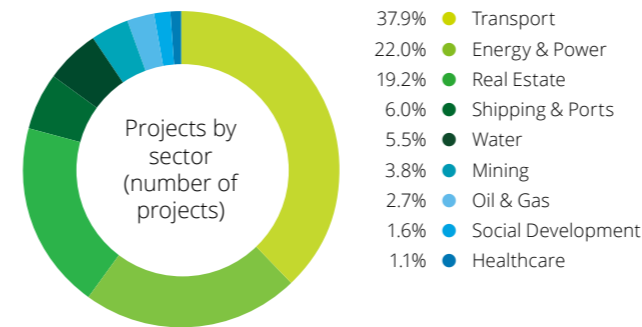
The number of infrastructure projects tracked by this report have risen steadily for the past few years and on the back of increased regional investments in infrastructure development. The total number of projects in East Africa rose by 30.9% between 2018 and 2019, with the region currently recording 182 projects under construction. The East Africa region accounts for 40.3% of projects across the continent and 29.5% of the value.

Tanzania has caught up with Kenya in terms of infrastructure projects, both recording 51 projects in 2019. Tanzania's total share of projects by value is 41.2% (US\$60.3bn), making it the largest contributor towards East Africa's total project value. Although Kenya has one of the most valuable infrastructure projects in the pipeline, the country accounts for only 24.6% (US\$36bn) of the region's total project value.

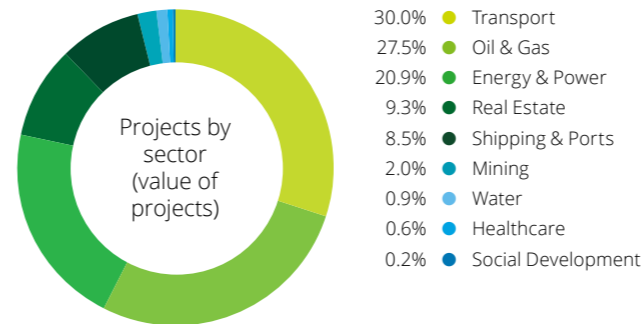
The total value of construction projects increased by 67.6% between 2018 and 2019, from US\$87bn to US\$146bn. The increase stemmed from investments in large infrastructure projects within the Transport and Oil & Gas sectors, such as Phase II of the Kenya Standard Gauge Railway Project and Tanzania's new Likong'o-Mchinga LNG plant. The LNG plant, worth US\$30bn, has become the most valuable project in the region.<sup>34</sup>

Projects by sector	Share of projects by number (%)				
	2015	2016	2017	2018	2019
Transport	51	47	52	45	38
Energy & Power	30	26	23	18	22
Real Estate	1	11	14	17	19
Shipping & Ports	/	9	3	7	6
Water	8	/	6	6	6
Mining	2	/	/	4	4
Oil & Gas	3	2	1	1	3
Social Development	5	/	/	/	2
Healthcare	/	5	/	2	1

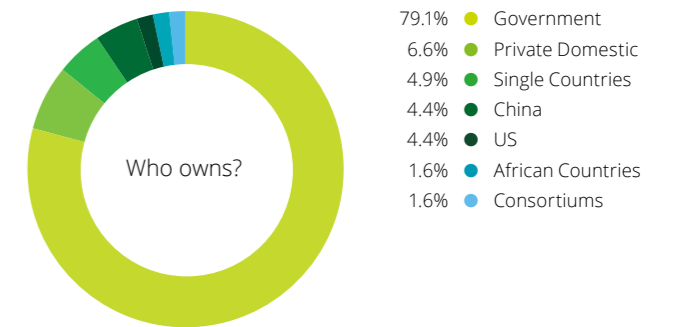
Source: Deloitte analysis, 2019  
May not total to 100% due to rounding.



Source: Deloitte analysis, 2019  
May not total 100% due to rounding



Source: Deloitte analysis, 2019  
May not total 100% due to rounding



Single Countries include Australia, Canada, India, Turkey, the UAE, and the UK.  
African Countries include Angola, Ethiopia, and Mauritius.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

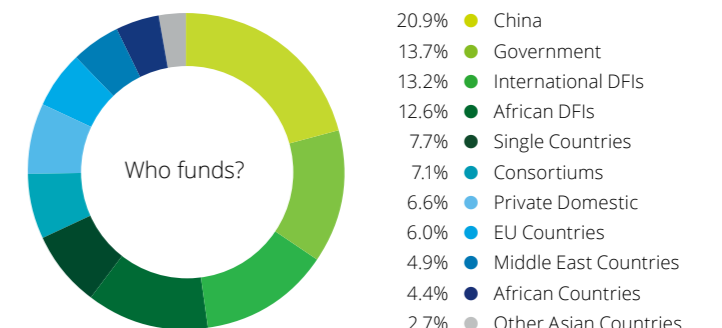
Projects in East Africa are mainly owned by Government (79.1%), while Private Domestic companies own 6.6%. Various East African governments have played a significant role in boosting infrastructure development. This has occurred from country-specific as well as regional developmental policy initiatives such as the East African Community (EAC) Development Strategy. The EAC Development Strategy aims to support East Africa in becoming a competitive and sustainable lower-middle income region by 2021, and also highlights infrastructure development as one of its regional priorities.<sup>36</sup>

The Transport sector continues to take the lead within the sectoral break down by value. The sector accounted for 30% (US\$44bn) of the region's total projects by value, followed by Oil & Gas (27.5%) and then the Energy & Power (20.9%) sectors.

East Africa has encountered several transport infrastructure challenges in the past years, thus making Transport investments a priority to ensure a reliable transportation network. As a result, the sector recorded the highest number of projects (69 projects out of 182), followed by the Energy & Power sector with 40 projects (22%) and Real Estate with 35 projects (19.2%).

The high number of transport projects came from investments in rail, road and airport projects. Numerous East African-based airports have launched expansion projects to cater for the rapidly growing passenger and cargo traffic volumes. One of these airport expansion plans, currently under construction, is the Bole International Airport Expansion Project in Ethiopia, will make Ethiopia the largest airport aviation hub in Africa.<sup>35</sup>

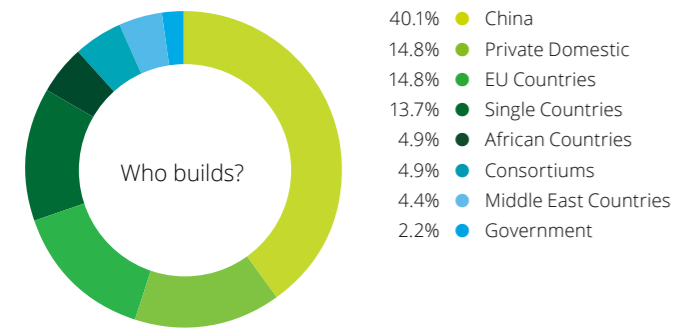
Such cross-border infrastructure projects demonstrate East Africa's commitment to boost regional integration.



Single Countries include Australia, Canada, Norway, Switzerland, UK, and the US.  
Middle East Countries include Oman, Saudi Arabia, Turkey, and the UAE.  
EU Countries include Austria, Finland, France, Germany, Italy, Luxembourg, and Portugal.  
African Countries include Angola, Ethiopia, Mauritius, Morocco, Nigeria, South Africa, and Tanzania.  
Other Asian Countries include India, Japan, and South Korea.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

East Africa relies on external funding for most infrastructure projects. The region's project funding is dominated by China (20.9%; down from 25.9% last year), while Governments account for 13.7% of total funding. International and African DFIs also play a significant role in East Africa's project funding, accounting for 13.2% and 12.6%, respectively. Ongoing and upcoming regional infrastructure projects have attracted various development financiers. The African Development Bank (AfDB), for example, has shown interest by introducing the East Africa Regional Integration Strategy Paper (EA RISP), which outlines a roadmap to accelerate regional integration through infrastructure development over a five-year period (2018-22).<sup>37</sup>



Single Countries include Australia, Canada, India, Japan, Russia, South Korea, the UK, and the US. EU Countries include Austria, Denmark, France, Germany, Italy, Norway, Iceland, Switzerland, and Portugal. Middle East Countries include Saudi Arabia, Turkey, and the UAE. African Countries include Ethiopia, Kenya, Mauritius, Morocco, South Africa, and Tanzania.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Construction activity is dominated by China, who is responsible for building 40% of the projects (and down from 54.7% of projects in last year's report). Both Private Domestic companies and EU Countries construct 14.8% of projects.

East Africa's top 10 projects make up 51.7% of the total value of projects in the region, thus accounting for a large proportion of expenditure on infrastructure projects. The Transport and Energy & Power sectors both recorded four projects in the top 10.

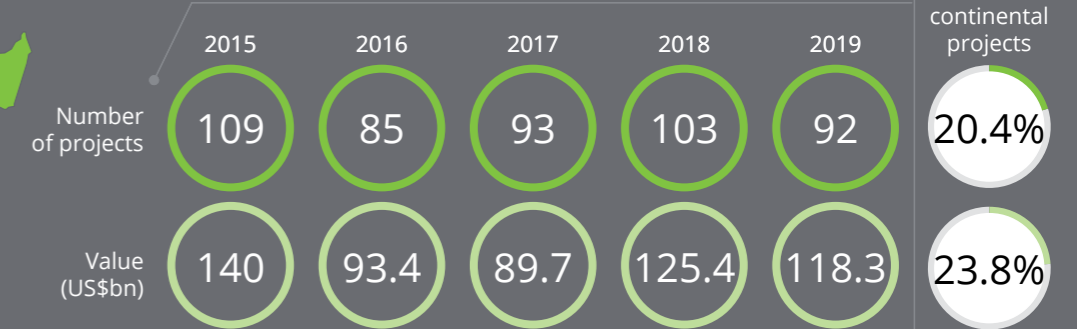
Tanzania's Likong'o-Mchinga LNG plant, has become the most valuable project in the region. Once completed, the plant is expected to contribute about 7% towards the country's economic growth.<sup>38</sup> Kenya's rail project is expected to contribute towards boosting trading activities in Kenya, thus, placing the country at the centre of East Africa's rail network.

### Top 10 projects (by value)

Rank	Country	Project	Sector	US\$bn
1	Tanzania	Likong'o-Mchinga LNG Plant	Oil & Gas	30.0
2	Tanzania	Bagamoyo Mega Port	Transport	10.0
3	Kenya	Kenya-Uganda-Rwanda-South Sudan Rail Project	Transport	9.8
4	Ethiopia	Grand Ethiopian Renaissance Dam Project	Energy & Power	4.8
5	Ethiopia	Tams Hydropower Project	Energy & Power	4.2
6	Ethiopia	New Addis Ababa International Airport	Transport	4.0
7	Ethiopia	Fairfax Oil Refinery Project	Oil & Gas	4.0
8	Kenya	Nairobi - Mombasa Highway Expansion Project	Transport	3.0
9	Tanzania	Mtwara Fertilizer Plant	Real Estate: Industrial Construction	3.0
10	Ethiopia	Koysa Hydroelectric Dam	Energy & Power	2.7

Source: Deloitte analysis, 2019

## Southern Africa



The Southern Africa region comprises of Angola, Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

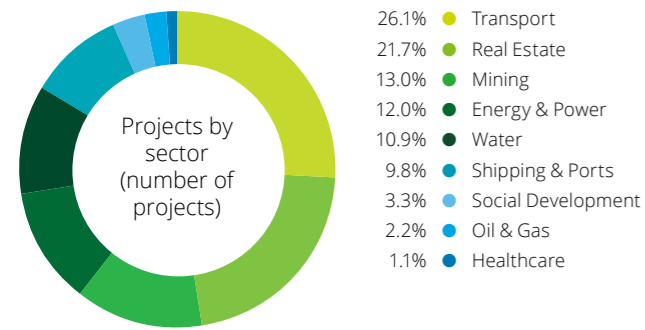
The region registered 92 projects in total, with a total value of US\$118.3bn. The region accounts for 20.4% of projects across Africa, and 23.8% of the value.

The total number of projects in Southern Africa declined by 10.7% in 2019, down from 103 in 2018. In value terms, construction projects declined by 5.7% between 2018 and 2019, from US\$125.4bn to US\$118.2bn. The decline in both total value and number of projects stemmed from the completion of projects in the past year such as the Kaombo South32 oil project in Angola, which was the largest project in 2018.

South Africa continues to account for the largest share of projects in Southern Africa. The country recorded 37 projects (40.2%) of all 92 projects in the region, while Angola and Mozambique both have 9 projects (9.8%).

Projects by sector	Share of projects by number (%)				
	2015	2016	2017	2018	2019
Transport	27	20	23	32	26
Real Estate	7	31	29	25	22
Mining	12	5	4	9	13
Energy & Power	34	25	25	11	12
Water	8	7	5	9	11
Shipping & Ports	/	7	8	10	10
Social Development	4	/	/	2	3
Oil & Gas	3	5	5	2	2
Healthcare	2	1	1	1	1
TMT	2	/	/	/	/
Education	1	/	/	/	/

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding.

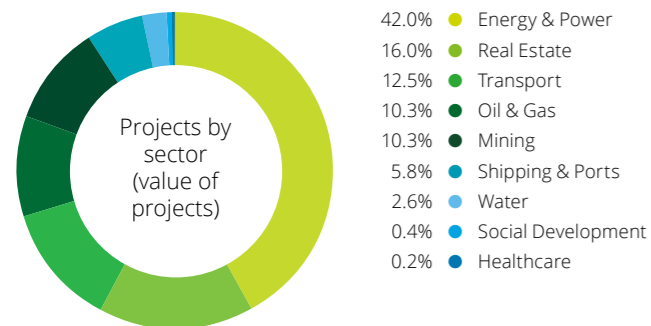


Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Energy & Power projects are a crucial part of regional infrastructure plans, with many countries in the region having to endure challenges such as insufficient energy supply and limited energy access.<sup>40</sup> With 42% (US\$50bn) of total project value in the region stemming from Energy & Power projects, this sector has the largest regional share by value. While this is testament to regional economies acknowledging their lack of energy infrastructure and the impact it will have on their industrial strategies and economic diversification, the sizable contribution stems from power projects such as Kusile and Medupi power stations in South Africa that are continuously over time and out of budget.<sup>41</sup>

Considering the upcoming restoration of South Africa-based Koeberg power station – Africa's only nuclear power station – this sector could see more funds allocated in the near future.<sup>42</sup>

The Real Estate sector is the second largest sector in terms of value, accounting for 16% (US\$19bn) of project value. The sector is mainly dominated by commercial construction projects, such as the Waterfall City development in South Africa – one of the largest projects in Southern Africa in value.

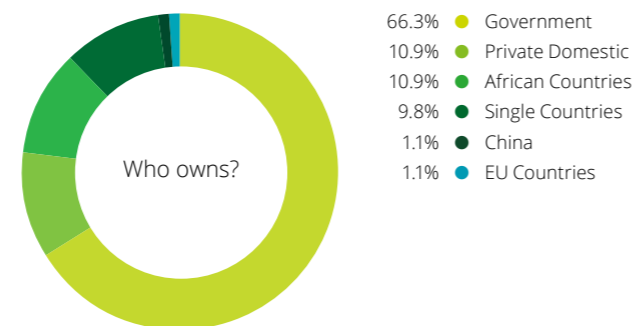


Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Several Southern African countries have endured infrastructure challenges, ranging from poor transport infrastructure to insufficient energy supply. In line with the region's infrastructure plans, Southern Africa continues to prioritise the Transport and Energy & Power sectors. This is seen through the North-South Corridor (NSC) Road/Rail project, which aims to boost regional integration and increase intra-African trade;<sup>39</sup> and the North-South power transmission corridor. One of the projects under the NSC corridor is the Beitbridge Border Post Upgrade project in Zimbabwe.

The Transport sector saw a significant decline (27.3%) in projects between 2018 and 2019. Even so, road network improvements made a significant contribution, with the Transport sector recording the most projects in the region (26.1% of projects). Real Estate accounts for the second highest share of projects (21.7%). The Mining and Energy & Power sectors follow with 13% and 12%, respectively.

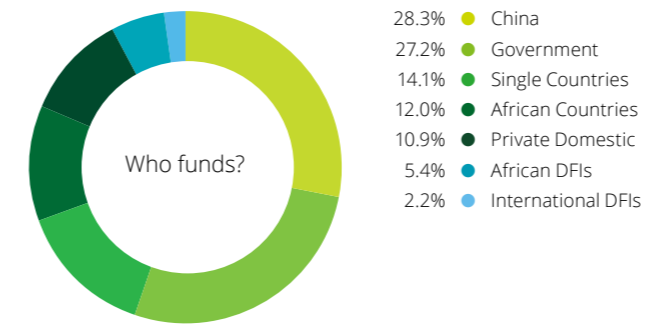
Shipping & Port projects saw the largest increase, with the number of projects increasing from two to nine projects in countries such as Angola, Mozambique, Namibia and South Africa between 2018 and 2019. These port projects are expected to improve regional capacity and provide developed port access to neighbouring countries.



Single Countries include Australia, Canada, Turkey, the UK, and the US.  
African Countries include South Africa and Zimbabwe.  
EU Countries include one unspecified country.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

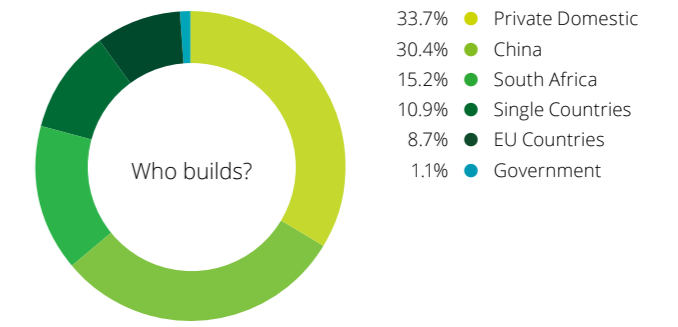
Governments own two in every three projects in the region, down from 70% in 2018. The drop in government share was mainly due to completed projects in the past year and increased ownership by other countries. Both Private Domestic companies and African Countries own 10.9% of all projects, respectively, while Single Countries collectively own 9.8% of projects.



Single Countries include Australia, Canada, Cyprus, Germany, Russia, Turkey, the UK, and the US.  
African Countries include Malawi, South Africa, and Sudan.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

While Governments funded the most projects in 2018, China this year is ahead of Government funding at 28.3%, with Government-funded projects dropping to only 27.2%. China funds some of the largest projects such as the New Luanda International Airport (US\$6.4bn) and the Caculo Cabaca Hydropower Project (US\$4.5bn).



Single Countries include Australia, Brazil, Canada, Mozambique, Russia, South Korea, Turkey, and the US.  
EU Countries include Cyprus, Italy, Portugal, and Spain.  
South Africa includes South African firms constructing projects outside of South Africa

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding

The construction of infrastructure projects is dominated by Private Domestic companies (33.7%), followed by China and South Africa (30.4% and 15.2%, respectively).

Southern Africa's top 10 projects account for 64% of the total value of projects in the region, a significant portion of the overall projects value. New projects in the top 10 in 2019 include Steyn City Development, Karo mine in Zimbabwe and the SADC Gateway Port of Walvis Bay in Namibia.

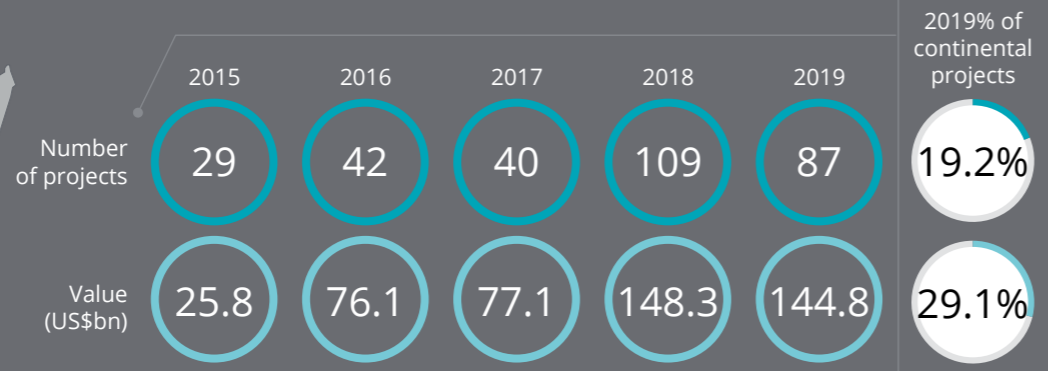
### Top 10 projects (by value)

	Country	Project	Sector	US\$bn
1	South Africa	Kusile Power Station	Energy & Power	18.0
2	South Africa	Medupi Power Station	Energy & Power	18.0
3	Angola	Namibe Refinery Project	Oil & Gas	12.0
4	South Africa	Waterfall City Development	Real Estate: Commercial Construction	6.8
5	Angola	Luanda International Airport	Transport	6.4
6	South Africa	Steyn City Development	Real Estate: Commercial Construction	4.7
7	Angola	Lauca Hydropower Project	Energy & Power	4.5
8	Angola	Caculo Cabaca Hydropower Project	Energy & Power	4.5
9	Zimbabwe	Karo	Mining	4.2
10	Namibia	SADC Gateway, Port of Walvis Bay	Transport	2.4

Source: Deloitte analysis, 2019



# North Africa

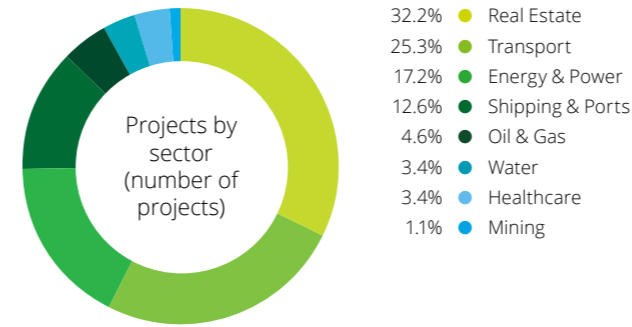


North Africa – made up of Algeria, Egypt, Libya, Morocco, South Sudan, Sudan, Tunisia, and Western Sahara – has 87 projects with a combined value of US\$144.8bn.

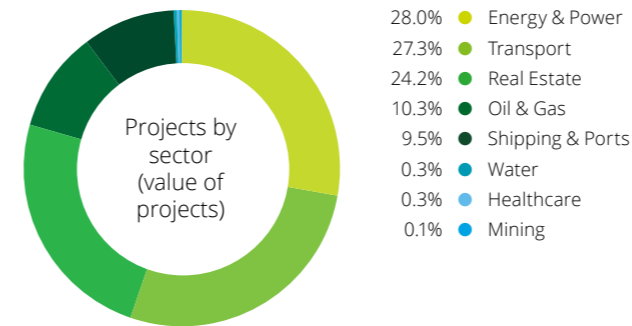
North Africa accounts for 19.2% of projects on the continent and 29.1% in terms of US dollar value. The number of projects in North Africa decreased by 25.3% from the previous year, while the value of projects decreased by 2.4%. Within the region, Egypt has the most projects with 49, followed by Algeria with 17 projects, and then Morocco with 16 projects.

Projects by sector	Share of projects by number (%)				
	2015	2016	2017	2018	2019
Real Estate	7	26	33	34	32
Transport	41	43	28	30	25
Energy & Power	28	10	12	16	17
Shipping & Ports	3	5	10	6	13
Oil & Gas	8	12	12	3	5
Healthcare	/	/	/	4	3
Water	7	5	5	3	3
Mining	/	/	/	4	1
Education	/	/	/	1	/
Social Development	3	/	/	/	/
Other	3	/	/	/	/

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding.



Source: Deloitte analysis, 2019  
May not total 100% due to rounding

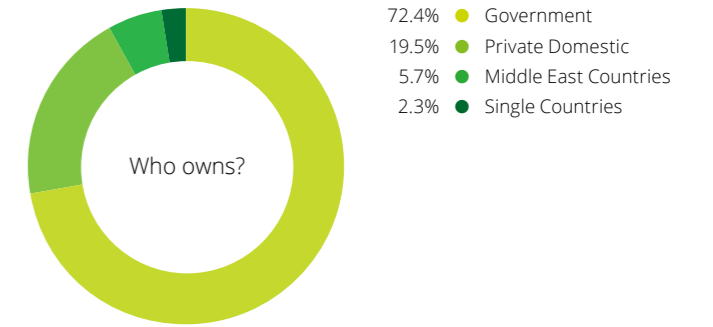


Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Real Estate projects constitute the majority of projects in North Africa, accounting for 32.2% of the number of projects and 24.2% in terms of US dollar value. Egypt has the most Real Estate projects under construction in the region with 18 projects, the most prominent project being Egypt's Oasis Mega Urban Development Project, a mixed-use development project.

The Transport sector accounts for 25.3% of the region's total number of projects and 27.3% in US dollar value terms. The US\$10.2bn Algerian Hauts-Plateaux Motorway is one such Transport project which aims to unlock and link the cities of Algeria's highland areas that run parallel to the country's East-West highway. These cities include Saida, Batna, Khenchela, and Tebessa.

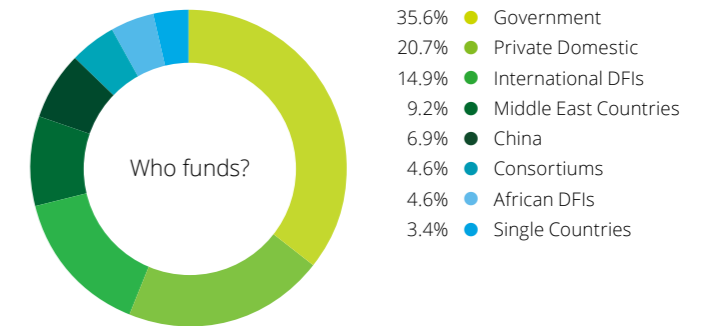
The Energy & Power sector accounts for only 17.2% of total projects in the North Africa region, but has the largest share of projects by value at 28%. Egypt's FourWinds Coal-Fired Power Plant is one such Energy & Power project.



Single Countries include Australia and China.  
Middle East Countries include Bahrain, Kuwait, and the UAE.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Governments continue to own the largest share of projects with 72.4%, followed by Private Domestic ownership at 19.5%. Countries such as Algeria continue to impose limitations on foreign shareholding to 49% of any Algerian company, accounting for a large share of government ownership in the region.

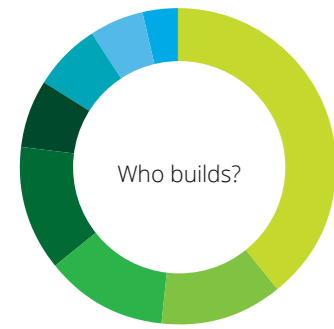


Middle East Countries include Bahrain, Kuwait, and the UAE.  
Single Countries include Australia and the UK.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Governments are the most important funders of infrastructure projects in the region (35.6%), followed by Private Domestic firms (20.7%) and International DFIs (14.9%).





- 39.1% Private Domestic
- 12.6% China
- 12.6% Middle East Countries
- 12.6% EU Countries
- 6.9% Other Asian Countries
- 6.9% Single Countries
- 5.7% Consortiums
- 3.4% Government

Private Domestic companies account for the largest share of construction activities within the region, constructing 39.1% of projects. Egyptian construction companies are the most visible firms, building 24 of the 34 private, domestically constructed projects in North Africa.

Chinese construction firms account for 12.6% of construction in the region, representing a slight decrease from 12.8% last year.

North Africa's top 10 largest projects account for 54% of the total US dollar value of projects in the region. The top five projects are all US\$10bn or more in value. Notably, the top 10 projects are concentrated in the region's two largest economies, Egypt and Algeria, with eight and two projects respectively. Three coal-fired power plants in Egypt, with a combined value of US\$25.5bn, are indicative of the government's efforts to increase power supply and subsequent industrial economic activity in the country.

Middle East Countries include Kuwait, Saudi Arabia, Turkey, and the UAE.  
 EU Countries include France, Germany, Italy, and Spain.  
 Other Asian Countries include Japan and South Korea.  
 Single Countries include Australia, the UK, and the US.

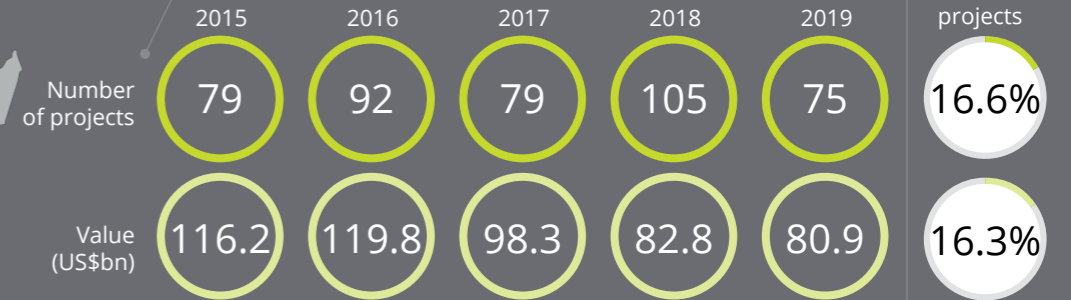
Source: Deloitte analysis, 2019  
 May not total to 100% due to rounding

### Top 10 projects (by value)

Rank	Country	Project	Sector	US\$bn
1	Egypt	FourWinds Coal-Fired Power Plant	Energy & Power	11.0
2	Egypt	Tahrir Petrochemical Complex	Oil & Gas	10.6
3	Algeria	Hauts-Plateaux Motorway	Transport	10.2
4	Egypt	Alexandria-Cairo-Aswan High-Speed Rail Project	Transport	10.0
5	Egypt	Hamrawein Coal-Fired Power Plant	Energy & Power	10.0
6	Egypt	October Oasis Mega Urban Development Project	Real Estate	8.5
7	Algeria	Dounya (Dounia) Park	Real Estate	5.0
8	Egypt	Ayoun Moussa Coal-Fired Power Plant	Energy & Power	4.5
9	Egypt	Hurghada – Luxor High Speed Rail	Transport	4.3
10	Egypt	Safaga Mining Port	Transport	4.2

Source: Deloitte analysis, 2019

## West Africa



West Africa includes Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

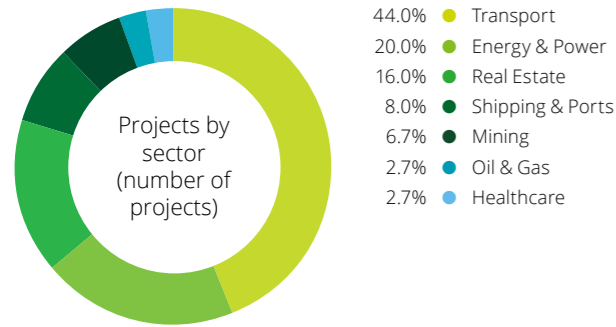
West Africa has 75 projects currently underway, with a total US dollar value of US\$80.9bn. The region accounts for 16.6% of all projects in Africa and 16.3% of the continent's total project dollar value.

The number of projects in West Africa decreased by 28.6% from last year, while the value decreased by 2.4%. A number of small-scale transportation projects were completed in the region, while at the same time large scale projects such as Nigeria's US\$18.0bn Centenary City were added.

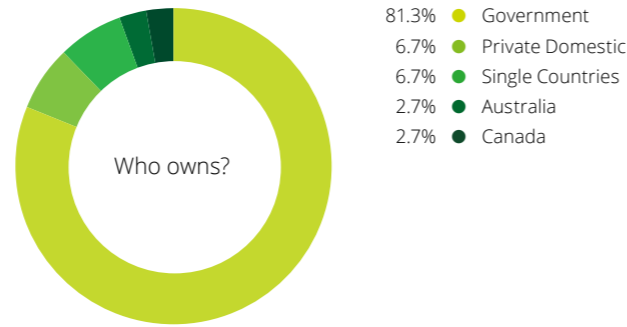
Nigeria holds the largest number of projects in West Africa with 21 projects (28%), valued at US\$54.2bn (67.1% in US dollar value terms). Ghana follows Nigeria with 16 projects, valued at close to US\$14bn. These two countries combined account for 49.3% of all projects in West Africa and 84.4% of the region's total project value.

Projects by sector	Share of projects by number (%)				
	2015	2016	2017	2018	2019
Transport	30	34	43	50	44
Energy & Power	23	18	13	11	20
Real Estate	8	22	19	17	16
Shipping & Ports	/	12	11	9	8
Mining	9	2	4	3	7
Oil & Gas	14	3	3	1	3
Healthcare	2	3	3	4	3
Water	10	2	4	5	/
Social Development	4	1	1	1	/
Education	/	2	/	/	/

Source: Deloitte analysis, 2019  
 May not total to 100% due to rounding.

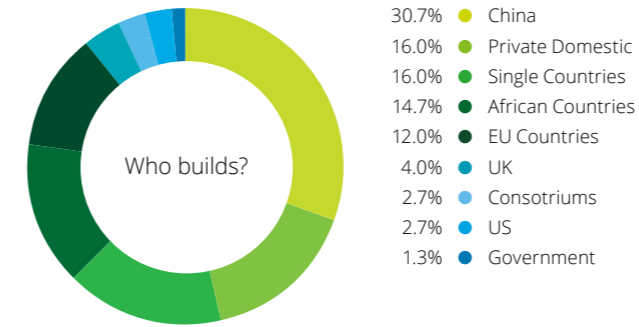


Source: Deloitte analysis, 2019  
May not total 100% due to rounding



Single Countries include France, Ghana, Macau, Nigeria, and Turkey.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding



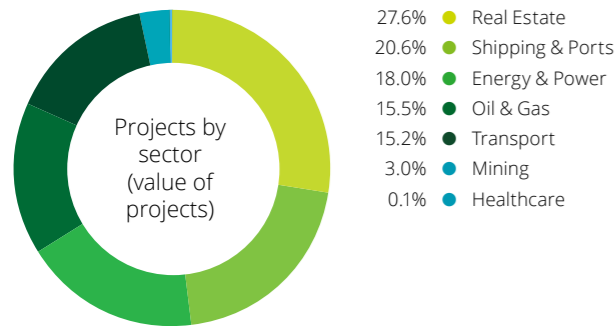
Single Countries include Australia, Brazil, Canada, India, Macau, Singapore, and Turkey.  
African Countries include Burkina Faso, Egypt, Ghana, Côte d'Ivoire, Mali, Nigeria, South Africa, and Tunisia.  
EU Countries include France, Italy, and Sweden.

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding

Chinese builders are the most visible in the West African region with 30.7% of projects, followed by Private Domestic companies (16.0%). Similar to Chinese funders, Chinese builders are heavily concentrated in the Transport sector.

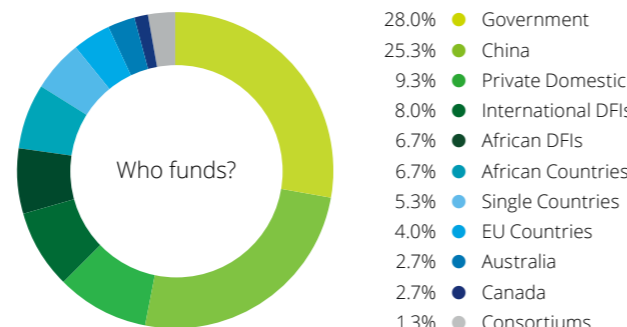
West Africa's 10 largest projects account for 72.8% of the region's total project value, with six of the 10 projects falling into the Transport and Shipping & Ports sectors.

Nigeria's Century City – a real estate development – is the region's largest project by value at US\$18bn, followed by Nigeria's Dangote Refinery at US\$12bn. Six of the top 10 projects in West Africa are in Nigeria.



Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Governments own the majority of projects in West Africa, accounting for 81.3% of project ownership. Private Domestic firms and Single Countries follow, each accounting for 6.7% of projects in the region.



Single Countries include Brazil, Macau, Turkey, and the US.  
EU Countries include France and Spain.  
African Countries include Côte d'Ivoire, Ghana, Mali, Morocco, and Nigeria.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

The majority of projects in the region are funded by governments (28.0%), followed by China (25.3%). Private Domestic and international funding follow with considerably lower representation at 9.3% and 8.0% respectively.

With a total of 33 projects, the Transport sector continues to have the largest number of projects in West Africa, representing 44% of total projects in the region. Projects in the Transport sector have a combined value of US\$12.6bn (15.2% of the region's total project value). The Energy & Power sector follows, accounting for 20% of all projects in West Africa, and 18% in value terms.

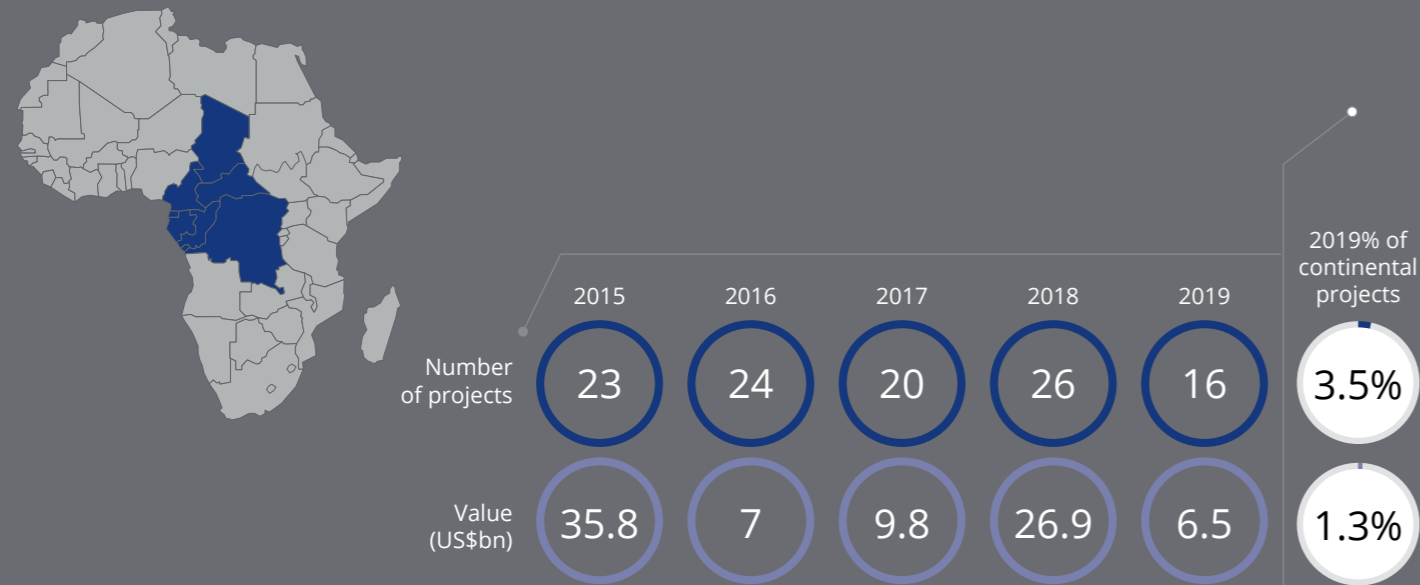
Despite the Real Estate sector accounting for only 16% of the number of projects in West Africa, large-scale industrial construction projects continue to keep the sector the most valuable in US dollar terms (27.6% of the region's total project value).

### Top 10 projects (by value)

	Country	Project	Sector	US\$bn
1	Nigeria	Centenary City, Abuja	Real Estate: Commercial Construction	18.0
2	Nigeria	Dangote Refinery	Oil & Gas	12.0
3	Nigeria	Olokola Deepsea Port	Shipping & Ports	12.0
4	Ghana	Ada Estuary Tidal Power Plant	Energy & Power	5.7
5	Nigeria	Onne Port Complex	Shipping & Ports	2.7
6	Guinea	Souapiti Hydroelectric Project	Energy & Power	2.0
7	Nigeria	Lagos - Badagry Expressway Expansion Project	Transport	1.9
8	Côte d'Ivoire	Abidjan Metro Project - Line 1	Transport	1.7
9	Ghana	Tema Port Expansion Project	Shipping & Ports	1.5
10	Nigeria	Lagos - Ibadan Railway Modernisation Project	Transport	1.5

Source: Deloitte analysis, 2019

# Central Africa



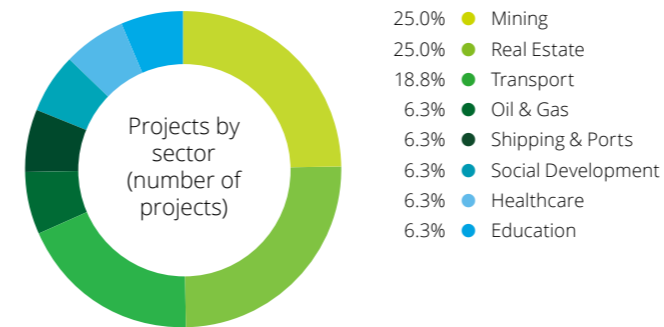
The Central Africa region is made up of Cameroon, Central African Republic (CAR), Chad, the Democratic Republic of the Congo (DRC), Equatorial Guinea, Gabon, Congo-Brazzaville, and São Tomé and Príncipe.

Central Africa represents 3.5% of all projects in Africa and 1.3% in terms of US dollar value. The region is home to 16 projects worth US\$6.5bn. The number of projects as well as the corresponding US dollar value represent a decrease of 38.5% and 75.8% respectively from the previous year. This is the result of a number of projects being placed on hold until further notice across the region.

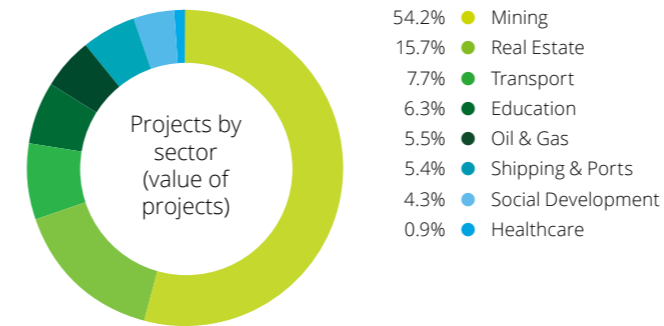
Cameroon accounts for the largest share of projects in the region with 50% of all projects, and the DRC accounting for 59.6% of projects by value.

Projects by sector	Share of projects by number (%)				
	2015	2016	2017	2018	2019
Real Estate	4	8	15	19	25
Mining	4	8	15	38	25
Transport	65	42	30	19	19
Oil & Gas	/	/	/	4	6
Shipping & Ports	/	4	10	4	6
Social Development	4	4	5	/	6
Education	/	/	5	4	6
Healthcare	/	/	/	4	6
Energy & Power	19	29	20	4	/
Water	4	4	/	4	/

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding.



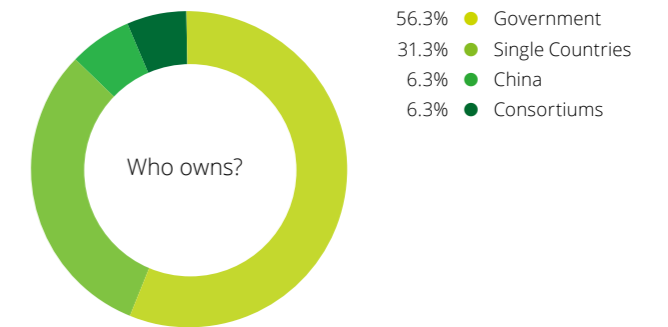
Source: Deloitte analysis, 2019  
May not total 100% due to rounding



Source: Deloitte analysis, 2019  
May not total 100% due to rounding

Mining and Real Estate projects both dominate the sectoral composition by number of projects in Central Africa, with each sector accounting for 25% of the 16 projects in the region. In terms of project value, the Mining industry accounts for the largest share at 54.2% of projects in US dollar terms.

Central Africa continues to maintain a high reliance on natural resources and extractives as dominant economic activities within the region, with little being seen in the form of economic diversification. Transport projects follow, accounting for 18.8% of projects and 7.7% in terms of US dollar value. One key transport project in the region is the Brazzaville–Yaounde corridor, a US\$206m project aimed at boosting connectivity between Cameroon and Congo-Brazzaville.

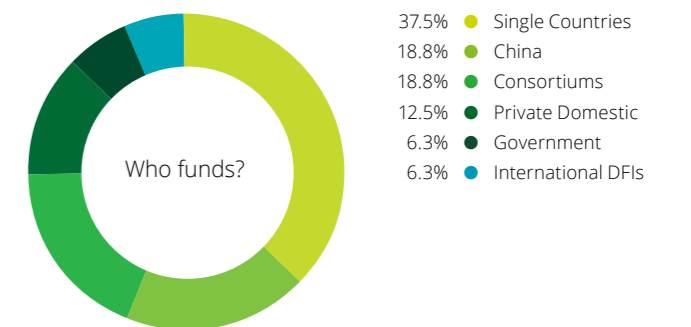


Single Countries include Australia, Canada, the DRC, Mauritius, and the US.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding

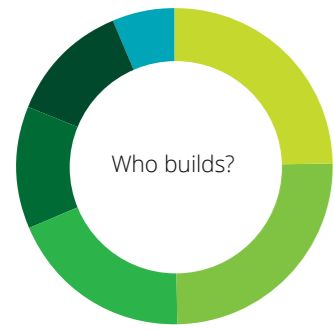
Governments own 56.3% of projects in the region, with the majority of these being in the Transport sector. The Libreville–Port Gentil Road Project, a US\$162m project under construction by a Chinese construction firm, is one of three road infrastructure projects in the region. Central African countries continue to have the lowest coverage of paved roads in Africa, thus investment opportunities in the sector remain high.

In terms of project funding, Governments in Central Africa finance 6.3% of projects, with the majority of funding coming from Single Countries. China is the largest single country funder, accounting for 18.8% of projects, with an inclination towards the Mining and Transport sectors of the region.



Single Countries include Australia, Canada, Italy, South Korea, Mauritius, and the UAE.

Source: Deloitte analysis, 2019  
May not total 100% due to rounding



- 25.0% China
- 25.0% Single Countries
- 18.8% EU Countries
- 12.5% Turkey
- 12.5% South Africa
- 6.3% Consortiums

EU Countries includes France, Italy, and Spain.  
Single Countries include Australia, Mauritius, South Korea, and the UAE.

Source: Deloitte analysis, 2019  
May not total to 100% due to rounding

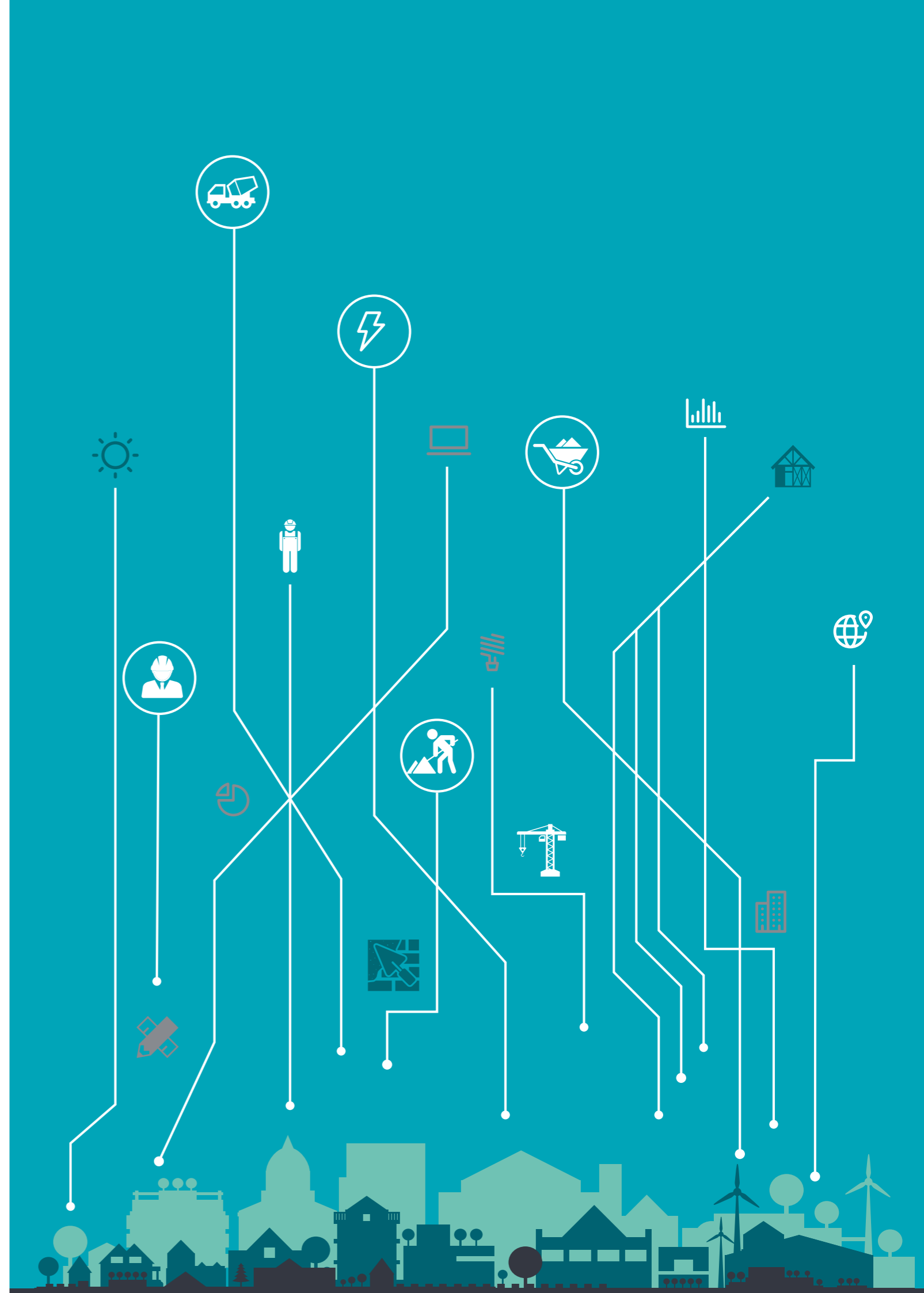
China is the most visible single country player in the construction of projects, building 25% of all projects in the region. Single Countries – made up of Australia, Mauritius, South Korea, and the UAE – account for the same amount of projects as China.

The top 10 projects in Central Africa account for over 90% of the region's total project value. Two of the largest projects in the top 10 projects fall within the Mining sector, with both mines being copper mines. Central Africa has one of the world's most attractive Copperbelt investment sites for international mining conglomerates, with global commodity prices informing interest in the sector.

### Top 10 projects (by value)

	Country	Project	Sector	US\$bn
1	DRC	Kamoa-Kakula	Mining	2.7
2	DRC	Kolwezi	Mining	0.61
3	Cameroon	Sonara Phase I Expansion Project, Limbe	Real Estate: Industrial Construction	0.47
4	Congo-Brazzaville	University of Denis Sassou – N Guesso, Kintele	Education	0.41
5	Cameroon	Limbe-Douala-Edea-Yaounde Hydrocarbon Pipeline Project	Energy & Power	0.35
6	DRC	Banana Deep-water Port	Shipping & Ports	0.35
7	Cameroon	Olembe Sports Complex, Yaounde	Real Estate: Commercial Construction	0.28
8	Cameroon	Douala Japoma Stadium Project	Real Estate: Sports & Cultural Construction	0.27
9	Congo-Brazzaville	Brazzaville (Congo-Brazzaville) – Yaounde, Mfoundi (Cameroon) Corridor	Transport	0.20
10	Cameroon	Douala Grand Mall & Business Park, Douala	Real Estate: Commercial Construction	0.20

Source: Deloitte analysis, 2019



# Digital adoption in capital projects

## Global trends in digital capital projects

Globally, digital transformation has risen to the top of organisational agendas. Businesses are devoting an increasing amount of time, effort and capital into digital transformation. According to research, 80% of companies globally have invested in digitalisation, with an estimated US\$2trn to be spent on digital transformation by 2022.<sup>43</sup>

The business case for digital transformation and its benefits are clear: it provides safety gains, financial benefits, productivity gains, enhanced decision making and improved efficiency. Research done by Deloitte globally shows that 50% of business leaders identify productivity and operational goals as drivers of digital transformation.<sup>44</sup> These benefits are also true for capital projects.<sup>45</sup>

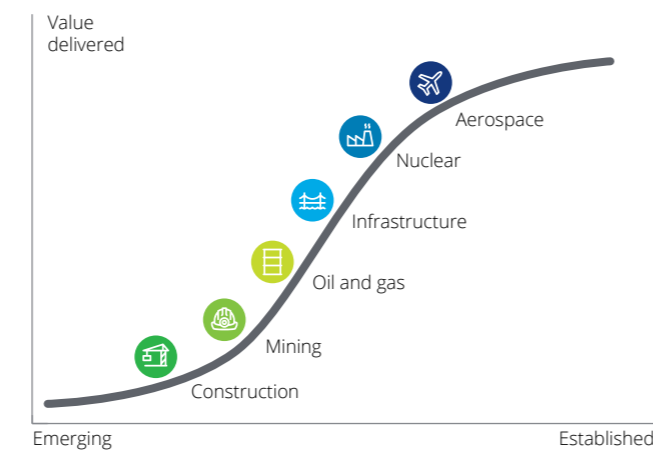
Yet, the capital projects industry has traditionally prioritised investment in conventional tools, techniques and process changes, as familiar ways to improve delivery on time and budget. Technological change can seem uncertain and has impacted digital initiatives negatively.

As is the case with regards to new technology investments in other industries – which are often a reactive response to business risks rather than proactive innovation causing the industry to be change resistant. Furthermore, digital initiatives, where they have occurred, have seldom delivered and sustained the anticipated value or achieved their full potential for various reasons.

While digital maturity varies from sector to sector, the capital projects industry lags behind other sectors, such as media, retail and finance. Construction and mining lag the furthest behind.

For many capital projects industries this is because digital investment has typically been ad hoc. Initiatives have simply emulated what has been done elsewhere, or used what seemed most convenient or readily-available. Project teams have tended to work in silos, adopting piecemeal and unconnected technologies that fail to serve the full project lifecycle.

## Digital maturity of key capital projects sectors



Source: Deloitte, 2019

Such thinking and practices have led to inconsistent data and information mismanagement within and between projects, leaving capital projects owners and organisations unable to develop and mature their digital capabilities in the long term.

Project teams, owner organisations, and the supply chain are coming to the overwhelming realisation that their traditional approach to technology investments are not yielding the benefits they had hoped for. Projects are still not delivering a fully digital operation, but rather delivering a traditional asset with some digital functionality. This fails to realise the full potential of the technology. In other cases, digital 'quick fixes' may be too limited in scope to deliver meaningful improvements.

Central teams still focus on impressive-sounding 'headline' initiatives, but advanced technology is often not mature enough, and as a result, fails to solve key business problems and delivers no immediate value to projects. This can discredit further initiatives, limit budgets and stall new digital ideas.

The scale and complexity of the digital landscape makes it hard to determine the most appropriate solution, with multiple providers, manufacturers and consultants each pushing different solutions. The right approach requires a fit-for-purpose, organisation-specific digital vision and strategy that allows cohesive piloting and appraisal, investment, planning and implementation.

A digital capital project is more than just the use of technology in delivering a project. A digital capital project represents a fundamental shift in how a project is designed, constructed, operated and decommissioned. Only when projects begin with a strong digital foundation built around data can subsequent investment in technology become more effective.

Deloitte research has shown that when digital is integrated and used effectively, it has the potential to add value throughout a project's lifecycle. For example, digital integration can reduce engineering hours by 10-30% in the design, financing and procurement stage of a capital project. Similarly, in the operations and asset management phase, operating costs can be lowered by 10-20%.

Other benefits include:

- Reduced project start-up costs and reduced construction defects
- Impact of design-stage decisions over lifecycle performance and cost
- Significant safety benefits by reducing hazards to human workers
- Reduced management process costs arising from incomplete data (5-10% saving on design fees)
- A single source of data, with visibility of assets at portfolio and national level.

Organisations that have invested wisely are seeing significant benefits. For example, in the mining sector, a major mining company in Australia uses a fleet of autonomous trucks to haul ore, which improves safety, productivity and cost, as one remote operator can supervise multiple trucks running 24 hours a day.

Other case studies, based on Deloitte's experience, have been in the Oil and Gas sector for example. One case required the objective of a step change in productivity and capital efficiency across the ecosystem as investments had been ad hoc and were not delivering value. The value estimation of digital transformation included the following:

- 5-10% reduction in build cost
- estimated value capture of up to US\$1.7bn annually based on productivity improvements
- 3-5% reduction in maintenance hours
- 30% reduction in engineering hours.

## Value of digital in capital projects



Source: Deloitte, 2019



### Capital projects – a South African view

In interviews conducted with capital project owners in South Africa,<sup>46</sup> one message was consistent: adopting digital technologies across the project lifecycle could see capital project owners realise significant benefits and savings. Greenfield projects provide the best opportunity to integrate digital strategies into the project preparation phase resulting in a competitive edge in the market. This has however not transpired yet in practice.



#### Value drivers and anticipated savings

Working smarter by adopting digital technologies may improve overall organisational competitiveness. Indeed, value drivers of digital adoption range from cost savings, and improved health and safety, to continuous operations, greater efficiencies and productivity, better decision making, more transparency and visibility; and ultimately reduced uncertainty, decreased re-work time and better risk mitigation.

#### i) Improved efficiencies

Digital adoption is expected to improve project efficiency by decreasing time and costs and allowing for the application of learnings from past projects to existing and future projects. Furthermore an integrated digital ecosystem across the project lifecycle is expected to give benefits in the form of a smoother transition from the design phase to the implementation phase of a project, which is often disjointed.

#### ii) Cost and time savings

Cost savings of up to 20% across the project lifecycle may be expected through better management of materials, less wastage, and better allocation of resources. In the engineering and design phases, intelligent use of data and incorporating 3D scans and digital twin construction could save between 25% and 40% in engineering hours. More savings may be expected once the benefits of improved health and safety associated with digital are quantified.

#### iii) Better decision making

In the operational phase of the project lifecycle, improved decision-making that is quicker and leaner will result from the smarter use of data, empowering the right people to make the right decisions at the right time. This could, for example, result in benefits such as an increase in mining throughput.



#### Industry readiness for digital adoption is lagging

Digital adoption in capital projects in South Africa is still in its infancy. There are only a few leaders in the industry. Larger players with legacy systems and infrastructure in place are less likely to have embraced digital across the capital projects lifecycle, yet are likely to have experimented with digital technologies in at least one phase of the capital projects lifecycle. Digital maturity in the industry also varies within organisations; for example, across different mining operations of an organisation.

Respondents agreed that digital adoption on capital projects has been backed by various factors. These include (but are not limited to):

- The view that digital is a separate function or department, instead of something that is applied across the organisation. This is a key deterrent to digital adoption in capital projects.
- Organisational hurdles in mindset, particularly holding on to old ways of thinking and rigid cultures. A mindset of “everything is unique and customised for a particular project” results in conclusions that project data will not have any applications in future projects, and curbs digital adoption. Furthermore, as digitalisation is age and generation sensitive, the industry has been stuck in the same status quo of doing things. However, an emerging younger generation could change the overall mindset around digital adoption.
- With the decline in South Africa's infrastructure and construction sector since 2010, the onus is on the project owner to force digital adoption and transformation of projects. This will otherwise not occur throughout the project lifecycle nor across value chains.
- The cost of introducing technologies and license fees are high and prohibitive as they are usually out of the company's means. Most companies are sceptical about spending large amounts of money on the uncertainty of how sustainable and valuable innovation will be to an ever-changing technological market.



#### Tech experimentation rather than adoption

Although respondents rated their organisations as not yet or only somewhat ready for digital adoption across capital projects, there has been some degree of experimentation with digital technologies at different stages of the capital project lifecycle and across value chains.

This has ranged from experimentation with drones used for geological mapping and surveying of sites, reconciliation of erected structures with initial plans, monitoring construction progress, matching sites with models, surveying stock piles, and security monitoring of premises. Other applications of drone technology include digital modelling/twins and 3D rendering (an area that the industry began moving towards a few years ago given the notable benefits).

One of the more notable benefits has been the use of sensors to collect and render data in dashboards for further application in real-time monitoring and predictive maintenance. Such uses have contributed to improving transparency and digital fluency.

There has also been experimentation with lean construction, artificial intelligence (AI) and deep learning, as well as virtual reality (VR) and augmented reality (AR) focused on safety and remote operations.



#### Clear absence of a digital strategy

At present digital adoption is limited to trial and error, or to ad hoc projects. There is a general absence of clearly defined digital strategies for capital projects. Prevailing digital frameworks are at best characterised by identifying “low hanging fruit” that can add significant value, or are limited to a specific phase of the capital project lifecycle (in most cases the operations phase of a project).

Respondents identified the need for organisations to set aside budgets for digitisation in capital projects, if not an organisational digital strategy, and just as much the need for the industry to understand that digital is not a division-specific initiative, nor a one-department-led project. Instead, digital should be understood as an organisational mindset, part of the organisation's DNA and culture, and ultimately a function that spans the whole business.

In the capital projects space, organisations are currently more likely to follow a piece-meal approach to digital adoption, driven by the need to reduce time and inefficiencies, often in the operational stage of a specific project.

While one company indicated that it does not embrace digital in the capital projects space at all, particularly given a lack of exposure to emerging technologies with applications in the capital project space, another indicated that it makes it its mission to visit sizable global capital projects to understand best practices in digital adoption and apply this to its own mega projects.



#### Applying digital across each stage of the project lifecycle

Although ‘quick wins’ on projects through digital adoption are seen as key in the short term, respondents agreed that digital adoption will only be sustainable and realise the greatest returns when technologies are integrated throughout the project lifecycle.

Digital solutions need to cross all foundational aspects of the capital projects lifecycle to unlock intrinsic efficiencies. This is particularly underpinned by better use of data (collection and utilisation, i.e. analysis and insights-driven decision making) across various stages in the capital projects lifecycle, but also the application of insights from this data between projects.

Increased efficiencies and competitiveness may be achieved with the integration of all systems into a single platform – one that allows for integration across the business, and for learnings from past projects to be applied in future projects. For example, this includes project cost models and timelines predictions based on past experiences and data collected.

Limiting the application of digital technologies to a single phase of the capital projects lifecycle, such as the operational phase only, presents an opportunity cost, namely that of not doing this earlier in the lifecycle. Applying digital solutions across the lifecycle can assist with continuity in information, actions and decisions, however, this in turn requires a framework and strategy.



### Key challenges to digital adoption

Some of the key challenges to digital adoption experienced by South African capital projects owners include the following:

#### i) Lack of support from leadership

With a lack of understanding and strong strategic digital leadership, there is a deficiency of buy-in. Digital adoption in capital projects needs to be approached from a strategic perspective, rather than just 'off-the-shelf, plug-and-play solutions'. With a lack of appreciation, capability and understanding of basic technology from leadership, tech may be seen as a black box to the older generation of leaders.

A general mindset of being complacent and relying on what has worked in the past is a key inhibitor to digital adoption at leadership level and across organisations. However, if leadership does not embrace digitalisation and see that this cascades down throughout the organisation, it is unlikely to happen. For digital initiatives to occur and an innovative culture to thrive, the tone must be set at the top.

#### ii) Bringing along the workforce

As there is a strong reliance in the industry on the 'old way of doing things', with the mantra of 'what has worked in the past, will work again', there is a requirement for more agile thinking across organisations. This requires managing expectations of the workforce and equipping them to overcome the barriers of digital adoption (especially when digital is seen to threaten rather than to improve jobs).

This requires that the workforce understands the entire end-to-end project value chain and how they add value to a project; and it requires communication on what digital is, how it will affect the workforce, what tech is available and what changes should be anticipated.

It includes teaching digital fluency, linking digital needs to employee KPIs, and to driving appropriate communication around people-centric technology whilst demonstrating the benefits of the projects that have adopted digital to change the organisational narrative. Appropriate change management and investing in the digital quotient of the workforce, i.e. by investing in free Wifi, digital learning platforms and the opportunity for the youth to upskill and develop their own digital skills, are part and parcel of this. The most important skills to have though are soft and human skills.

#### iii) Funding

A challenge to digital adoption in the industry is funding. This is particularly acute in the mining capital projects sector given the cyclical nature of commodity prices. It is further exacerbated by conflicting objectives of cross-functional departmental teams. Another funding challenge is justifying spend on digital adoption given existing infrastructure and assets that are in place and the significant outlay of funds they require.

#### iv) Existing infrastructure/legacy systems

As capital projects can be in remote locations, the ability of organisations to embrace digital technologies may be hindered by infrastructure challenges associated with those locations. For example, due to a lack of internet and bad reception (which are typical challenges in many locations across Africa), a lot of funding and time may be spent on improving infrastructure, specifically IT infrastructure, before making investments in digital technology.

Furthermore, a bad experience with technology in one area of the organisation may restrict the willingness and ability of people to change their behaviour in another area. Also, as systems for various functions exist across organisations, there is a need to integrate across partners in the ecosystem so that efficiencies can improve the entire work environment.

One such example is the need for a single platform or system to access data (data collected from tenders, costings, design, etc.) by all relevant stakeholders in the organisation. Collecting and drawing insights from the data to learn from mistakes must be a key focus. While it is difficult to innovate off old, legacy infrastructure, the lack of confidence in itself (i.e. if digital will actually deliver on the proposed and expected benefits) is a significant barrier.

#### v) Demonstrating the benefits of digital

A progression toward industry readiness and embracing change is a function of clearly demonstrating the associated value of digital adoption and transformation. Owners' costs are expected to decrease with the adoption of certain technologies. The expected Return On Investment (ROI) from digital adoption varies and ranges from as high as 15% to incremental or small improvements to ROI, including one to five additional percentage points. Projects with higher uncertainty naturally require a higher than normal ROI, with brownfield projects that have a higher risk also demanding a higher ROI.

However, while 'low-hanging fruit' projects can demonstrate quick wins, these do not necessarily demonstrate the holistic benefit, which is a barrier to digital adoption across the project lifecycle.

#### vi) Other industry challenges

As alluded to in a Deloitte Africa 2019 report, South Africa's "current market conditions and socio-economic circumstances, mining companies not only need innovative business models to deal with cost, capital, efficiency, talent, technology and digitisation; but also new strategies to manage rising stakeholder demands, strategic risks related to their 'social licence to operate' and increased regulatory requirements linked to socio-economic priorities".<sup>47</sup>

Given the pursuit of multiple objectives, including a 'social licence to operate' there is a need to understand how industry-wide collaboration on the applications of digital in capital projects (within the framework of what can make the mining industry as a whole more competitive internationally) could take place. At the least, there is a need for ecosystem partners to work together to realise the benefits of digital.

### What are the critical success factors to digital maturity?

Deloitte's experience in working with clients has identified four key success factors that are critical to enable digital transformation:



#### 1. Develop your digital roadmap

This is the foundation for digital transformation. The design must consider current digital capability, investment environment and key issues that could be addressed by digital. The roadmap depends on the project or organisation's lifecycle phase, and will evolve as these progress, however there should be a single view to integrate on-site construction activities with both a digital value office and back office work. Transformational leadership is needed to set the direction for and drive the organisation's digital journey.



#### 2. Prepare your digital workforce

Digital capability is not simply about technology, systems and data. Successful transformation comes from people, culture and behaviours, so preparing for the 'future of work' is essential. Today's digital natives will be the people delivering projects in the medium and long term, and they will expect a digitally mature working environment. The future workforce will demand agility, efficiency and facilities that can host vast amounts of project data.



#### 3. Invest at the right time, for the right reasons

Develop a strong business case and clear sponsorship for the digital journey. The ability to introduce digital to the heart of the organisation may be affected by the current data and information landscape, level of design standardisation, risk appetite, and organisational culture. All these areas should be considered. A holistic business case and clear vision can make the difference between an investment becoming a success or a failure.



#### 4. Embrace the digital operating model

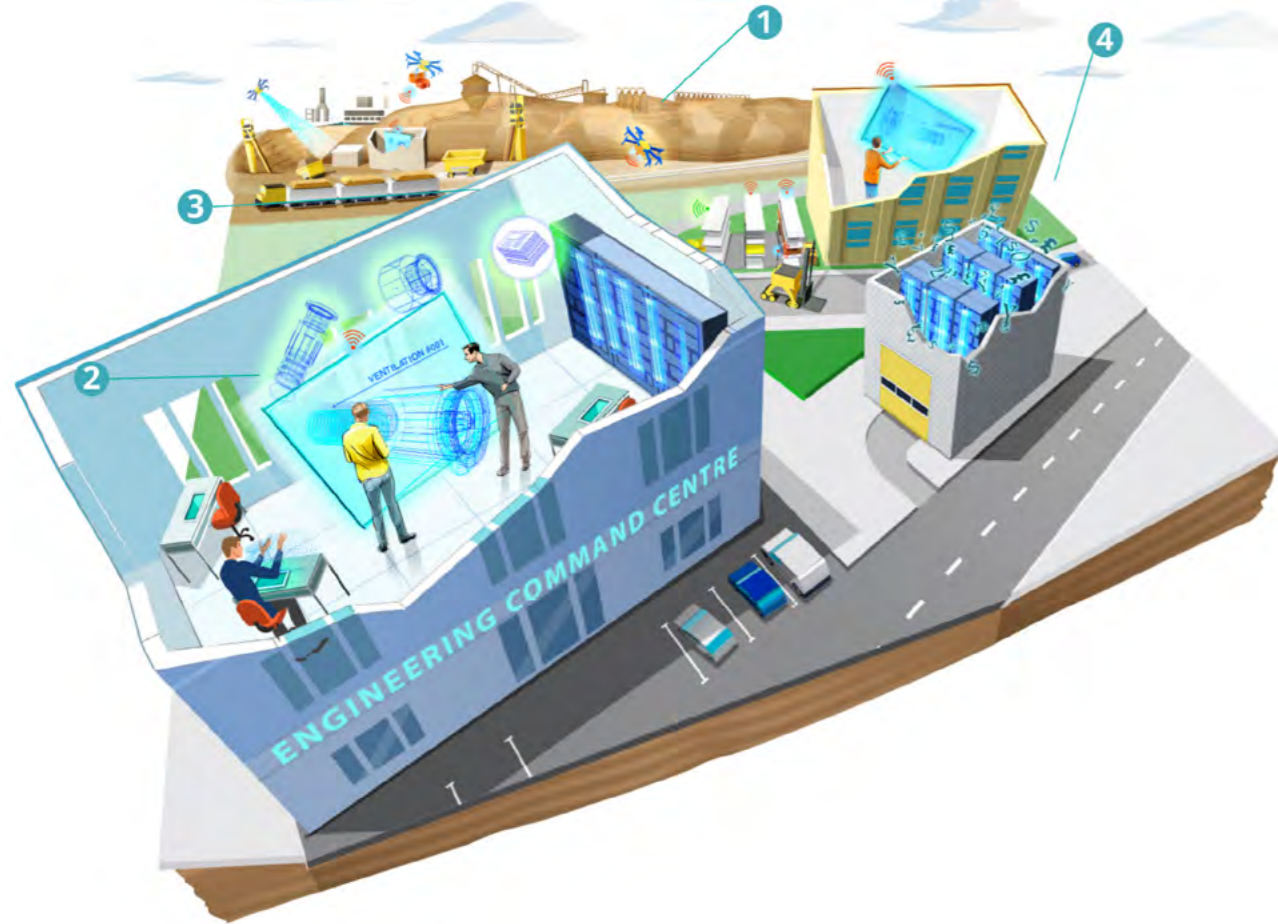
Digitally transforming a capital project is a major undertaking. Such scale and complexity requires careful considered assessment, design and implementation; bringing the team along on the journey is a must. It is essential to consider and understand the entire strategy, capability, organisation, process, systems and data elements.



**The capital project of the future**

By applying digital throughout the project lifecycle, Deloitte sees the capital project of the future as follows.

**Example technology: Digital through the lifecycle<sup>48</sup>**  
**Phase 1: Design, financing & procurement**



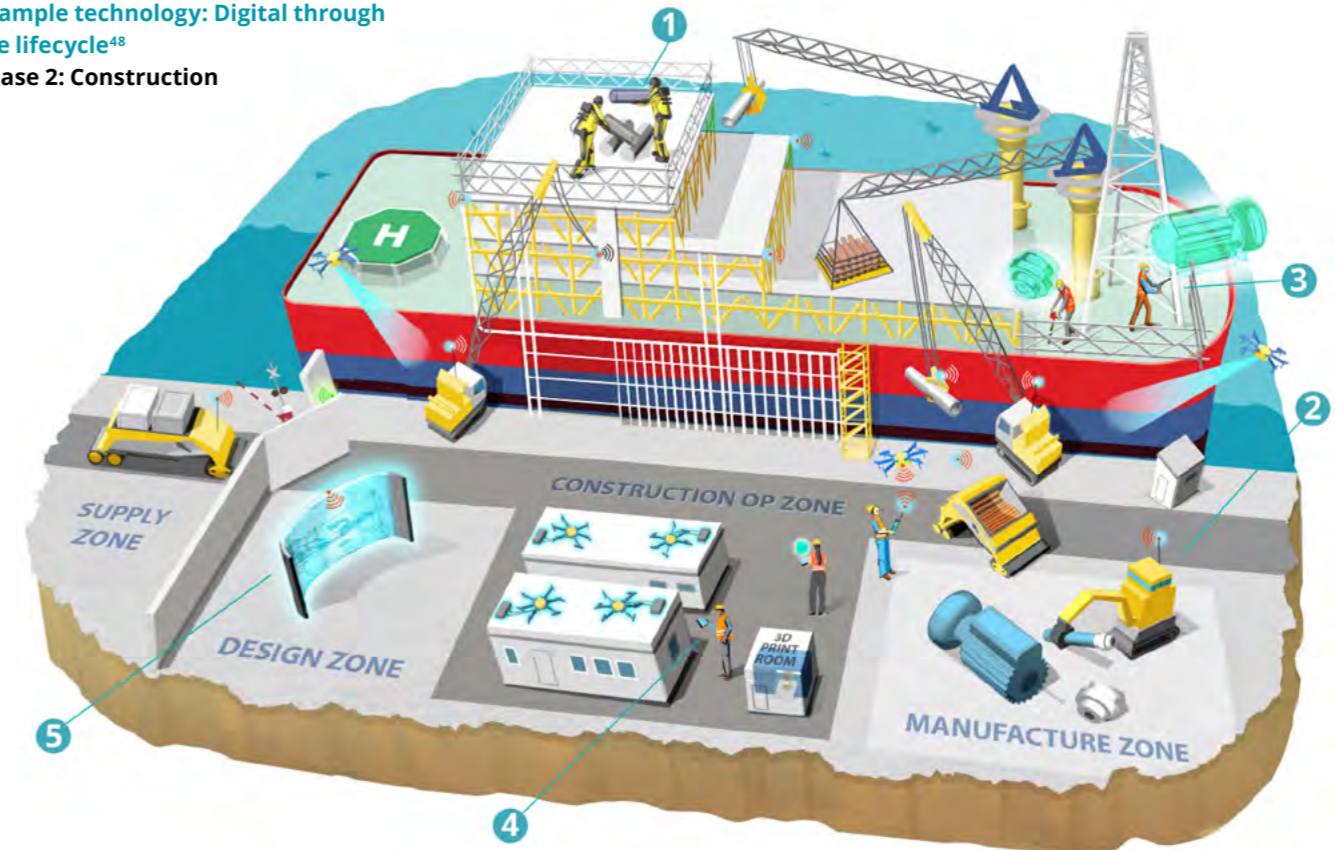
Collaborative engineering design work is facilitated through an immersive design environment, with data readily available from vendors and previous projects, in a cloud hosted platform.

- 1 Drones**  
Surveillance, inspection and topographical surveys are just some of the applications for drones in the field. For example, a drone can provide live visual support to a design or construction team, with off-site teams viewing footage and relaying feedback, or the construction team viewing drone visuals through augmented reality wearables.
- 2 Collaborative design**  
The advance of 3/4/5D modelling and visualisation technologies supported by cloud hosted data enables a highly collaborative design process, with multiple engineers working on the same

design in real time. Live manipulation of the design is possible, and Virtual Reality (VR)/Augmented Reality (AR) can be utilised to provide a fully immersive design experience and capability.

- 3 Intelligent design search**  
Organisations have access to huge amounts of information from previous projects – engineering designs, inventory lists, technical standards, historic costs, trends and project plans. Artificial Intelligence (AI) can provide real-time support in the design process by analysing and processing vast amounts of data to provide insights and comparisons with previous projects.
- 4 Blockchain (digital ledger)**  
Blockchain has an application as a secure transaction and record platform – a digital ledger. Throughout a project, the complex network of interactions between the project owner, contractors, suppliers and other stakeholders necessitates an environment where digital information (e.g. financial transactions, equipment history, inventory) is securely managed.

**Example technology: Digital through the lifecycle<sup>48</sup>**  
**Phase 2: Construction**



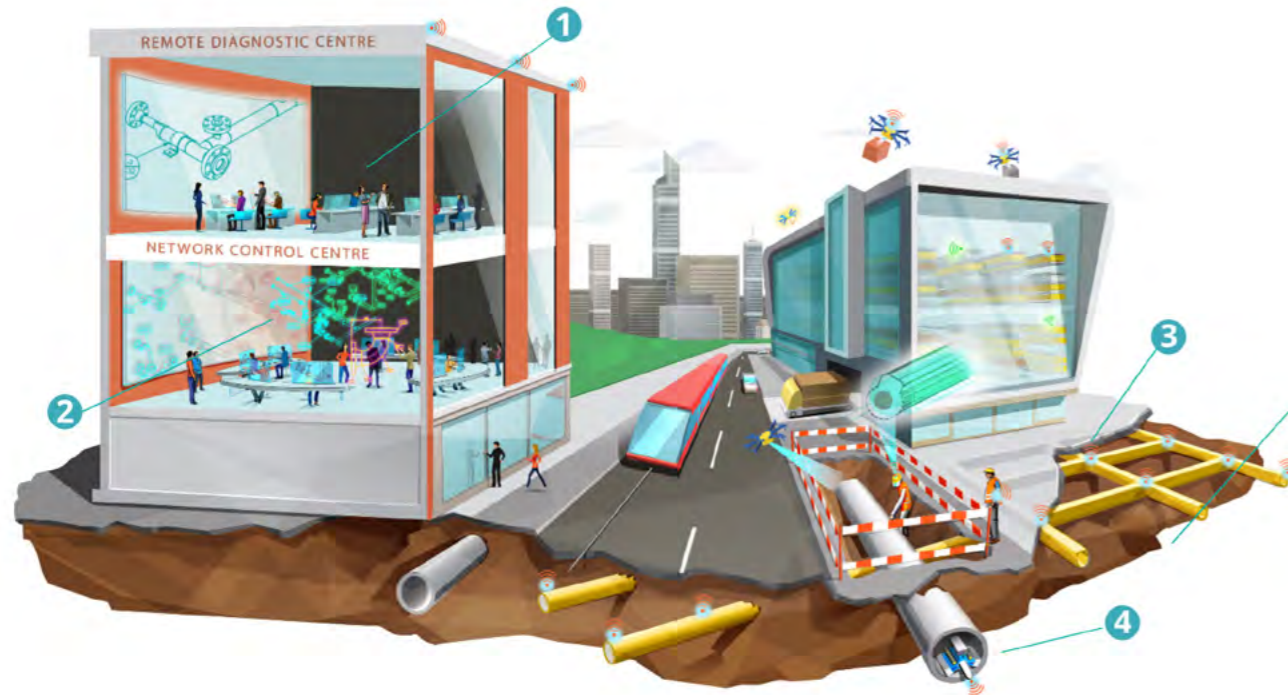
During construction, workers equipped with exoskeletons, drones and mobile solutions are supervised off-site through augmented reality technology.

- 1 Exoskeletons**  
Although in its infancy, exoskeletons augment the human body to provide the ability to avoid repetitive strain injuries, and add additional strength and dexterity.
- 2 Modular design & construction**  
Modular construction (closely linked to pre-fabrication) allows construction assemblies to be built more efficiently than ever before. Through the use of a standardised design inventory, and a set number of commonly used components, complex assemblies can be built by robots with minimal human interaction. 3-D printing can often be used in parallel to manufacture elements of the design with greatly reduced lead times. Ideally, the construction process can occur off-site in a controlled and hazard free environment, limiting on-site activities to installation and commissioning.

- 3 Augmented Reality**  
AR technology provides a virtual overlay of information onto a real-world view. Construction workers equipped with AR headsets can view design schematics during on-site activities. Integration of wearables with live video-feed and sound allows offsite personnel to 'view what the worker is viewing' – one technical specialist can provide live oversight and support to a team of on-site workers.
- 4 Mobile/tablet solutions**  
Mobile/tablet solutions are already being used in many construction projects, providing worksite personnel with easy access to designs and work instructions, as well as being able to submit project data (e.g. health/safety audits, progress data and images).
- 5 BIM (Building Information Modelling)**  
Advanced 3D models through BIM can be used to understand the impact of design changes and inform sequencing of tasks. This also includes capture of operational asset data throughout the design and construction stages.



**Example technology: Digital through the lifecycle<sup>48</sup>**  
**Phase 3: Operations and asset management**



A network of sensors capture data from the operating asset, with background AI analysing the digital twin to generate predictive maintenance regimes.

**1 Robotic Process Automation (RPA)**

Technicians are supported by computer software which enables the automated processing of transactions, data manipulation, and communication with other systems. Companies are able to spend less time on administrative tasks and more time supporting value-adding tasks. Back-office functions can also benefit from RPA, enabling an organisation to be more efficient.

**2 Digital twin**

The digital twin is a complete digital replica of an existing asset - created through the combination of 3D visualisation, analytics and sensors (IoT). Sensors attached to the operating asset provide real-time data, with analytics capabilities giving insights from other similar assets. Predictive maintenance regimes can be established, as well as the digital twin feeding the design for new assets.

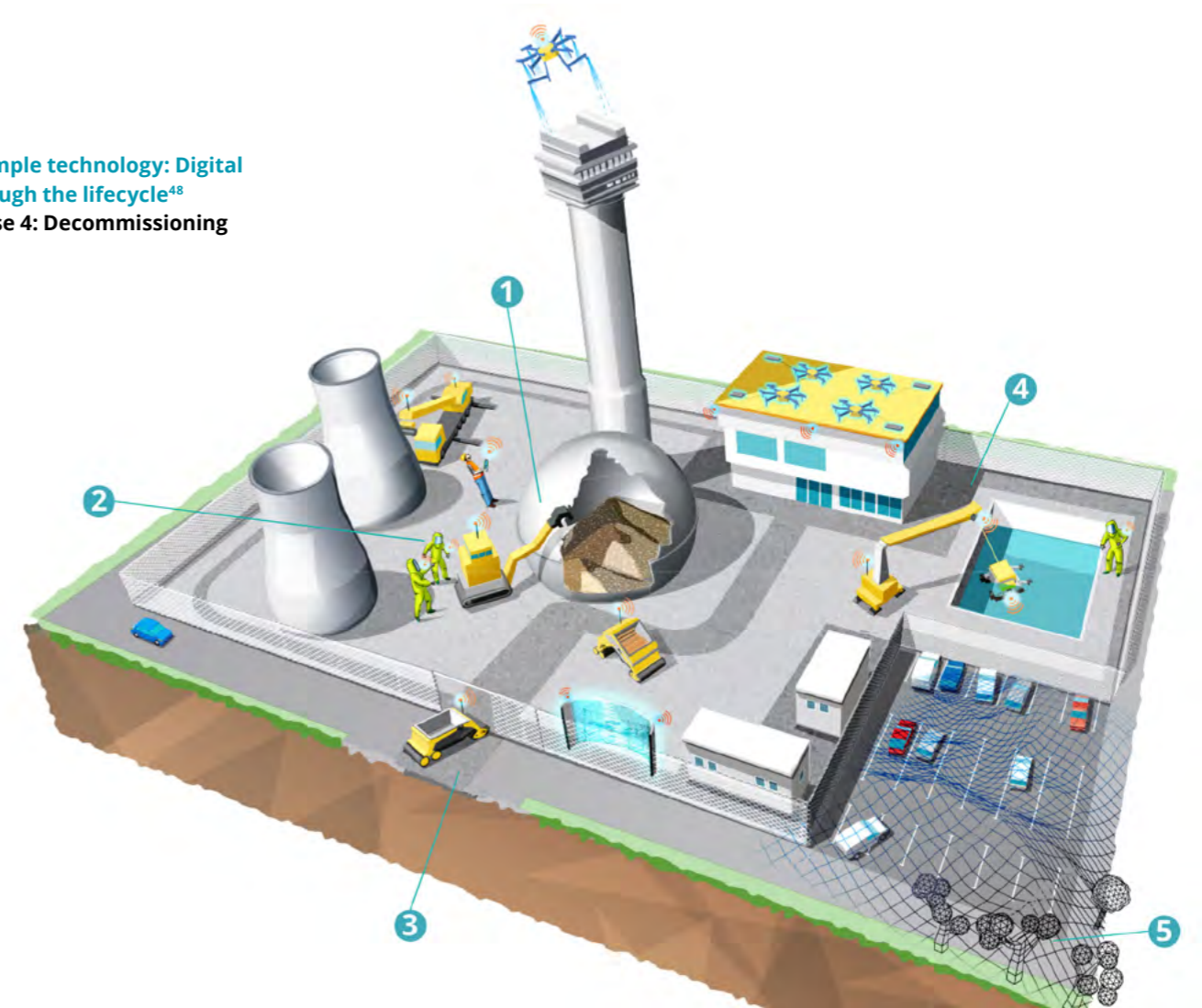
**3 Internet of Things (IoT)**

The introduction of sensors and internet connectivity to new applications enables complex equipment and networks to provide live feedback on various operating parameters. The vast amounts of data being fed back is supported by analytics capability to analyse, process and provide insights based on the data. Operating patterns and malfunctions can be identified and proactively addressed.

**4 Predictive maintenance**

Equipment and network connectivity supported by AI enables maintenance regimes to be more effective and proactively designed. Significant reductions in equipment down-time can be achieved when a network is managed in this way, with data and information at the heart of the maintenance process.

**Example technology: Digital through the lifecycle<sup>48</sup>**  
**Phase 4: Decommissioning**



Decommissioning risks are mitigated through use of robots and autonomous vehicles, with hazardous areas restricted through workers' RFID wearables.

**1 Robotics**

The application of robotics across asset management and decommissioning significantly reduces hazards on-site. As well as being able to enter environments unfit for humans, multiple types of data collection are possible during operations.

**2 Wearables**

Wearables have a wide ranging number of applications, including monitoring of remote workers and external environmental factors (such as radiation and gas concentrations in enclosed spaces).

**3 Autonomous vehicles**

Autonomous vehicles combine sensors and software to allow driverless carrying capabilities. In applications with fixed-routing (e.g. transportation of goods in a warehouse, or mining trucks ferrying waste tailings along a predefined route) these solutions

are in place. The driverless car revolution, combined with advances in battery technology, has the potential to transform the construction site into a safer, and more environmentally friendly place, with reduced demand on the workforce.

**4 RFID identification**

RFID (Radio Frequency Identification Technology) uses electromagnetic fields to identify and track proximity of objects. It has various applications - for example, workers can be alerted when entering restricted areas controlled by an RFID sensor - called geofencing. The restriction of various areas of a site can be remotely controlled, minimising the need for physical barriers.

**5 Environmental modelling**

Following decommissioning of engineering facilities, it is important to understand how quickly the natural environment will regenerate. Advanced modelling and impact assessment software is supported by GIS (Geographical Information Systems - systems designed to capture, store and analyse spatial and geographic data) to provide project owners with long-term project impacts.

# Methodology

The annual Deloitte *Africa Construction Trends Report* monitors the progress of capital-intensive infrastructure on the continent. To qualify for inclusion, infrastructure construction projects are required to be valued at over US\$50m. For this year's edition, projects must have broken ground, but not yet been commissioned by 1 June 2019.

The analysis of construction trends focuses on projects that are physically under construction, with construction crews on-site at the annual cut-off date. The successive annual reports track the value of construction projects underway as at 1 June of each year, so the numbers should not be read as reflecting the total value of projects constructed during a 12-month period.

In this edition, we are able to draw comparisons across five years of data, both from a continental and regional perspective, drilling down into the sectoral, project ownership, project funder, and project builder landscape.

Categorisation of regions covered in this report followed that of the African Development Bank (AfDB). Data collected was limited to publicly available information and informed the *Africa Construction Trends Report 2019* dataset. All graphics displayed in this report, unless otherwise indicated, are based on this dataset. LNG projects, which were previously classified as industrial Real Estate projects, have been reclassified as Oil & Gas projects. This has been done as part of our ongoing efforts to improve on the categorisation of our project data.

## Definitions:

- African DFIs – Development Finance Institutions headquartered in Africa, such as the African Development Bank (AfDB), Trade and Development Bank (TDB), Development Bank of South Africa (DBSA)
- Consortia – two or more construction companies or governments holding an equal split of a project's ownership, building activities, or funding activities
- International DFIs – Development Finance Institutions headquartered outside of Africa, such as the World Bank, International Monetary Fund (IMF), International Finance Corporation (IFC), Japan International Cooperation Agency (JICA), and United States Agency for International Development (USAID)
- Private Domestic – an African construction firm headquartered in the same African country where it is constructing a project
- Single Countries – countries that could not be grouped together according to a common or shared geography. These countries do not make up a significant portion of project ownership/funding/building activities on their own and have thus been grouped together under this title.

## Acknowledgments

The authors would like to thank Kirstyn Whiting and Parthiv Dedasaniya for their research and logistical assistance in preparing this report.

The authors and the Deloitte Africa I&CP team would also like to thank all the senior executives that made the time to share their industry insights on digital capital projects.



# Endnotes

1. This is a difference in the total number of projects and is not equivalent to the number of new projects, as projects are completed and new projects are started.
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49. Some of the technologies listed will be applicable in other lifecycle phases.

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