

2014/5 Study on the Sub-Saharan Africa Zinc Market

International Zinc Association Southern Africa

(Rob White August 2015)



EXECUTIVE SUMMARY

The Market Study for the first time covers the key regions of West and East Africa in depth to assess the market potential for galvanized products currently and in the immediate future. Six of the world's fastest growing economies are now in Sub-Saharan Africa (SSA). The focus on Nigeria, Kenya and, Ethiopia specifically is deliberate to highlight the high potential for zinc consumption of these countries within the growing in importance regions of West and East Africa. The importance of SSA as the last untapped agriculture source is also discussed with the market potential for zinc containing additions estimated at 11 000 zinc tonnes currently. SSA is applying an average of 15kg/ha of fertilizer on agricultural land compared to 8kg/ha in 2008. With an annual fertilizer consumption growth rate now exceeding 8% per annum, Africa is the fastest growing fertilizer market. Fully realised a potential of 500 000 zinc tonnes could exist.

Zinc consumption in Sub-Saharan Africa has largely surpassed that of South Africa alone such that consumption figures of around 200 000 tonnes in 2014 would appear reasonable. This consumption is largely restricted to West, East and Southern Africa with the former two regions showing a doubling of consumption of zinc coated steels over the past 5 years. Direct zinc consumption in East Africa has grown 57% over two years to service rapid growth in continuous galvanizing facilities. A construction boom and major investments in energy are providing for significant galvanized steel opportunities. The Grand Renaissance Project in Ethiopia and the concomitant roll-out of transmission and distribution networks are offering rich pickings for galvanized steelwork (transmission and distribution towers) such that in 2014 Ethiopia alone imported 272 000 tonnes of transmission tower steelwork.

Due to current regulatory restrictions on market access to South Africa, zinc imports from Namibia into South Africa in 2014 were limited to 33 000 tonnes. The balance was exported out of the Southern Africa region. Total zinc imports into South Africa were reported as 92 000 tonnes in 2014. The Apparent Demand for zinc in 2014 is estimated at 97 000 tonnes, as zinc equivalent tonnes.

Legal framework uncertainties, such as the Mineral and Petroleum Resources Development Act, labour unrest and an unattractive operating environment (energy shortages, regulatory impediments, infrastructural bottlenecks) remain a constraint on future Private Investment and growth in South Africa. Government expenditure on infrastructure halved in 2014 when compared to 2013 despite promises of increased expenditure. GDP growth was recorded as 1.5% in 2014 and mining made its lowest ever contribution to GDP at 5% in 2014 compared to 11% in 1993. Galvanizing continues its dominant market share as other zinc value adding industries battle for survival. For general galvanizing, the role of solar projects continues to grow in importance filling the gap left by low mining investment - a traditional high galvanized steelwork user industry.

In contrast, the rest of Southern Africa is showing robust growth in zinc coated product consumption. This is reflected in the imports of coated steel into the region to support the infrastructure construction boom. Angola and Mozambique, despite some hiccups have seen coated steel consumption rise by a factor of threefold in only 4 years and a doubling of consumption of steel amenable to hot dip galvanizing over the same period. As would be expected, this has resulted in the development of general galvanizing facilities in the region outside of South Africa.

ZINC PRODUCTION AND EXPLORATION PROJECTS – SUB-SAHARAN AFRICA

In the last two years there have been some interesting developments concerning possible zinc production in Sub-Saharan Africa (SSA). African production remains low at under 4% of global production but some promising announcements have been made.

1. Vedanta has started development of the Gamsberg zinc development project in South Africa. With a budget of \$630m and an estimated output of 250 000 tonnes of zinc concentrate per annum, this will be one of the largest producers in the world. A significant proportion (yet to be determined) of concentrate output will be directed at a modified (\$150m) Namzinc plant in Namibia with an annual capacity of 150 000 per year, with the balance available for export. This project will ensure that zinc production remains a key part of the SSA landscape.
2. Nevsun Resources have announced that zinc production from its Bisha operation in Eritrea will start in 2016. Currently a copper operation, it is estimated to produce around 45 000 tonnes of zinc in concentrate per annum over its estimated 10 year life.
3. The Kipushi project has recently yielded some interesting values from drilling where primary mineralisation values of 50% zinc have been reported. These are typical values for concentrates rather than ore. Notwithstanding this, the ore body remains stuck in the exploration stage.

REGIONAL OVERVIEW – SUB-SAHARAN AFRICA

The past decade has witnessed Sub-Saharan African economies grow at over 5 per cent, higher than the world average of 2.7 per cent (World Bank). In fact, 6 of the world's 10 fastest growing economies over the past decade are located in Africa, namely, Angola, Nigeria, Ethiopia, Chad, Mozambique and Rwanda. **Figure 1** indicates current and predicted growth rates for key countries within SSA. The largest economies are Nigeria and South Africa (which account for almost 50% of SSA GDP) followed by Angola, Ethiopia, Sudan and Ghana.

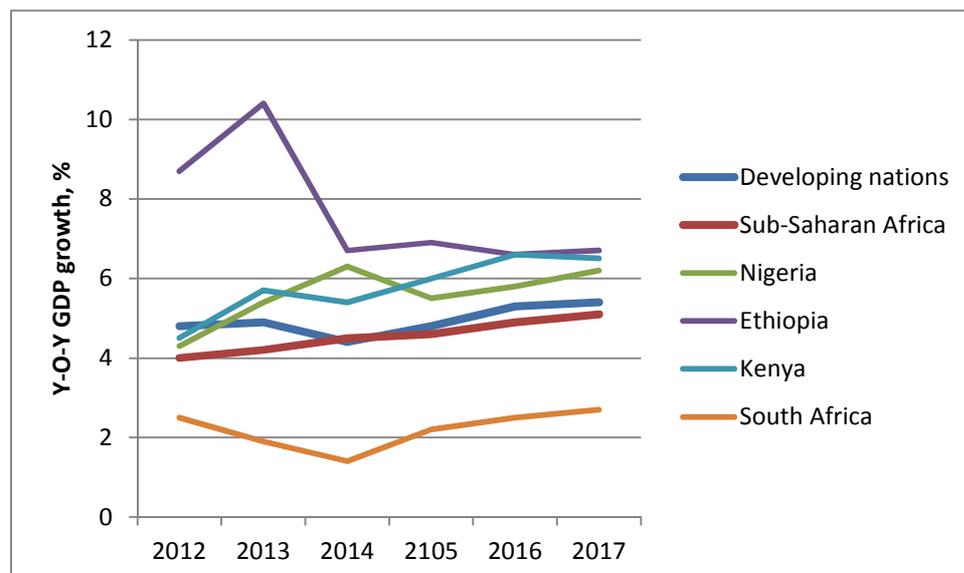
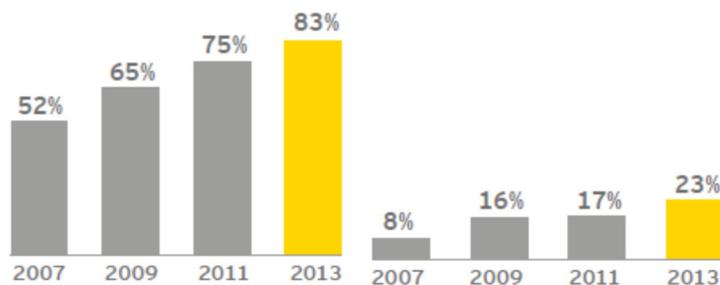


Figure 1 GDP growth rates (World Bank, 2015)

In 2013, it was estimated that Foreign Direct Investment (FDI) figures were of the order of \$40bn+ (source IMF). Africa has been a net creditor to the world, as measured by the net resource transfers, of up to \$1.4 trillion in the period between 1980 and 2009 – adjusted for inflation (African Development Bank & Global Financial Integrity). SSA (FDI) figures have shown substantial growth reaching 83% of African FDI and there has been rapid growth in inter Africa FDI to 23% of the total by 2013.



SSA FDI as % total for Africa Percentage of FDI from within Africa

Figure 2. Demonstration of increase in inter-Africa FDI into SSA projects (Ernst & Young, 2014).

FDI growth rates into Nigeria have maintained a compound annual growth rate (CAGR) in excess of 19.5% since 2007 with Kenya experiencing 40%. Natural resource developments (mining, oil and gas, minerals, etc.) account for only 5% of the FDI with 95% being in services (technology, media and communications, retail, business and financial services). In the latest investment attractiveness survey, only North America ranks higher than Africa (source Ernst & Young, 2014).

The three key areas of growth are public infrastructure, private investment and agriculture. The African Development Bank estimates that some \$90bn a year (or 15% of GDP) will be required over the next decade to address the poor infrastructure situation with some 40% going to power generation and 40% going to water and transport needs. A breakdown of key project expenditure per sector is shown in **Figure 3**.

In 2014 estimated project expenditure throughout SSA was estimated as \$61bn for East Africa, slightly down on 2013; \$74.6bn for West Africa, almost 50% higher than in 2013; \$145bn in Southern Africa, some \$74bn higher than 2013. Central Africa continues to be of concern although figures of \$33bn were recorded for 2014. In highlighting these figures, it should be noted that long lead times and overruns may mean that some of these figures include projects in progress in 2013 (i.e. some doubling counting is occurring). Notwithstanding this, the value of projects being undertaken is substantial. A perception often expressed is that many projects are not just funded externally, but also key suppliers, and even contractors, are from outside the continent. Specifically, complaints are that projects are managed from China. This sometimes leads to the complaint that there is little or no local impact (skills transfer, use of local inputs, etc.). However, as can be seen from **Figures 4 and 5**, the majority of projects are managed from Europe or the USA where often local skills development is part of the deal. Indeed the importance of local developers is highlighted in all the three regions. The need for Public Private Partnerships (PPP) is clear with Nigeria leading the way.

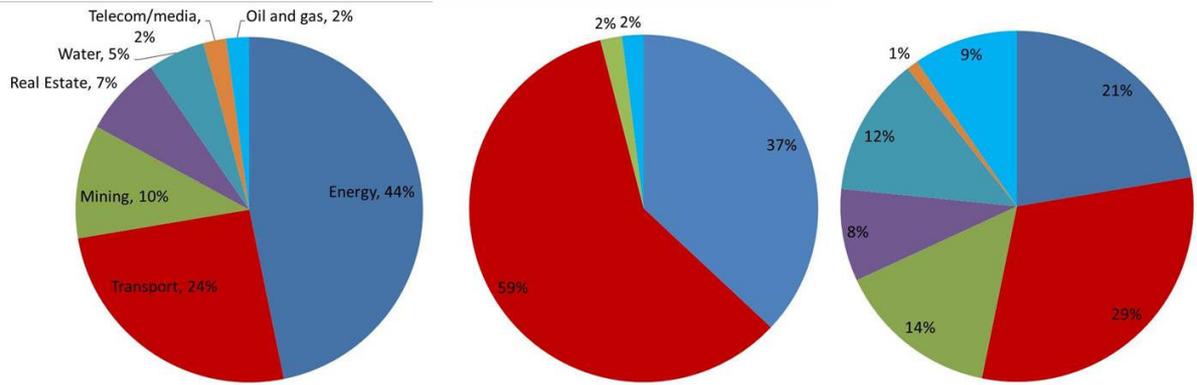


Figure 3. Key Projects by category for Southern, East and West Africa respectively, & (source Deloittes and others, 2015)

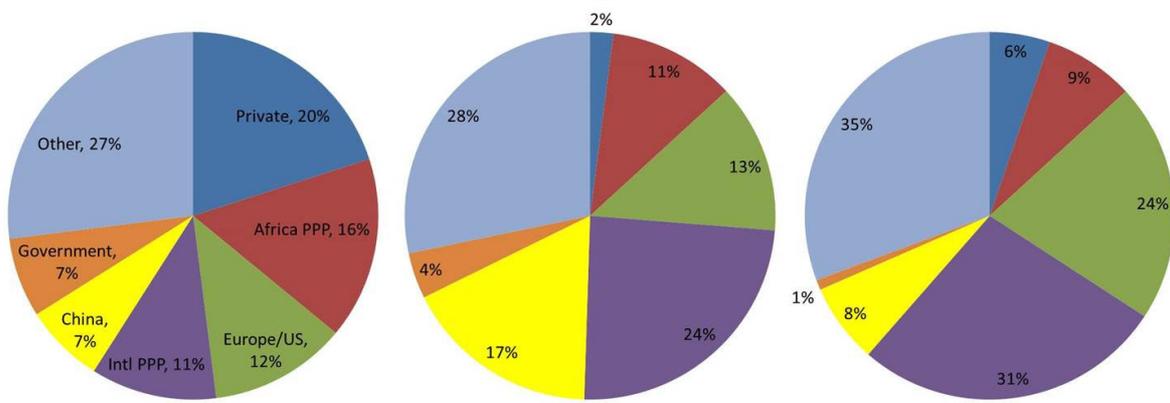


Figure 4. Key Project Funders for Southern, East and West Africa respectively, & (source Deloittes and others, 2015)

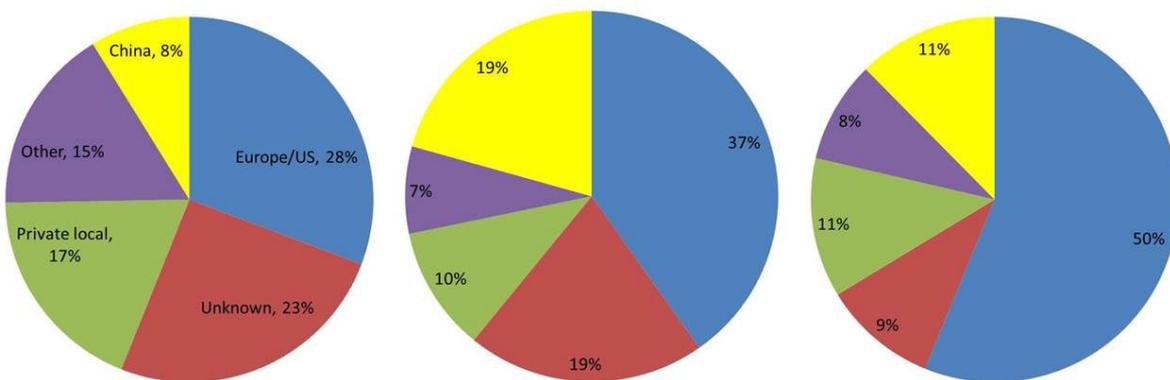


Figure 5. Key Project Contractors for Southern, East and West Africa respectively, & (source Deloittes and others, 2015)

Regional differences in the attractiveness of construction are provided by a comparison of building costs. From this analysis, it is clear that East Africa is the cheapest region for building (residential, commercial and retail, industrial) with Southern Africa the most expensive. Kenya is almost as cheap

as India in terms of building costs per square metre with southern Africa being on a par with the Middle East and Angola being almost as expensive as Singapore (Figure 6).

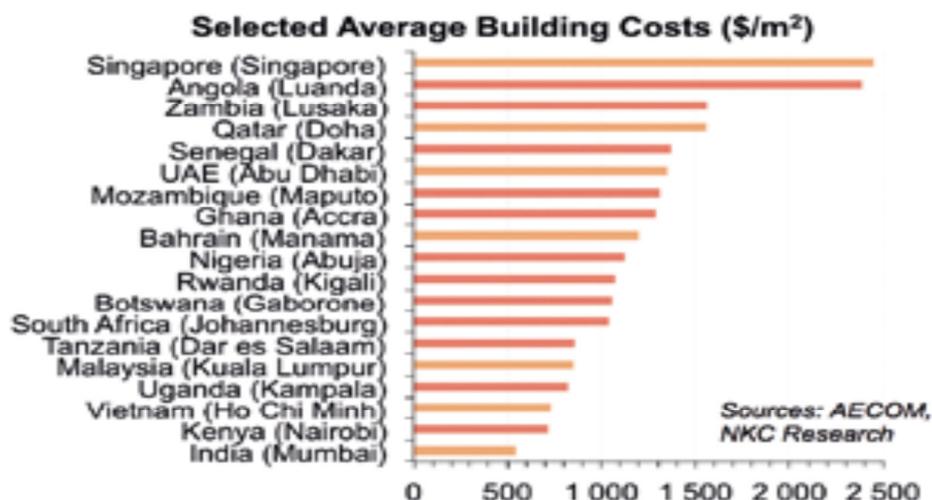


Figure 6. Costs for building per m2 (AECOM Africa Property and Construction Handbook 2013).

Zinc market growth potential is discussed through steel consumption forecasts backed up through a discussion of three key infrastructure requirements, energy, transport and water. Agricultural opportunities are discussed separately.

Steel Consumption

Steel consumption has been estimated as 37 million tonnes in 2013 for Africa as a whole and 16 million tonnes for SSA. This is set to double in the next 5 years and various investments, such as those above, are underway to take advantage of this. Steel use per Capita (Worldsteel) as kg finished product in 2012 was given as South Africa 106, Nigeria 11, Ghana 29, Tanzania 8.6 and Kenya 22.5 demonstrating the upside potential as country development accelerates. For comparison the figure for Brazil was 127. Consumption figures for the top countries for 2014 are given in Table 1 although these numbers appear low when referenced to trade details.

Table 1. Estimated Steel Consumption in key countries of SSA in 2014 (ref. AMSA, 2015)

Country Ranked by GDP	Consumption, kt	%, flat products	%, long products	
1	Nigeria	2000	65	35
2	South Africa	5000	60	40
3	Angola	905	37	63
4	Kenya	1220	74	26
5	Ghana	825	50	50
6	Ethiopia	1035	34	66
7	Tanzania	540	65	35
8	Cote d'Ivoire	200	48	52
9	DRC	70	49	51
10	Cameroon	180	36	64

With the exception of South Africa, SSA produces very little steel. However, there are a growing number of steel coil coaters and the rapid increase in coil consumption in West and East Africa is a reflection of this (see **Figure 7**). The LME reported that, in 2014 the global market for continuously galvanized coil products grew by 8%. In comparison, coated and uncoated coil imports into West and East Africa have doubled in 5 years.

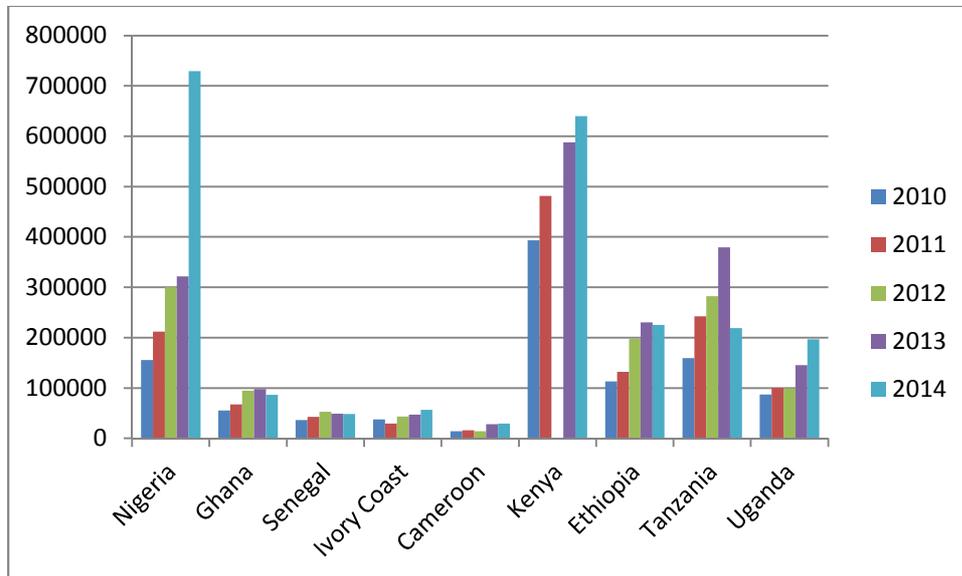


Figure 7. Uncoated Coil imports into West and East Africa, tonnes (source Trademap).

In SSA, most of the imported coated coil is for local consumption. The exception is in East Africa where inter-regional trade is quite developed and significant coated coil exports from Kenya and Uganda go into central African countries such as the DRC and the lakes regions. In West Africa little inter-country trade exists. The import figures are displayed in **Figure 8**.

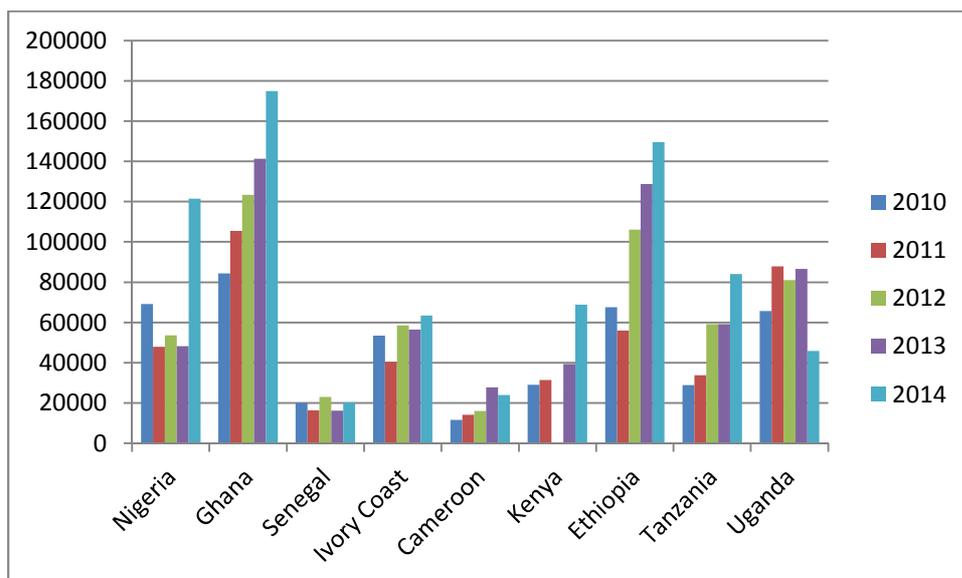


Figure 8. Coated coil imports into West and East Africa, tonnes (source Trademap).

ENERGY

The 48 countries of SSA, with a combined population of 936 million people generate less electricity than that of France with a population of 65 million. It is estimated that only 290 million people have access to electricity (International Energy Agency, 2013). Generation constraints and transmission losses reaching up to 20% in some regions hamper economic development. Covering losses in the system also means that overall delivered prices are higher than the rest of the world despite generation revenues being too low to attract investment. The lack of reliable energy is considered to be one of the major factors hindering SSA development. The number of people without electricity per country is shown in **Figure 9**. What is needed is additional generation capacity and, almost more importantly, sufficient cross-border cooperation to ensure electricity delivery is widespread. Africa has the highest level of solar irradiation in the world and 93% of Africa's hydropower potential is untapped. The poor transmission network inhibits service delivery but offers opportunities for off-grid and micro-grid solutions mostly in the form of renewables. Notwithstanding this, transmission development is increasingly rapidly and represents a similar situation to that experienced in South Africa during the 1970s. Ethiopia showed a staggering 375% increase year-on-year (y-o-y) in 2014 in the importation of transmission steelwork. Overall, the regional growth has been over 300% in 5 year (**Figure 10**). Potential power generation capabilities are shown in **Figure 11**.

Currently, (excluding South Africa) SSA consumes less power than Brazil. Within 25 years estimates put SSA capacity at greater than the 2010 total of Latin America and India. This will be met through a mix of solutions. Although there are ongoing concerns regarding a possible over-expenditure on generation being countered by an under-expenditure on transmission and distribution, estimates are that spend on transmission and distribution will have to be of the order of \$80bn and \$265bn respectively. In terms of zinc coated steel, this offers an immense opportunity as all transmission lines makes use of galvanized steel-work as does the majority of distribution systems where timber availability is limited or supply has been denuded. During 2014, over 450 000 tonnes of galvanized steel towers were imported into East and West Africa alone. This represents around 30 000 tonnes of zinc consumption. The establishment of new galvanizing facilities in East and West Africa with kettles in excess of 12.5m is driven by this market which will continue for a decade at least.

The analysis of the energy sector by region serves to illustrate that numerous projects are already in-place to address the energy deficit. The most successful countries have privatised the sector to varying degrees. Independent Power Producers (IPPs) and China have become the major funders. China's investment growth has been from almost zero in 2009 to \$2bn by 2012. Most IPPs are thermal with China focusing on hydro (UCT, 2014).

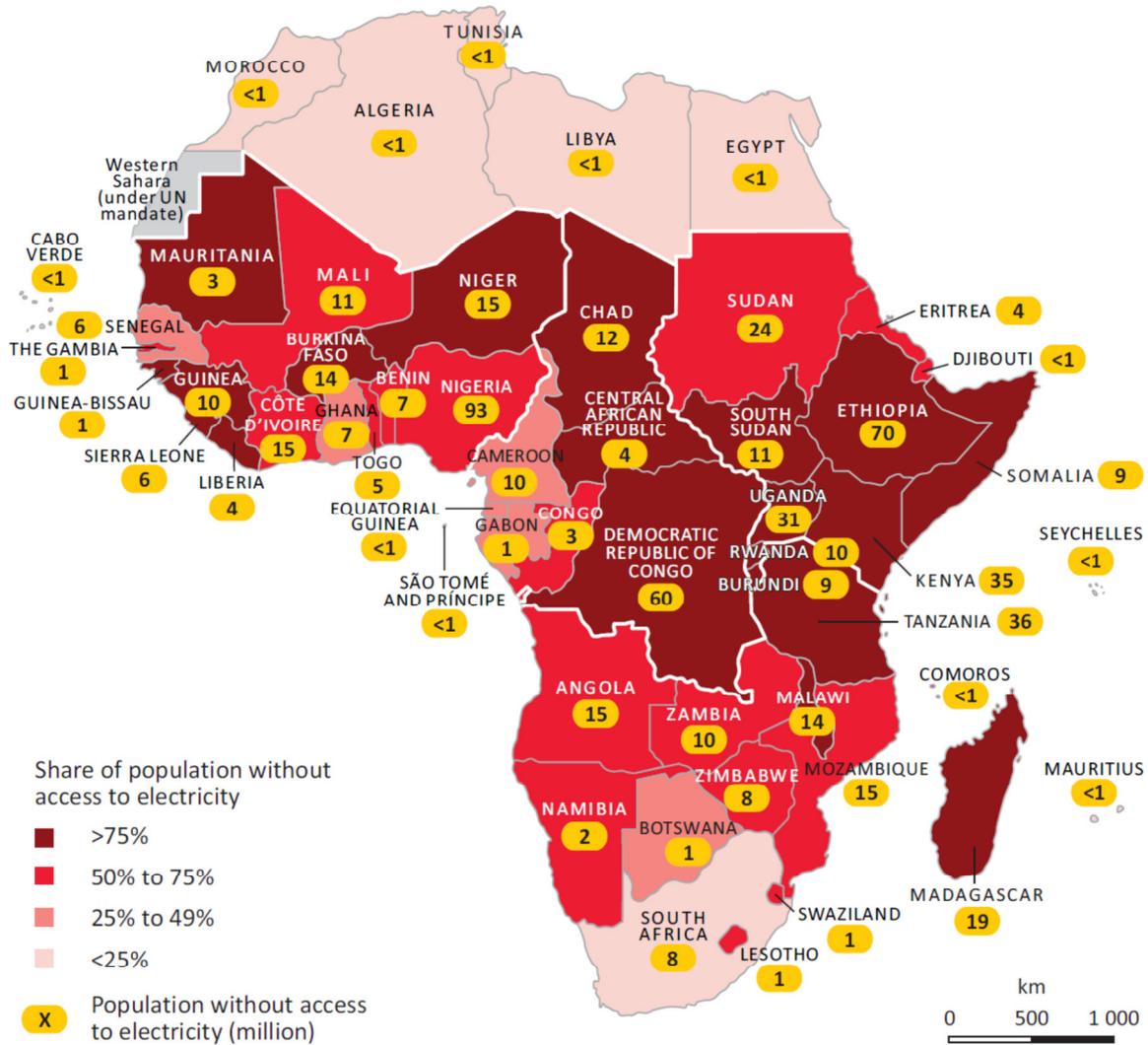


Figure 9. Number and share of people without access to electricity in Africa - 2012 (source International Energy Agency, 2013).

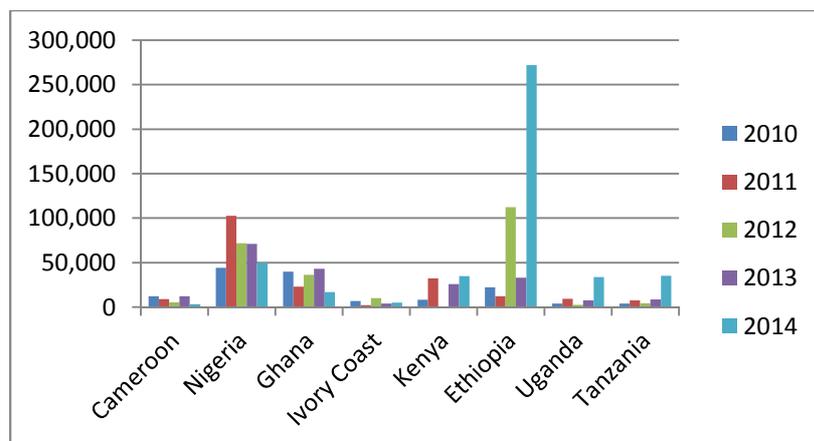


Figure 10. Transmission tower imports for East and West African countries, tonnes (source Trademap)

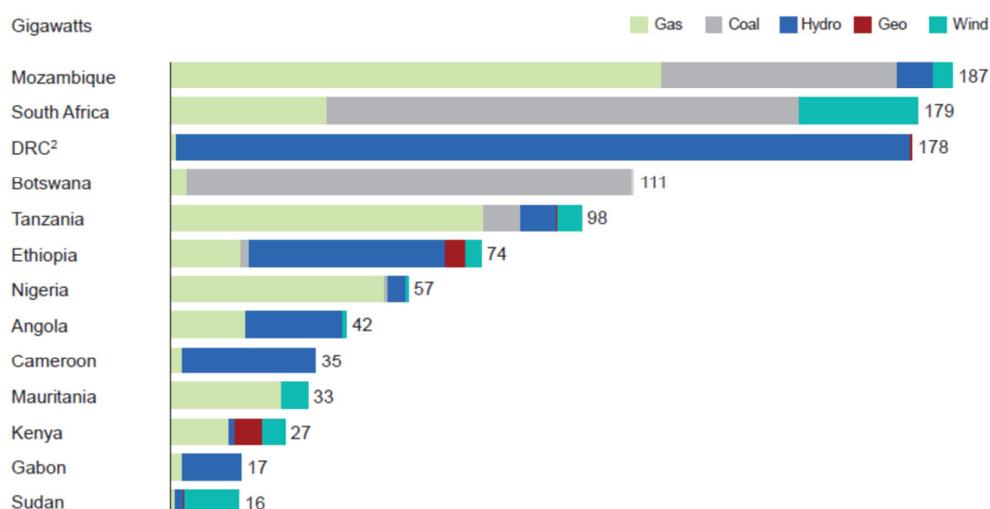


Figure 11. Power generation potential for SSA by technology (source McKinsey, 2015).

Southern Africa

In South Africa, the Integrated Resource Plan 2010 to 2030, which is regularly updated, targets to double generation capacity from 44GW to 88GW by 2030 key elements of which are shown in **Table 2**. Various IPP projects have been developed with renewables the major activity through REIPP (Renewable Energy Independent Power Producer Procurement Programme) where 64 projects totalling 3 916MW are being constructed at a cost of \$14bn. By the end of 2014 approximately 1000MW of renewable energy plants had been connected to the grid. Of concern in terms of coal fired stations and projections into the future is that in 2015, at 2.8Mt, South Africa now emits more SO₂ than the whole of the EU (2Mt).

Table 2. Key elements of the South Africa IRP to 2030 (source KPMG, 2014)

Project	Capacity
Medupi (coal)	4 800MW
Kusile (coal)	4 800MW
Ingula Pumped Storage (hydro)	1 332MW
Sere Wind Farm	100MW
Additional coal	6 250MW
Imported hydro	2 610MW
Combined cycle (natural) gas turbine	2 370MW
Nuclear	9 600MW
TOTAL	31 862MW
Other	12 138MW

Some 95% of Zambia's 1900MW of installed capacity comes from hydro-power with a potential hydro capacity of 6 000MW considered possible. These include the JV (Tata and ZESCO) development of the 120MW hydroelectric power plant at the existing Itezhi-Tezhi dam, the 360MW Kariba extension project and the 750MW Kafue Gorge project. Abundant coal also opens the possibility for coal powered plants such as the 300MW Maamba power plant. Extensive transmission development is underway to improve power availability. With only 4 000 MW of installed power generation capacity, Mozambique requires significant transmission and distribution investment to

deliver power to the economy. Most of Mozambique's electricity is generated by hydro-power (Cahora Bassa – 2075 MW) with more construction currently - Mphanda Nkuwa (1500 MW) and Cahora Bassa North Bank (1245 MW). Mozambique has the largest untapped coal reserves in the world and the Moatize and Benga projects will bring 1200MW to the grid. The first phase of the Moatize project is an IPP with Vale and Mitsui being the largest investors and the plant being managed by the Saudi company ACWA Power. 250 MW will be consumed by the coal mine with 50MW released to the national grid. Large off-shore natural gas reserves are allowing the export of gas to South Africa and open the future for gas powered electricity generation. Mozambique is already a new exporter of power, primarily to South Africa. The country has one of the smallest generation capacities in Africa at around 520 MW. Some 60%+ of Namibia's power is imported. However, with demand in neighbouring countries becoming an issue, government has identified local generation capacity development as a key need. The Kudu project (800 MW) is now envisaged to come on-line in 2018 and it is envisaged that the Baynes mid-merit peaking power station's capacity could be between 350-550MW which will be shared equally between Namibia and Angola. Ongoing improvements are underway on the Southern Africa Power Pool transmission system.

West Africa

The West African Power Pool serves to assist with individual country initiatives to get power to the population.

Privatisation of the state energy utility is underway to move Nigeria from a country that generated 300MW in 2009 to a capacity of 40GW by 2020. Government has kept ownership of the transmission assets (management under concession), while the six generation and ten distribution companies were fully privatised on 1 November 2013. This has immediately opened the country to overseas expertise to fast track the development process. Included in the developments is the 2013 Gas Supply Agreement guaranteeing supply to the generation companies. Nigeria has substantial gas reserves and with coal, solar and hydro all energy sources are open to the market-place. The success of the system so far is a case history for other African countries.

Cameroon has a privatised power utility with a limited (1100MW) capacity. With a possible 20GW hydro power capability from the Sanaga River Basin, Cameroon hopes to become a net power exporter in the region. Current developments are 5 000MW within the next 6 years through hydro developments. This is in addition to various small gas turbine operations and solar installations. Ghana similarly has a small generation capacity (2 500MW) with a demand that has been exceeding 15% growth per annum for over a decade. More than 50% of power generation is by the private sector (Independent Power Producers – IPP and Public Private Partnerships – PPP). The power generation capacity will double over the next decade with large projects such as the 350MW Kpone Project (the largest IPP in Africa), Takoradi 4 gas turbine and Ghana 1000 power plants coming on stream and more projected as the West Africa Gas pipeline from Nigeria provides gas to the whole region. A renewables program is also underway. Constant power interruptions have played havoc with the country's mining industry (source Ghana Chamber of Mines, 2015).

East Africa

Ethiopia has had a staggering GDP growth of over 10% per year for over a decade. As Africa's second most populous country, it has shed the poverty image of the 1970s. With the Transformation and

Growth Plan impacting upon everything from agriculture to infrastructure Ethiopia is targeting Middle Income status by 2020. Part of this is an ambitious plan to expand electricity generation from less than 2500MW in 2012 to 10 000MW by the end of 2015 and almost 40GW by 2037. Ethiopia now has a completely open electricity sector from generation to transmission to distribution. With an estimated 45GW potential in hydro and 10GW from geothermal and almost 10% of power already coming from wind power, Ethiopia is positioning itself as an electricity power-house in the region. The income from this will be used to develop the country. The Renaissance Dam project, being built by Italy's Salini Impregilo, will produce some 6 000MW once it comes on-stream and is Ethiopia's flagship project. Gibe III will come on-stream in 2015 producing 1870MW at a project cost of \$1.6bn. Ethiopia has the unique situation of not needing to rely on any non-renewable input for power generation. The transmission roll-out programme in Ethiopia is shown through the numbers displayed in **Figure 10**.

The Kenya Power Company controls all transmission and distribution and buys power from the permitted private power producers which produce around 42% of Kenya's power of 1200MW. An overdependence on hydro has led to supply problems due to drought. Investment is needed into power transmission and distribution. The intention is to add another 5 000km of power lines to the current 3 800km by 2017. This includes projects totalling 1500km of 132kV, 650km of 220kV, 1100km of 400kV (500km being for connection to Tanzania), 686km of 500kV lines and an additional 5000MW, mainly geothermal, of power will come on stream by 2018. The objective is to halve electricity bills in the next three or four years from present levels of between \$0.17/kWh and \$0.18/kWh (Engineering News, Feb 2015). Additional capacity will come from the coal-fired power station being developed as part of the new coal mine to be developed by the Chinese Investment Company HCIG Energy within the Mui Basin. Tanzania only generates some 1500MW but has some real hurdles to cross. Poor transmission and distribution is hindering development. The 665km 400kV from Iringa to Shinyanga transmission project will assist the north in getting reliable power and currently there are two IPPs - Independent Power Tanzania Ltd and Songo Gas. The current lack of transmission and distribution capability makes Tanzania ripe for Microgrids (see below).

Renewable Energy

1.8GW of renewable power capacity (excluding large hydro-electric projects) will be commissioned in SSA in 2014. Although small by world standards, it is more than that in the total previous decade illustrating the rapid rise of energy investment in the region (Bloomberg New Energy Finance, 2014). Africa offers significant potential in terms of solar power generation with many areas experiencing an annual sum of horizontal irradiation exceeding 2300 kWh/m². This equates to more than 2MWh/kW of solar array installed. Overall, Africa offers the greatest usable solar power potential of any continent with East Africa, South Western Africa and the Sahara desert offering the greatest potential. The three largest markets for utility-scale installed renewable power over the 2014-16 period will be South Africa with 3.9GW (wind mainly and solar), Kenya (geothermal and wind) and Ethiopia with around 570MW (wind and some geothermal). The recent signing of the \$2.2bn investment by SkyPower in Kenya to provide 1GW of solar systems (to be produced locally) over 4 years indicates the speed of renewables development within Africa.

Within the African context, renewables essentially means wind, solar and water. The diversity of technology is shown through some key examples in **Table 3**. New technology is allowing the use of 50MW+ Concentrated Solar Power (CSP) package plants that produce power at costs not unduly higher than typical grid costs. This scale also allows for salt storage systems which ensure 24 hour power availability. The market for zinc in terms of corrosion protection is enormous as most of the solar steel structures are hot dip galvanized and the use of zinc metal spray to offer a base prior to

organic coating is growing in popularity for wind tower installations. Almost all flanged areas of wind towers are metallised to a thickness of 40um as are areas around access hatches and doorways. This application is always done by the steel fabricator resulting in a growing knowledge base of the advantages of zinc metal spray which augers well for future growth within this market sector.

Although looked on as an uneasy compromise within the developed world, the use of *Microgrid* solutions is a popular high growth market in Africa. Essentially a *Microgrid* is designed to provide power for specific applications allowing industrial operations and village communities to operate with an efficient system free of grid power. Solar and wind are ideally suited to these applications where synching to the grid is not necessary or simply there is no grid availability. The growth of PV systems (especially in terms of rooftop applications) has shown enormous growth throughout Africa. Most scenario analysts indicate that urbanisation levels whilst high in Africa will still leave a significant proportion of the population in rural areas. These areas are unlikely to be part of any electricity grid roll-out. Electricity is unlikely to provide for cooking and heating in these communities.

So, whilst considered an issue some years ago, Africa’s renewables potential offers an affordable alternative to grid power in rural areas. Thus, Microgrid development is a likely significant industry for the foreseeable future in SSA. The importance of this cannot be over-emphasised within the context of limited funding and generally poor electricity energy cooperation within and between SSA states. A survey of 16 projects showed that big grid projects in SSA, based upon coal, whilst showing immense potential in South Africa, Mozambique and Botswana tend to run significantly over budget and behind schedule (**Figure 12**). Wind fares little better favouring solar and gas as preferred options.

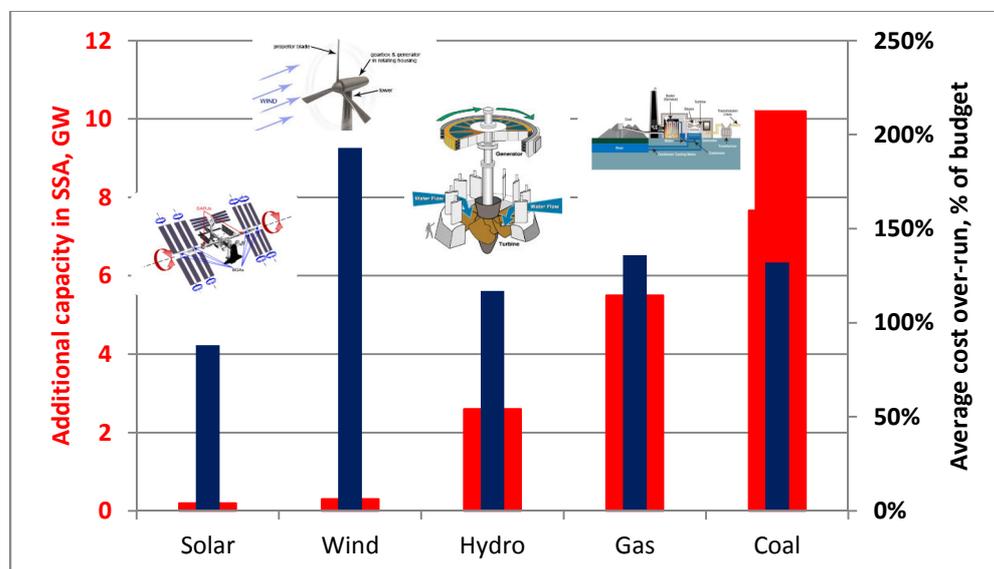


Figure 12. Reliance on “Big-Power” comes with its consequences as shown by the cost over-runs (source McKinsey, 2014).

With technology improvements making solar systems in particular more competitive with respect to standard “Big-Power” (such as coal and gas fired power stations with extensive grid systems), SSA could well demonstrate that off-grid systems are indeed a global solution. The jump to mobile telephony omitting adoption of fixed line systems has already demonstrated that SSA can leap-frog

to a new technology. Poor, weak, interfering governments drive alternative solutions to technology adoption. There is no reason to think that, within the SSA context, provision of electrical energy should be any different. PV systems rely upon zinc coated steel framing systems so the potential for increased demand is good and probable given the diversity of funding mechanisms.

Table 3. Some of the renewable IPP projects in Africa

Project	Funding	Comments
310MW Wind Power, Lake Turkana, Kenya	Norfund (Norway) \$870m	Completion 2016. Will be the largest renewables project in Africa.
100 MW KaXu Solar One, CSP, Pofadder, South Africa	PPP with Abengoa, Spain	Inaugurated, 2015
50MW Khi Solar One, CSP, Upington, South Africa	PPP with Abengoa, Spain	Completion 2016
100MW Xina Solar One, CSP, Northern Cape, South Africa	ADB with Abengoa, Spain	Investment of \$880m
360MW Wind Power, Northern Cape	PPP	Three projects by Mainstream Renewable Power
225MW Wind Power, Aitepa, Ghana	PPP/Actis	Managed by Mainstream will be run via Lekela Power
125 MW Eolien Taiba N'diaye Wind Power	Senegal	
155MW Nzema Project, Solar PV	Ghana	Complete and currently the largest project of its kind in Africa
500MW Northern Cameroon	China	GSC Energy consortium including Austrian Sun Value, South African Tricom Structures and Conco
86MW Prieska, PV solar, South Africa	Nedbank/Standard banks	REIPPP project tendered by Sonnedix
75 MW Linde PV solar, Dreunberg project, Eastern Cape, South Africa		Scatec Solar system
75MW Scatec Solar PV, Kalkbult, South Africa		incorporates 312 504 PV panels
40MW, Scatec Solar PV, Hanover, South Africa	Standard Bank +	Uses solar tracking technology
50MW ACWA Power CSP, Boksport, Northern Cape, South Africa	Saudi	
120MW Ashegoda Wind Farm, Ethiopia	\$313m funded by French gov. & banks	Built by France's Vergnet Group. Became operational in October 2014.
204MW Southeast Ethiopia		Under construction by the Chinese
50Mw Wind Farm Singida, Tanzania	China's Exim Bank – \$132m	Completion date 2016
West Coast Wind Farm	Investec/Nedbank	47 wind turbines. GDF SUEZ holds a 43% stake, Investec 34.5% and empowerment shareholder Kagiso Tiso 20%

TRANSPORT

Transport encompasses road rail and ports. East Africa has some of the most expensive logistics costs anywhere in the world. However, this is not just due to poor infrastructure but also delays at ports and excessive inter and intra country regulatory frameworks which add excessive costs. The latter is an issue throughout Africa despite the numerous cooperation agreements in place. In terms of hardware, roads are improving with over 75% of major transport corridors in good shape. Major bottlenecks as a result of either over-use (and over-loaded trucks) or poor road surface can only be overcome through rail investment.

Most of the SSA railway network was constructed in colonial times with the aim to connect resource areas to the sea to provide for exportation (**Figure 13**). A study in 2006 showed that 75% of SSA's railways (totalling 90 320km) were interconnected, implying that there were 25% missing links (source Nepad – Infrastructure development Study, 2006). These are now being planned or constructed. In addition, new rail development, largely as a result of demands for exports of resources, is often planned with a passenger component in mind. With estimates of agricultural product movements matching those of minerals and that movement of manufactured goods will become the highest volume of business (growing by some five times in Southern and East Africa alone - Source, Transnet, 2014), railway growth seems to be assured.



Figure 13. Main railway lines in Sub-Saharan Africa (source World Bank, 2009).

One of the most remarkable road projects is the construction of the 4,500 km Algiers-Lagos highway. Also known as the Trans-Sahara highway, the project is already 85% finished and the remainder is expected to be completed this year (2015). Although meant to immediately address regional logistic bottlenecks, the Lapsett project (starting in Kenya) is part of a wider project which will connect Kenya with Cameroon and so the Atlantic Ocean (The Great Equatorial Land Bridge - **Figure 14**). Lapsett includes:

- A port at Manda Bay, Lamu
- Standard gauge railway line to Juba and Addis Ababa, the South Sudanese and Ethiopian capitals
- Road networks
- Oil pipelines (Southern Sudan and Ethiopia)
- Oil refinery at Bargoni
- New \$2bn 1 000MW coal fired power station (joint venture development with local, Gulf and Chinese investment).
- Three airports
- Three resort cities (Lamu, Isiolo and Lake Turkana shores)

Being domestically funded, progress remains slow.

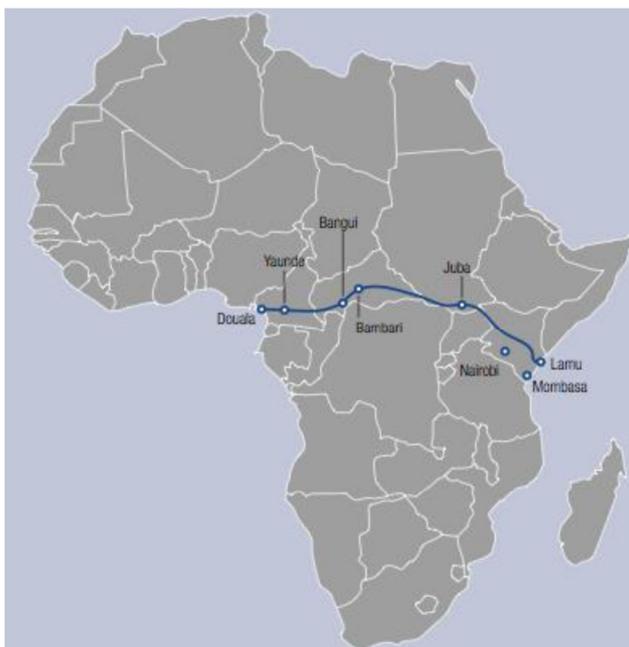


Figure 14. The envisaged Great Equatorial Land Bridge

Two of the more congested areas, namely the East West corridor in Kenya and the sea connection to Djibouti from Addis Ababa will soon be revived through investment in a new road system, in the case of Ethiopia, and a new railway in Kenya. The \$195m, 220km road link between Addis Ababa and Djibouti port will significantly reduce the cost and time for trade into land locked Ethiopia and will be assisted through the development of a \$1.6bn (electrified) railway due for completion by the end of 2015. In Kenya the new 3000km standard gauge (\$3.8bn) rail line will connect Mombasa to Kampala in Uganda and eventually Kigali in Rwanda. Being built by Chinese Railway Construction Corporation over 40% of the contracting work will be done by locals. As at mid-2015, a significant proportion of the clearing and foundation work was in progress. China Civil Engineering Construction Corporation (CCECC) is working on a \$3.5-billion intercity railway line in Nigeria's south western Ogun state. In

terms of city transit systems Kenya and Ethiopia are re-developing their city systems with Nairobi rehabilitating the old railway system and Addis Ababa opening a new light railway system in 2015. Ethiopia also has an ambitious railway development plan connecting it to its trading neighbours. In southern Africa the rehabilitated Benguela railway, traversing Angola from the western port of Lobito to the eastern border town of Luau, started operation in February 2015. This 1344km railway was completed by the Chinese Railway Construction Corporation at a cost of \$1.9bn. Although many railways employ diesel traction, city systems use electrification requiring many galvanized structures.

Numerous port development projects are in the pipeline with some already in progress. The port expansion at Mombasa is well underway with completion by early 2016. This will provide for a 50% increase in container traffic capacity to 2.1m containers per year and, with the railway development, will offer relief to the interior served by this port as well as provide for support to the developing off-shore gas fields. Kenya Ports Authority expects to handle a 27Mt throughput and 1,3m containers by 2016. The development at Lamu in Kenya has been discussed and would provide for better logistics into surrounding countries to the north. The developments at Djibouti have resulted in it becoming the third most active port in Africa. Further south, there is talk of port development at Bagamoyo in Tanzania. However, being only 75km from Dar es Salaam, which is doubling its capacity already, there is still scepticism regarding its viability so it remains a project on the drawing board. If construction was to start, the project would result in the largest port in Africa. Port volumes in Mozambique increased y-o-y 14% in 2014 to 19.5m tonnes. The developments at Nacala and Beira are primarily for coal exports and some access to the interior with the Nacala corridor serving land-locked Malawi and beyond with railway and road links. The port at Maputo is being dredged to take Panamax vessels (14.2m draft). The development of the trans-Kalahari corridor will terminate at the enlarged port of Walvis Bay (with a capacity of over 1m containers per year) which hopes to have a coal terminal to serve the new Botswana coal exports. The ports at Luanda and Lobito are being expanded in Angola and a new \$600m port development project is underway at Caio in Cabinda Province. Abidjan in Ivory Coast remains West Africa's biggest port and the second biggest in Africa after Durban in South Africa.

WATER

Water scarcity has plagued SSA for many years. Poor access to clean water has a major health impact and water scarcity reduces agricultural outputs. In 1990 only 55% of the population in SSA had access to clean water but by 2011 this had improved to 75% (IMF, Regional Economic Outlook, Apr, 2014) with some countries exceeding this (**Figure 15**). Water provision and sanitation in general go together.

Urban development has outstripped the ability to provide meaningful piped supply in many SSA cities such that less than 28% of all urban dwellers had access to piped water or the use of flush toilets (World Bank, The Future of Water in African Cities, 2012). **Figure 16** shows the average per capita consumption of water and continuity of piped supply. 25 litres per capita per day is considered the minimum for subsistence. The inability to fund supply as a result of unaccounted for water (losses and dilapidated infrastructure) and non-revenue water (where delivery cannot be recovered as revenue) hinders urban water supply development.

To identify countries where water supply and sanitation have developed such that population increase will be matched by services, **Table 4** shows the access percentages to clean water for selected countries.

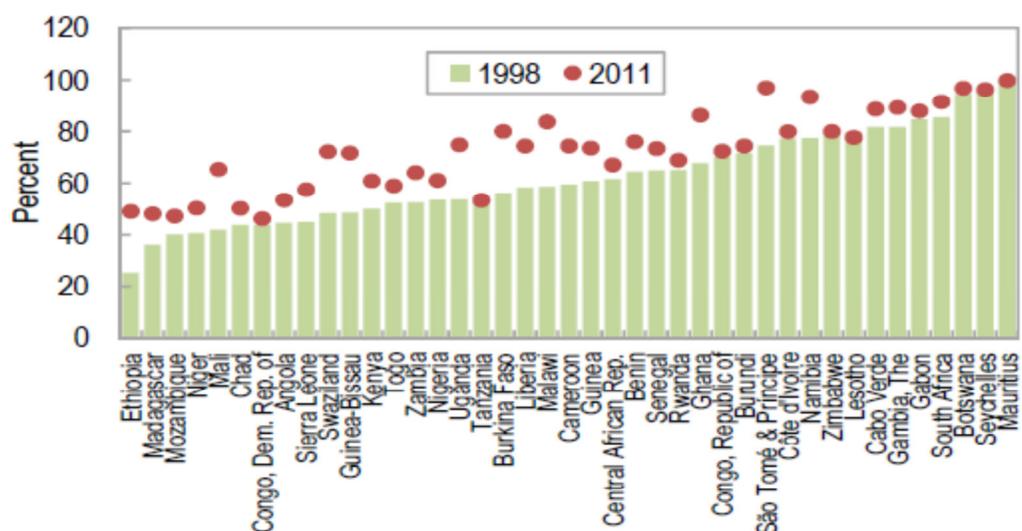


Figure 15. Population with access to improved water supply, distribution (source, IMF, Regional Outlook, Apr 2014).

Table 4. Access to clean water, % of population (source 2014, African Water and Sanitation Status Report, 2014).

Country	Clean Water		Clean sanitation	
	Urban access	Rural access	Urban access	Rural access
Nigeria	78%	56%	47%	35%
Ghana	63%	63%	not available	not available
Senegal	99%	84%	62%	39%
Cameroon	90%	53%	55%	26%
Kenya	61%	47%	71%	64%
Ethiopia	81%	67%	84%	65%
Uganda	70%	64%	82%	71%
Tanzania	86%	56%	20%	7%

Most bulk water distribution projects are underway as a result of the need to secure agriculture (irrigation) or power (hydro-power). In Kenya, various projects to build dams to provide water for agricultural use are underway to increase irrigated land for agricultural use by over 1m hectares. The supply of drinking water is also a priority. The Grand Renaissance Dam project in Ethiopia will secure water supply countrywide. From Ghana to Mozambique numerous rural schemes have been developed to raise water security and improve per capita delivery (MDG Report 2013). The percentage increase in irrigated land is a key indicator in determining market attractiveness for piping systems overall. In the three key areas at least a 50% increase in irrigated hectares has been achieved since 2000. Some countries have exceeded this substantially though. These include Nigeria (179%), Ethiopia (258%) and Uganda (500%). Opportunities exist for galvanizing piping.

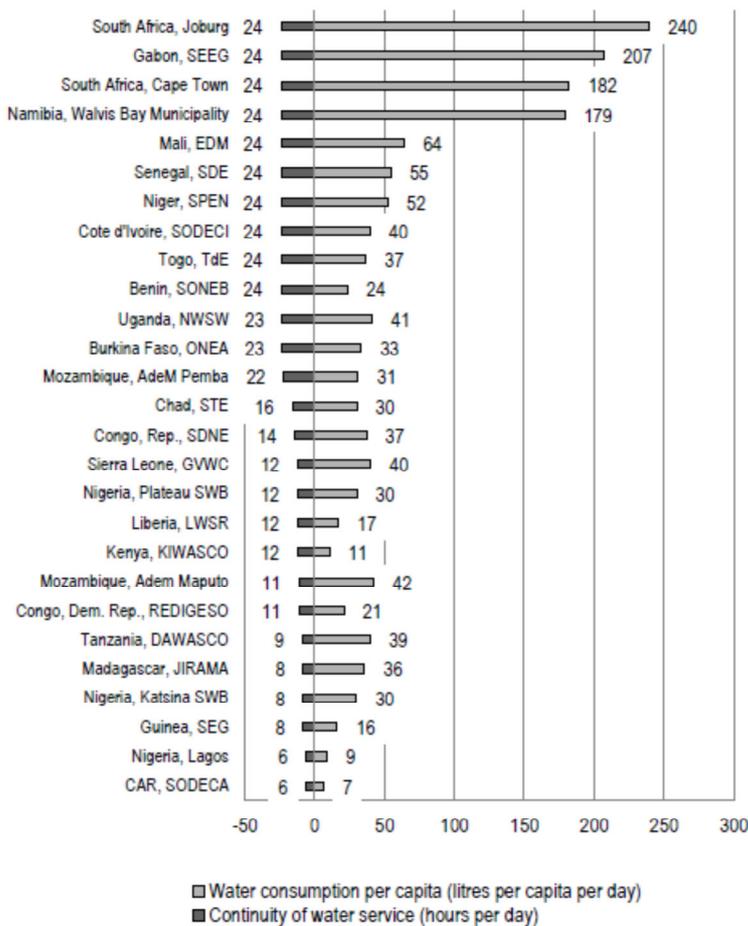


Figure 16. Water consumption per capita and continuity of piped supply (source AIDC, 2011, cited by WB, 2012).

AGRICULTURE

Africa contains over 60% of the world’s available and unexploited cropland. As the world’s population heads towards a likely peak of around nine billion in 2050, it is very likely that Africa will become a major food exporter. However, agricultural productivity in SSA remains a challenge. Only 5% of current cultivated land is irrigated. Irrigation alone would increase productivity by 50%. A World Bank funded irrigation project in Mozambique will increase rice yields from 1t/ha to 4t/ha. In Nigeria focus on traditional low value crops and the urbanisation trend has hampered improvements in agriculture. Considered to contribute 22% of GDP and employing a third of the total labour force (source NB Statistics, 2010) some simple interventions are showing results. The development of food processing plants (such as the Dangote flour mills) and farm consolidations are permitting better commercialisation of agriculture.

The SSA fertilizer market is estimated at 3.2m tonnes with 1.8mt of N, 0.9mt of P₂O₅ and 0.5mt K₂O. SSA consumption is less than 2% of the global total (source IFA) and is dominated by four countries: South Africa, Nigeria, Ethiopia and Kenya (**Figure 17**). SSA fertilizer consumption growth rates are now at over 8% per annum making the region the fastest growing fertilizer market globally.

The average application rate has risen from 8kg/ha in 2008 to an expected 15 kg/ha in 2015 (14kg/ha – 2014). This remains short of the Abuja target of 50kg/ha. However, the market is becoming more buoyant and has reached a point of rapid increase as a result of:

1. Exploration being opened for competitive bidding.
2. Massive potential in natural gas supply: SSA accounts for 5% of world natural gas proven reserves.
3. More than 25 countries with phosphate deposits, with more than 25 billion tonnes of P rock resources. Yara has just announced the development of a 600 000 tpy, \$740m investment in Ethiopia.
4. Several countries with huge deposits of potassium minerals, mostly in coastal regions.
5. Infrastructure development.
6. Monetisation of projects providing for sustainability.
7. Stability and security of supply.
8. Foreign exchange inflows.
9. Distribution of wealth – for all citizens.

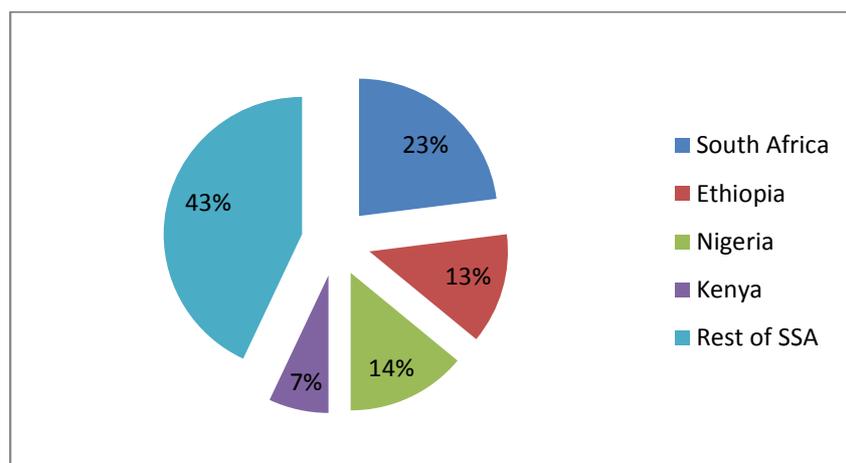


Figure 17. Split of SSA fertilizer market (source IFA)

The fertilizer industry in SSA requires investment in facilities as local production of fertilizer product was less than 2.3mt which is actually down from 2.7mt in 2003. 90% of P produced is exported with 90% of N produced consumed locally (IFA, 2014). Natural gas development will enable SSA to become a meaningful exporter of urea. So, with the exception of N, the supply of fertilizers relies heavily on imports as shown in **Figure 18**.

The use of micronutrients to enhance fertilizer efficacy has become a growing trend throughout SSA. There are many countries operating subsidy programmes in various forms and in many cases zinc is now included within the various schemes. Fertilizer blending facilities are now being built at various coastal locations around SSA. Added at 0.5% to 1% a 32 000 tonnes (as Zn units) opportunity exists with current consumption figures. The major forms used are oxides and sulphates with the latter growing in importance. The introduction of blending facilities and the growing awareness and inclusion of zinc in formulations should be reflected in the zinc compound import statistics in the future. Over 20 countries in SSA now have access to zinc containing fertilizers (**Figure 19**). Without consideration of foliar sprays and other additions, the potential zinc market into NPK products would be of the order of 11 000 zinc tonnes currently. It is estimated that the current area under managed water and land development totals some 12.6 million ha, equivalent to only some 8 percent of the total arable land (FAO. Agriculture Towards 2015/30 estimates). If fertilizer intensity of use was to increase threefold and land under management increases almost 13 times, then a full potential for zinc use would be of the order of 0.5mt as zinc units. This would represent the largest agricultural opportunity for zinc globally and the potential is probably underestimated as a result of the need to account for years of simple soil mining of nutrients in the past.

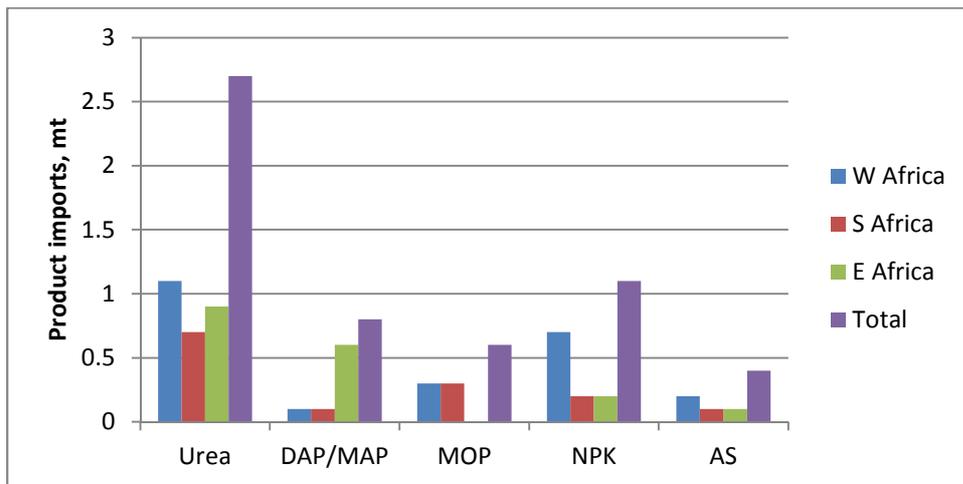


Figure 18. Imports of fertilizers into West, Southern and East Africa (source IFA November 2014)



Figure 19. Countries in SSA which have access to Zn containing fertilizers (source IFA).

WEST AFRICA

In estimating the potential for the zinc market in West Africa it is important to note that, whilst infrastructure development offers good potential, the maturity of Nigeria is often overlooked. Nigeria is the 7th most populous country in the world and is now the largest economy in Africa and 26th in the world. GDP is \$510bn and only 14% of GDP is from resources, with retail and wholesale trade the biggest drivers of GDP growth. Road density is 1/7 that of India, and power generation capacity is just 1/5 that of India. Divided into 36 Federal States, the economy of Lagos State is larger than that of Ghana and would rank 4th on the continent. The national government is heavily dependent upon oil revenues to support infrastructure expenditure but Nigeria has become the top destination for Foreign Direct Investment in Africa, averaging \$7bn per year with 50% going into services. By 2013 it was estimated that over 8m households had incomes in excess of \$7 500 pa, the threshold for what the McKinsey Global Institute considers “emerging consumers”, with sufficient income to meet all basic necessities and have money left over to start buying more and better food as well as health and education services. This will increase by a factor of 5 within 15 years with the consumer market being worth around \$1.4tr or greater than Germany and France combined (McKinsey, 2014). A number of auto makers are looking to establish manufacturing now in Nigeria.

The construction industry in Nigeria is booming with residential housing having grown on average 17.5% y-o-y (Construct Africa, 2014). Further development of the Lekki Free Trade Zone and the development of Eko Atlantic City offer key opportunities for the construction industry. Eko Atlantic City is currently the largest civil engineering project in the world.

Coated coil trade is reported in **Figure 8**. An interesting development in Nigeria (demonstrating increased wealth) is the market penetration in the building industry of aluminium sheeting. Despite being over three times the cost of zinc coated products, long-span aluminium is gaining ground in the expensive housing market (Nigeria Daily news, 2015). The cost of roofing a standard three bedroomed bungalow is N500 000 for long span aluminium versus N150 000 for zinc. Common colours are red, blue, yellow, green, chocolate and brown. The market for aluminium tiling products is also making headway. This shift is aided by the perceptions that zinc coated roofing is cheap and doesn't last. Local information indicates that the housing market has largely been served by thin coated products which do not perform and this has provided an opportunity for another (more reliable) product to gain headway. Clearly, the use of better specified zinc coatings is required to keep this rapidly expanding market.

Nigeria remains very dependent on refined petroleum imports —38 percent of the country's imports are petroleum products. This will change in the near future with the construction of the new refinery, which, with an output of 650,000 barrels per day, will be the biggest single site petrochemical complex in the world. Cost estimates are \$12 billion to build, but it will generate a turnover of \$24 billion per year. In addition to this investment, significant FDI is going into transport infrastructure projects which offer good opportunities for the zinc market.

Ghana has shown enormous growth with both housing and retail stock estimated to be doubling from 2013 to 2015 (KPMG, Construction in Africa 2013). This is reflected in steel coil imports. Ghana is the fastest growing economy in Africa and sees itself as the key entry point for West Africa (PWC, 2014). Ghana is rapidly developing its petrochemical industry and the gas from its Atuabo gas processing plant started to flow in 2014 much headed for electricity generation.

General information and the zinc consumption for the region is given in **Table 5**. Although overall zinc consumption figures have not moved significantly, the increase in ash exports is clear and will

continue to grow as more continuous capacity comes on stream. The zinc supply is mainly from India, Belgium, Japan and Mexico.

Table 5. General information on West Africa and relevant zinc statistics (estimates from World Bank, IMF, Africa Monitor, AFDB, Investec, Trading economics)

Country	Pop. m (2010)	Size, square km	Zn tonnes import (2014)	Zn ash exports (2014)	Forecast GDP growth. %		
					2015	2016	2017
Ghana	24.2	239, 460	266		4.5	5.5	6.0
Nigeria	158.4	923, 768	28 000	2585	5.5	5.8	6.2
Senegal	12.8	196, 190	1723		4.8	4.7	4.7
Ivory Coast	21.4	322, 460	100		8.5	8.2	8.0
Cameroon	21.7	475, 440			5.1	4.9	5.1
TOTAL			30 089	2585			

General Assessment of Market Potential for Galvanizing

Previous market reports have reported figures for West and East Africa with little notion regarding market development possibilities in terms of general galvanizing. Assessing the market for galvanizing is best approached through two routes – relevant steel usage and use of current organic coatings consumption figures to define both galvanizable steel and the application of ratio analysis of organic heavy duty coatings (HDC) compared with general galvanizing (HDG) to determine likely early market adoption. This analysis will also be attempted for East Africa.

The industrial coatings sector was estimated in 2013 to be 19% of the total by volume or 24m litres (**Figure 20**). Sales growth has been 9% y-o-y and this is anticipated to continue at this or an even higher rate for the next decade. It is estimated through private communications that around 20% of this figure is used outside of the petrochemical industry. This would give a possible steel coverage of between 500 and 750kt.

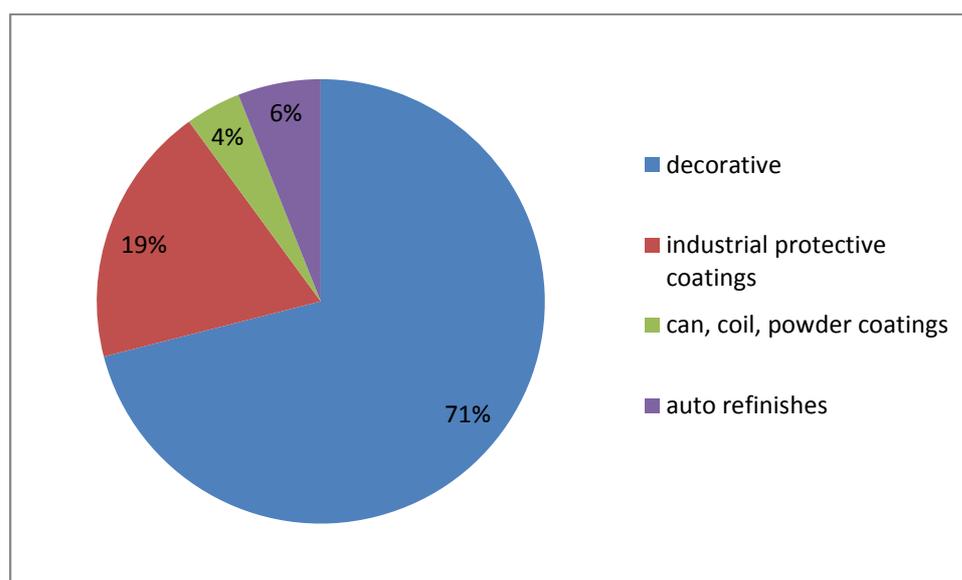


Figure 20. Percentage Volume Split of Total Paints & Coatings Market, Nigeria, 2012

(Source: Frost & Sullivan, cited in The Nigerian Paints & Coatings market, Nijalink, Ltd, 2014)

With no meaningful local production of steel, other than in Nigeria with local production being only 2.5m tonnes (2014), regional imports serve to provide data on market potential for galvanizing. The imports of uncoated steel products for fabrication (angles, shapes, sections, profiles, flats, etc.) are shown for the region in **Figure 21** (Trademap/SAISI/SARS). The tonnage has grown some 62% over a 5 year period. Nigeria dominates the region. With a considerable iron ore capability (2 bn tonnes of deposits) and outstanding coal reserves (in excess of 1 tr tonnes) Nigeria has an expansion program to produce over 15m tonnes of steel per year by 2020. Today there are more than 15 functioning steel rolling mills producing reinforced bars; about three functioning cold-rolled steel mills producing cold-rolled flat sheets; and nearly three producing or about to commence the production of wire coils. The importation of galvanizable steel is calculated using the tariff codes shown in **Table 6**.

Table 6. Codes used to define galvanizable steel.

Tariff Heading	Description
7207	Semi-finished products of iron or non-alloy steel
7216	Angles, shapes and sections of iron or non-alloy steel
7307	Tubes, pipes and hollow profiles of iron or steel, nes
73089*	Structures & parts of structures, i/s (excl. prefabricated buildings – tariff 9406)

*this figure omits transmission structures which are given separately, **Figure 10**.

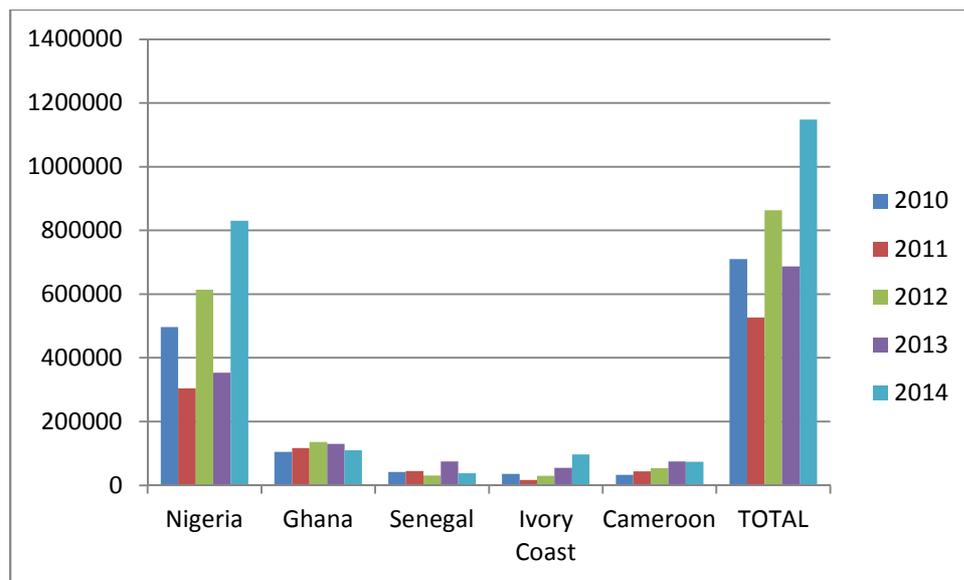


Figure 21. Imports of galvanizable steel into West Africa (source Trademap)

With galvanizable steel being of the order of 830kt in Nigeria, this is close to the top end of the estimate for currently painted steelwork. Working on a ratio of 3:1 (coatings to HDG), it would not be unreasonable to estimate the market potential for general galvanizing to be of the order of 200kt in Nigeria alone. This agrees with current installed capacity figures. However, when the transmission tower imports are added, it is clear that a regional market of 300ktpy+ could easily be supported with 10% pa growth rates possible.

EAST AFRICA

As with much of Africa, the region is experiencing a construction boom with one key advantage. Kenya is the cheapest place to build in globally with the exception of India (**Figure 6**). East Africa has good regional integration and many of the key infrastructure projects will require further cooperation. Logistics is still hindered by regulations and poor institutions which limit the overall effectiveness of the regional cooperation bodies such as COMESA and EAC (PWC, 2014, Capital Projects and Infrastructure in East Africa, Southern Africa and West Africa). Per capita income and economic growth are estimated to remain above 6 -7 % regionally for the immediate future. Tanzania's road infrastructure is sufficient for trade requirements, but the rail network requires considerable investment. In Uganda, only 25% of the national roads are paved. Kenya is a regional leader in air transportation with Kenya Airways ranked among Africa's top three international carriers, with an extensive network across the continent and a sound safety record. In addition, the new standard gauge railway from Mombasa to Uganda will alleviate many of the logistical trade problems and assist with regional economic integration.

As reported in previous reports, Kenya is achieving middle income status in urban areas and the recent rebasing of the GDP demonstrates this which augers well for housing and other services. Agriculture remains the main contributor to the Kenyan economy up from 24.1% to 25.4% based on 5-year average 2009 to 2013. Manufacturing contribution to GDP increased from 9.5% to 11.3% and Information and Communication Technology (ICT) sectors are now treated as a standalone sector indicating their importance. The telecoms industry in Kenya pioneered mobile payments technology which has been adopted globally. Additional development taxes on the use of cement and the import tariffs on steel products should be an enabling factor in boosting the share of steel used in the booming construction sector in Kenya. Kenya's overall spending on infrastructure went up by 21% in 2014 to \$3 billion up from \$2.5 billion in 2012. To counter rising steel imports (which have doubled in 7 years), the Kenyan government has embarked upon a study to investigate the commercial and technical feasibility of constructing an integrated iron and steel manufacturing plant (with Sino Steel of China).

Kenya, Tanzania and Uganda have all experienced large gas finds and many projects are underway to utilise these benefits. Ethiopia is looking to develop a \$5bn refinery to service the region.

General information and the zinc consumption for the region is given in **Table 7**. Zinc imports have grown by almost 60% in 2 years as more galvanized sheet manufacturers enter the market. The main zinc supply comes from South Korea with Europe a close second. The rapid growth in ash residues will continue as many new galvanizing plants are only just starting and many more are in the construction phase.

Table 7. General information on East Africa and relevant zinc statistics (estimates from World Bank, IMF, Africa Monitor, AFDB, Investec, Trading economics)

Country	Pop. m (2010)	Size, square km	Zn tonnes imports (2014)	Zn ash exports (2014)	Forecast GDP growth. %		
					2012	2015	2016
Kenya	41	580,367	13946	2446	6.0	6.7	6.5
Tanzania	43.2	945,087	9557	298	7.2	6.8	7.0
Uganda	32.9	236,040	7744	354	6.6	6.9	7.0
Ethiopia	84.3	1,127,127	11552	251	6.9	6.6	6.7
TOTAL			42 799	3 349			

General Assessment of Market Potential for Galvanizing

The emergence of the oil and gas industry in East Africa and the growth of the sector in other parts of Africa have also increased demand for pipeline coatings. Kenya is constructing a new \$300 million pipeline linking the Indian Ocean port city of Mombasa to the capital Nairobi, 450 kilometers away. The line is likely to be extended to Uganda to cater to an anticipated production of the recently discovered oil. In Tanzania the government is constructing a 532-kilometer gas conveying pipeline between the gas-rich Mnazi Bay and the port city of Dar es Salaam. The key markets for industrial coatings in the region are the mining, petrochemical and metal processing industries as well as for wind turbines, containers and infrastructure. Numerous new investments are underway by many Industrial Paint and Coatings companies to have a regional presence with the latest being an investment of KES 250m in Kenya by Jotun. The East African market is around 50% that of West Africa. This would equate to a steel coverage of around 200 to 400ktpa. Using the tariff headings in **Table 6**, **Figure 22** shows the growth of galvanizable steel imports into the region. The 2014 figures are viewed as incomplete. The 2014 imports of over 500 000 tonnes omit the high transmission tower imports as stated previously. Using a 3:1 ratio current market potential for general galvanizing should be of the order of 100 to 150ktpa. This is higher than the current capacity and with the add back of the significant transmission tower imports of over 375 000 tonnes in 2014, the region could support a general galvanizing market close to half that of South Africa. The current installed capacity is less than 50 000 tpa.

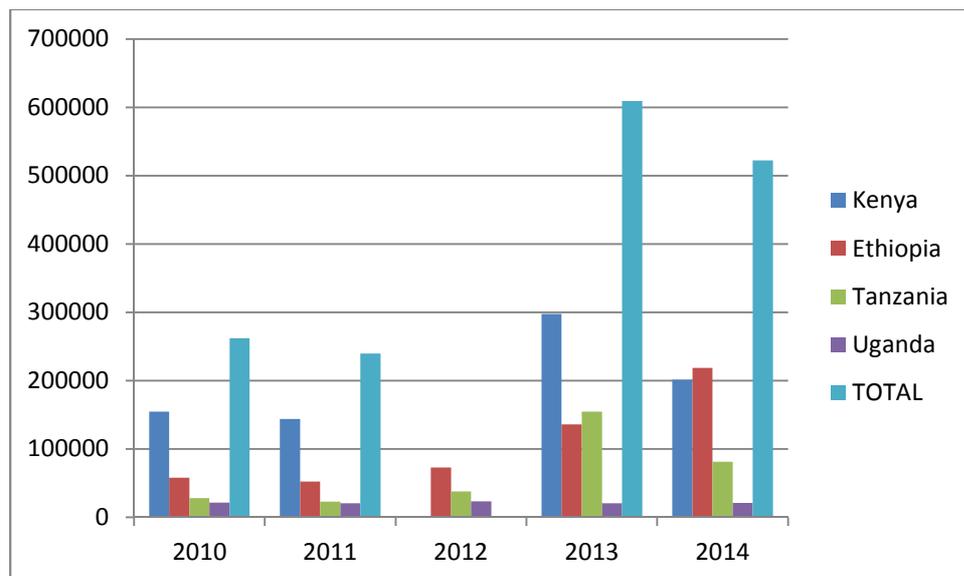
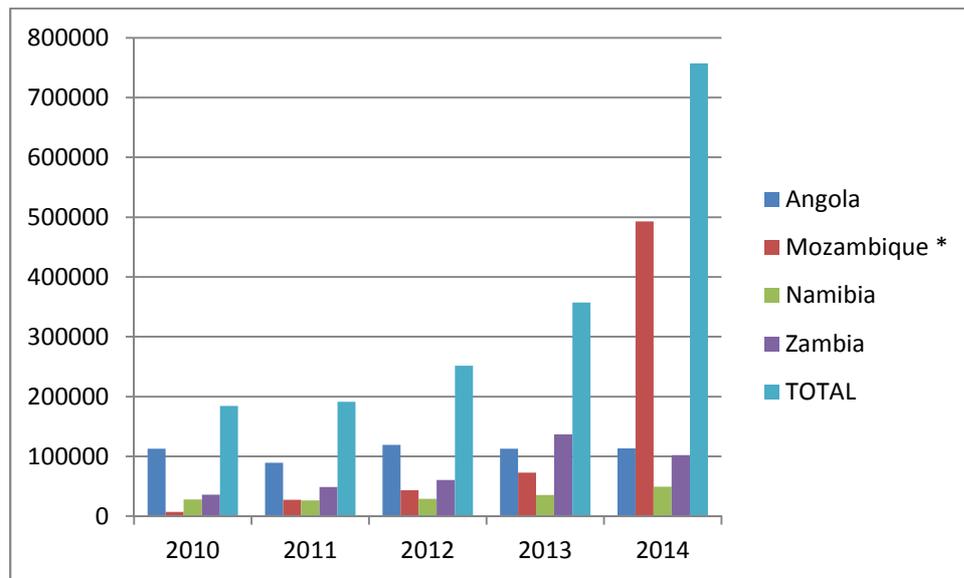


Figure 22. Imports of galvanizable steel into East Africa (source trademap)

SOUTH AND SOUTHERN AFRICA

Southern Africa is dominated by South Africa in terms of supply of zinc coated products. However, market conditions (market growth of galvanizable steel - **Figure 23**) north of South Africa are such that general galvanizing plants are being built in Angola, Namibia, Mozambique and Zambia. Coil coated product imports into the region (much from South Africa) have grown such that new facilities are now being built in neighbouring countries (**Figure 24**). To a degree, this is demonstrated through the growth in uncoated coil (**Figure 25**).



*figures for Mozambique appear incorrectly reported

Figure 23. Imports of galvanizable steel into Southern Africa (excl South Africa) (source Trademap)

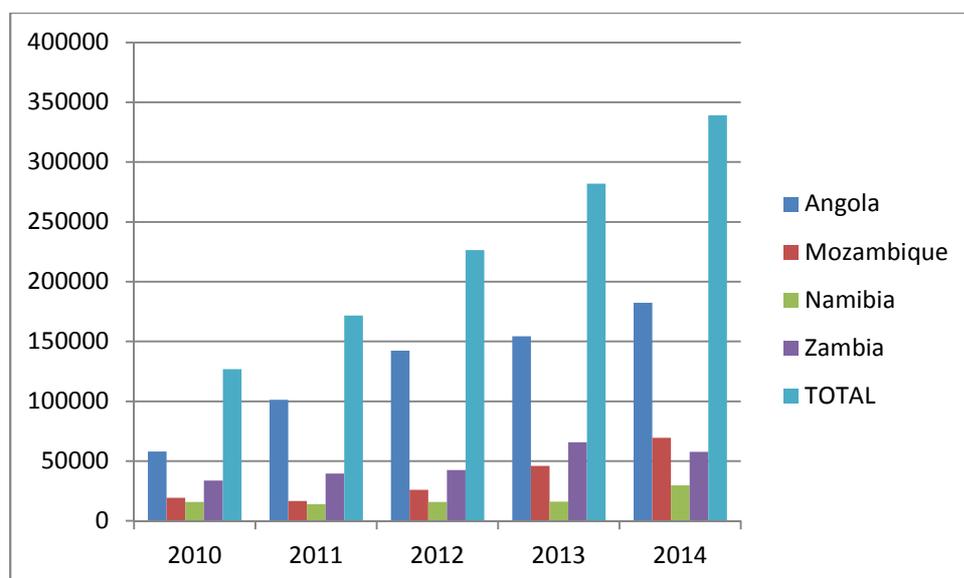


Figure 24. Imports of coated coil into Southern Africa (excl South Africa) (source Trademap)

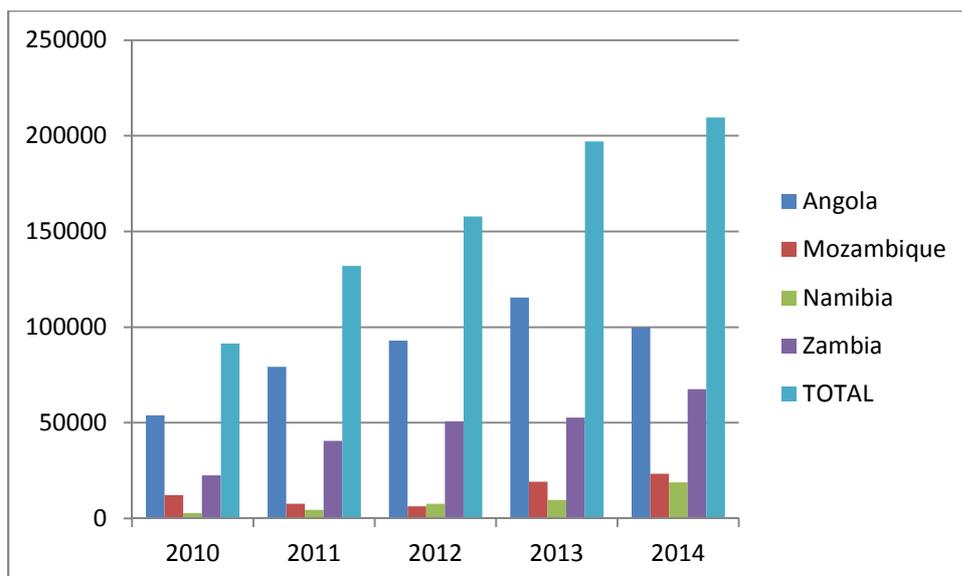


Figure 25. Imports of uncoated coil into Southern Africa (excl South Africa) (source Trademap)

The rapid market increases in Angola and Mozambique have largely been driven by exploitation of natural resources. Mozambique has the largest untapped coal reserves globally and is becoming a giant gas producer such that if the reserves are commercially proven, Mozambique will be the fourth largest producer in the world behind Russia, Iran and Qatar. Rapid development of infrastructure to support this together with the redevelopment of the Beira corridor and Maputo port for general merchandise (ranging from agricultural products to consumer goods for neighbouring countries) and the Nacala corridor linking the Tete coalfields and land locked Malawi to the sea have generated good steel opportunities as shown in **Figures 23 – 25**.

Oil production has increased by 400% over the past 20 years in Angola with 2013 daily production at 1.6mmbbl/d. Angola became an LNG exporter in 2013 with the commissioning of the Soyo facility which has a capacity of 5.2m tonnes. The 200 000bbl/d Sonaref refinery is expected to come on-stream by 2016 with product directed at export. Income from petroleum is fuelling a construction boom as shown in **Figures 24 and 25** with the \$7bn Luanda Waterfront Development one of the beneficiaries. Luanda is Africa's 5th largest city with almost 6 million people. If completed, Torre De Angola at 325 m will be the tallest building in Africa and in the top 100 tallest in the world. The average growth in GDP in Angola was 9.2% per annum until 2012. In 2014 the GDP growth rate was 6.4% (Bloomberg, 2014).

Some 119 construction projects were underway in Southern Africa during 2014 with a value of \$144bn. This is up from the operating figure of \$83bn in 2013. The percentage split per industry is given in **Table 8**. General information on the region is given in **Table 9**. Deliveries of zinc into South Africa during 2014 were reported as 92 000 which represents an increase of 12% over 2012 reported values. This is surprising given the parlous state of the local economy and is considered as a reporting error. Accounted for direct sales in South Africa were of the order of 81 000 tonnes which is in line with industry activity. Production from the Skorpion plant in Namibia was reported as 125 000 tonnes in 2013 and 119 000 tonnes in 2014. Of this 33 000 tonnes was exported to South Africa, the balance being exported out of the region.

South Africa's apparent zinc tonnes demand for 2014 was 97000 tonnes. This is well down on the 2012 figures. The growing distortion occurring due to the high export figures for copper products (mainly scrap) have been omitted to evaluate total supply numbers (although they are included in the Zinc Flows Schematic). Total local supply for zinc and zinc containing products is in balance with Apparent Demand as all trade (excluding copper products) is almost in balance. This is significantly down on 2012 figures unless estimated trade reporting errors of 15 000 tonnes are added back.

ZINC FLOWS IN THE SOUTH AFRICAN MARKET FOR 2014 - zinc tonnes equivalent

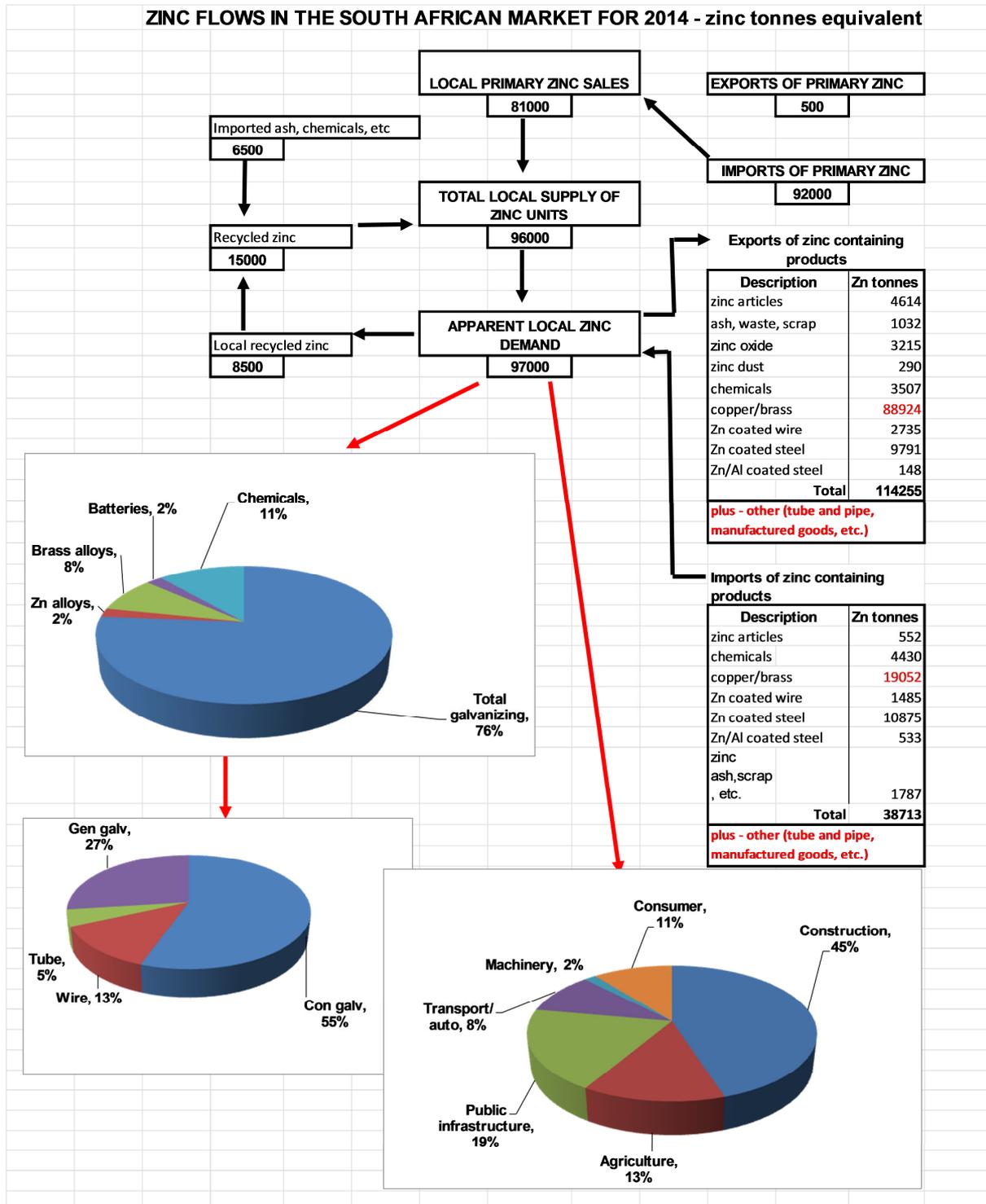


Table 8. Infrastructure spend: Southern Africa by industry split (Source Deloitte, cited in Finweek 17 April 2015)

Industry	2013	2014
Energy and Power	31%	44%
Transport	18%	24%
Mining	19%	10%
Real Estate	17%	7%
Water	9%	5%
Mixed Use	1%	3%
Oil and Gas	1%	2%
Technology, media, communications	0%	2%
Healthcare	2%	1%
Education	1%	1%
Agriculture	1%	1%

Table 9. General information on Southern Africa and relevant zinc statistics (estimates from World Bank, IMF, Africa Monitor, AFDB, Investec, Trading economics)

Country	Pop. m (2014)	Size, square km	Zn tonnes imports (2014)	Forecast GDP growth. %		
				2015	2016	2017
Angola	21.5	1 246 700		5.9	6.2	7.2
Mozambique	26	799 380	5 361	8.0	8.3	8.2
Namibia	2.3	823 114		4.5	4.5	4.5
South Africa	53	1 219 912	92 000	2.0	2.2	2.5
Zambia	14.5	752 614	1 455	7.0	7.1	7.2
TOTAL			98 816			

The percentages allocated to First User markets remains distorted towards galvanizing in some form (**Figures 26 and 27**). However, the galvanizing totals are down on 2012 with an increase in the percentage allocated to chemicals rising to 11%, primarily into agriculture.

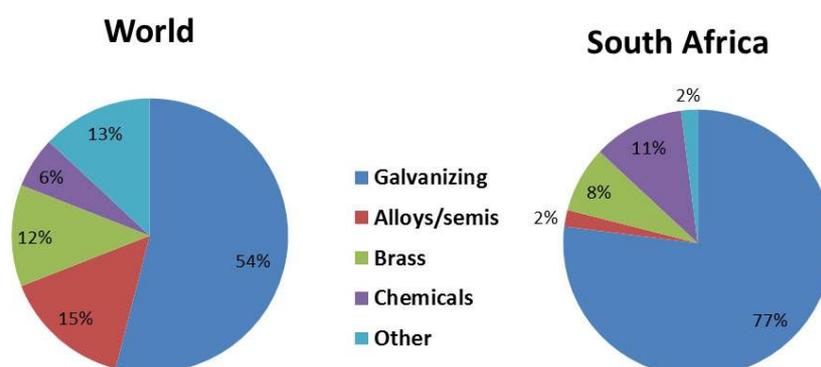


Figure 26. First User market demand for zinc in South Africa for 2014

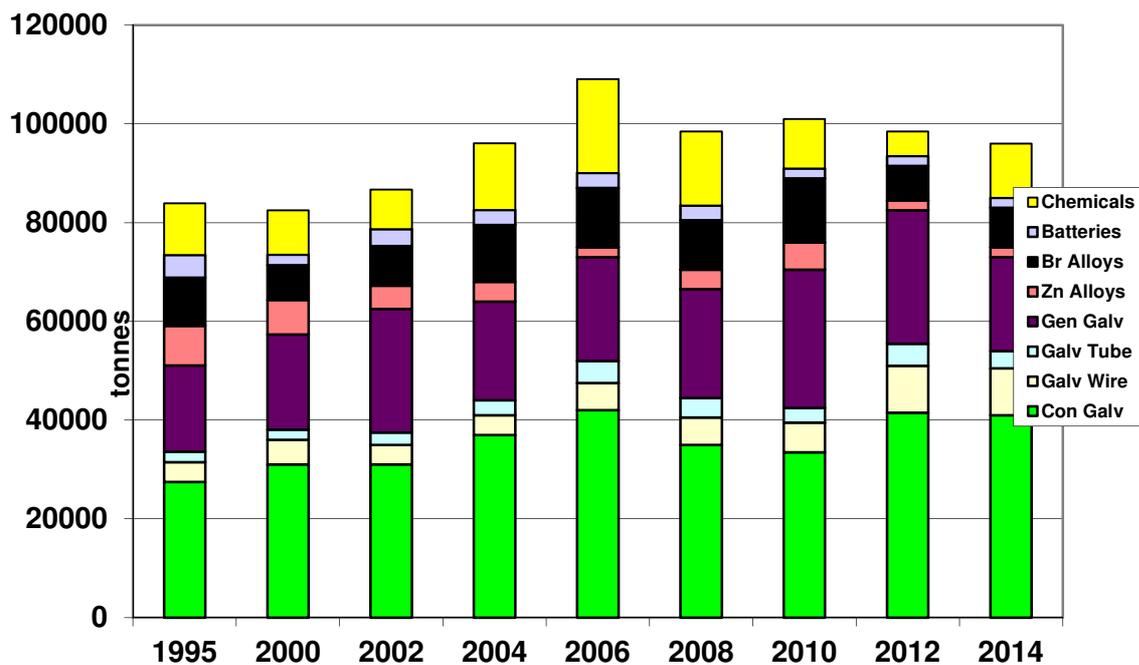


Figure 27. Estimated final market demand percentages since 1995 for South Africa

The dollar price of zinc was steady during 2014 until June when it rose and spiked at a monthly average of \$2326.99 in August before falling back to \$2175.76 by year end. To mid-year 2015 the price has been relatively steady. In Rand terms, the significant fall in the value of the Rand has been appropriately reflected in the Rand zinc price which climbed from R22 365 to R24 955 by year end with a June 2015 figure of R25 670. The figures are shown in **Figure 28**.

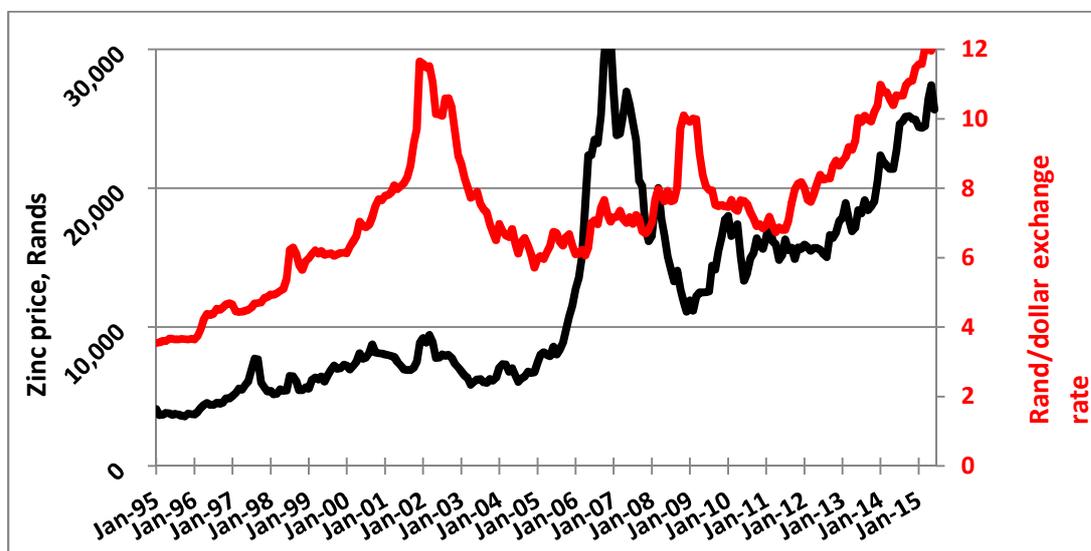


Figure 28. Rand exchange rate and local zinc price since 1995

There are divergent views on the global supply/demand imbalance and the un-sustained price rise in 2014 reflects the market view that the closure of some large mines and the shortage of finance for new projects may be written into the existing price. New projects are in the pipeline and enough concentrate appears to be available for existing refinery capacity. Price projections are beyond the scope of this report.

Economic conditions within the Southern African Development Community (SADC) remain mixed with growth in South Africa being particularly poor.

Mining has had a particularly rough time with uncertainties over legal and tax frameworks having resulted in concerns in South Africa, Zambia and Mozambique. In the latter countries these concerns, combined with the uncertainties of local elections, have had a detrimental impact upon developmental infrastructure projects which offer market opportunities for galvanized steel.

In terms of opportunities for zinc market growth, it is clear that, as with the rest of Africa, Southern African growth is in infrastructure (energy, transport and water) where steel consumption growth rates particularly in the energy field have exceeded 45% year on year. Significant growth rates are seen in the medium term. In contrast, the mining sector is essentially stagnant with no real consumption growth being recorded currently or envisaged in the near term. The mining sector in South Africa has been in decline for many years contributing some 11% to the GDP in 1993 to less than 5% in 2014. Increasing depths for mineral extraction, waning labour productivity, unrest and, an increasingly unattractive operating environment have led to rising costs which cannot be easily addressed without significant restructuring.

South African GDP growth in 2014 was recorded as just 1.5% with that largely the result of a last quarter rally which has not been sustained into 2015 where power cuts due to capacity constraints by the electricity provider (Eskom) have hindered industrial output, investment and development. **Figure 29** shows the GDP situation for South Africa with a breakdown of the sector contributions. One positive is that South Africa imports around 150 million barrels of oil annually. A \$50 reduction in price is worth about 2% of GDP at current exchange rates (source Allan Gray, 2015).



Sector	Growth, Y-O-Y, %	Comments
Agriculture	5.6	Good prices and yields, good demand from Africa
Mining	-1.5	Low commodity prices, labour unrest and, concerns regarding legal frameworks
Manufacturing	0	Low demand, labour unrest and, power disruptions
Construction	2.9*	Improving demand, some projects and, margin squeeze remains
Utilities	-0.9	Capacity constraints and new project deadlines not met
Retail	1.3	Interest rate rises, banking issues and, poor job numbers
Logistics	2.3	Good African demand, communication systems growth
Education/Health	1.4	Meaningful growth in demand

Figure 29. GDP Growth in South Africa (based largely on FNB, 2015)

Although construction activity as reported in **Figure 29*** has seen some improvement this is not borne out by the activity registered as shown in **Figure 30**. The lack of “real” activity has a significant impact upon the zinc market where coated steel products are commonly used. This drop is clearly

shown in the steel consumption numbers.

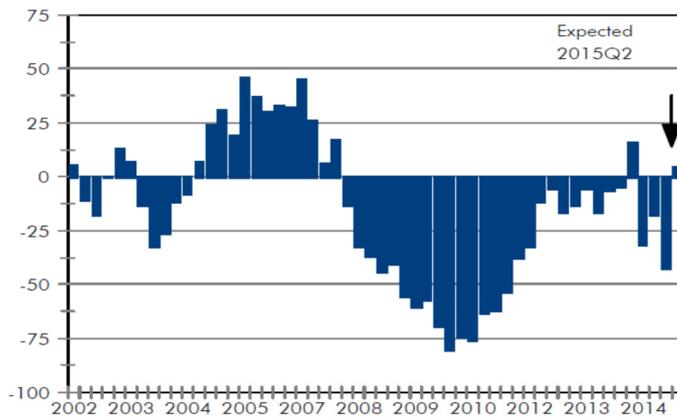


Figure 30. Growth in Construction activity in South Africa (FNB, 2015)

The spending on infrastructure promised by government halved in 2014 compared to 2013 (source Nedbank). The private sector contributed 77% of the 65 new projects valued at R95.4bn announced last year. This was down from 85 projects valued at R187.9bn in 2013. Public sector projects were only worth R10.5bn in 2014 versus R42.4bn in 2013. It is viewed that without significant improvements in electricity generation and transport, South Africa will never grow at rates above 3% per annum. Legal framework uncertainties, such as the Mineral and Petroleum Resources Development Act, labour unrest and an unattractive operating environment remain an impediment to future Private Investment and growth in South Africa. Consumer services and domestic demand are unable to replace Fixed Asset Investment as drivers for growth in South Africa, largely due to the excessively high Gini index.

Steel market – South Africa

To understand the current steel position in South Africa it is important to note that one steel maker is now in Business rescue (May 2015) and that no local steel maker is currently operating at capacity due to low domestic demand and cheap imports amounting to almost 20% of local demand. This excludes the figures for fabricated steelwork where imports remain an issue. The steel and engineering sector remains (2014) at 25% below its peak of 2007. Notwithstanding imports, overall steel demand in South Africa fell by 9% from 2013 to 4.9 million tonnes in 2014 (almost similar numbers to those recorded in 2012 with a similar market breakdown). Long products declined 10% and flat steel 9% compared to 2013. The recent announcement of a \$4.5bn development of a new steel mill by Hebei Steel of China to take advantage of the market growth in SSA will add a new dynamic. To be completed in two stages, the first \$2.8bn investment will be in a long and flat products mill, the second \$1.7bn will be for speciality grades. The plant will take advantage of the large magnetite resource at the Palabora Copper mine which is now owned by Hebei Steel and the South African Industrial Development Corporation.

Various projects opportunities in Southern Africa have been identified as requiring the use of steel and the dominance of energy and logistics reflects the rest of Africa as previously discussed (**Figure 31**). Galvanizing should be able to take advantage of these opportunities.

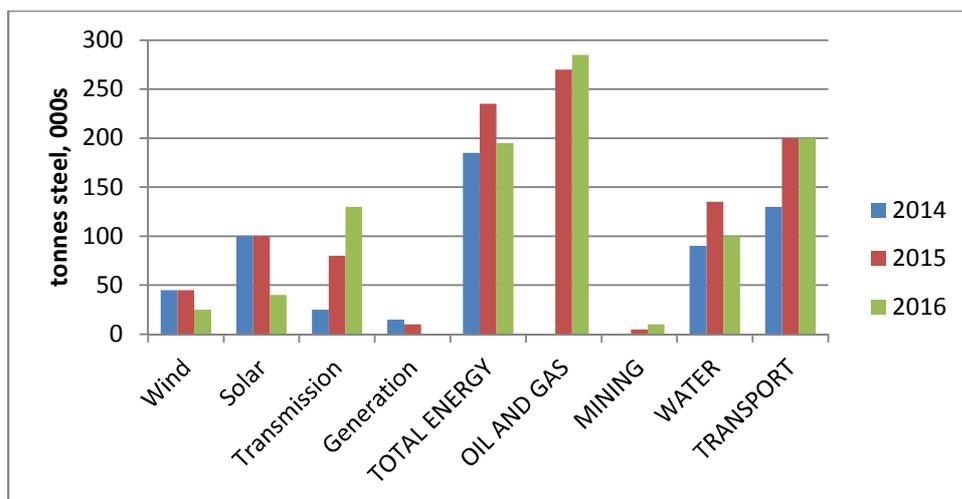


Figure 31. Potential steel demand from new Southern Africa projects (source, AMSA, Feb 2015)

Continuous galvanizing – South Africa

Whilst capacity for continuous zinc coated coil is around 800 000 tonnes, it is estimated that production was around 600 000 tonnes in 2014. Exports were 202 000 tonnes and imports 240 000 tonnes giving an Apparent Demand of 640 000 tonnes of zinc coated steel for the year. Demand for AZ coated product was of the order of 100 000 tonnes for the year with 6 000 tonnes being exported.

Whilst total building investment has fallen 10.8% y-o-y in 2014 (and 2013 was 5.77% less than 2012) the square metres of buildings completed in 2014 was 0.6% higher than 2013 (which was 15.21% higher than 2012 (BMI, 2015). Clearly not all buildings use steel but there is an indication that the square metres of product consumed in 2014 may not be significantly less than 2013.

General Galvanizing – South Africa

The shift in market share attributable to energy is clearly shown in **Figure 32** (Infrastructure). Although the general galvanizing industry has taken a beating in South Africa of late, it is fair to say that renewables projects have provided some respite but low margins have had an impact upon the industry with plant closures having occurred during the reporting period. The general galvanizing market is now below 20 000 tonnes per annum of zinc consumption having decreased by around 10% y-o-y compared to 2013. A similar decrease is envisaged for 2015. A number of key solar projects have been secured by the larger companies. However, those with limited access to this market are under real strain such that more plant closures are likely.

Wire Industry – South Africa

For the key tariffs, 54 703 tonnes of zinc coated wire and products were exported and 29 695 imported. Estimates are that with a local installed capacity of 160 000 tonnes per year, there is only 60% utilisation of capacity. The balance of supply is from imports. The overall market in South Africa is considered to be of the order of 120 to 140 000 tonnes per year. The 8 wire plants are grouped into 4 key operators, namely Sharon Wire Mill (Pty) Ltd, Consolidated Wire Industries (Pty) Ltd, The Allens Mescho Group and Barnes Fencing Industries (Pty) Ltd. Currently, there is only one wire

coater using 95/10 Galfan wire products. These are used exclusively for gabions. The wire manufacturers produce a full range of wire products from fencing products to consumer products. Agriculture and general security remain the main wire product markets.

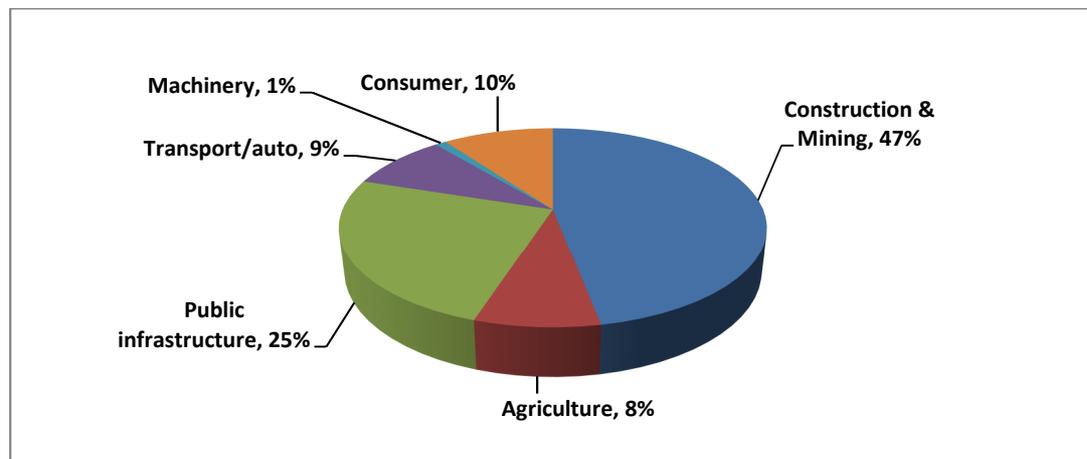


Figure 32. Percentage market sector demand for the general hot dip galvanizing industry in South Africa (excluding wire)

Galvanized Tube – South Africa

The total market for steel tube and pipe is estimated at around 400 000 tonnes with an additional 100 000 tonnes of spirally welded large bore pipe locally produced. Local production of galvanized piping was estimated at around 60 000 tonnes in 2014. This includes small bore and large bore piping which is generally galvanized through a general galvanizing operation, mostly in the Johannesburg and Durban regions. Imports of tube and pipe were estimated to be of the order of 20 000 tonnes in 2014 with around 4 000 tonnes of small bore product. Products such as thin wall piping and distribution poles continue to gain market presence regionally.

Zinc Alloys – South Africa

The total direct market for zinc alloys into zinc die-casting has declined from just over 1000 tonnes in 2012 to an estimated 750 tonnes in 2014. The total zinc allocation to alloys (including brass) remains constant at around 10 000 tonnes which indicates that the growth in imported product is significant.

Continued importation of white goods, declines in local hardware production and the poor impact (to date) of the Automotive Production and Development Programme and the still low industry impact of the restrictions on export of un-beneficiated scrap mean that the zinc die-casting industry, in particular, continues to struggle. Electricity charge increases have had an impact on die-casters but less than that in more energy intensive industries. Local sources indicate that with the growth of ship and rig repairs in South Africa, the zinc anodes business is displaying a turnaround with Chinese products less of a threat than previously thought.

Copper production in South Africa is now secured with the announcement of the R9.3bn extension to life of mine and smelter improvements at Palaborwa. In 2014 copper production was 45 000 tonnes and is expected to be of the order of 75 000 tonnes per year by the end of 2017. The total market for copper in South Africa is 80 to 85 000 tonnes per year. Exports of un-beneficiated scrap

remain high and whilst difficult to fully interpret, it does appear as if the exports remain high (in excess of 100 000 tonnes). Local Brass production is estimated as being of the order of 15 000 tonnes in 2014.

Battery Industry – South Africa

Battery callots (R6 and R 20 sizes) are now fully imported into South Africa from Peru with the single local producer being Ever Ready. In 2014 less than 400 tonnes of zinc callots were imported. Flat cell zinc chloride and zinc air battery manufacture has ceased in South Africa. In terms of future opportunities for zinc battery technology in Africa, the rapid adoption of solar systems may well provide an opportunity for the new zinc redox flow batteries developed in Montana in the USA.

Chemicals Industry – South Africa

The Chemicals sector is the fourth largest employer in South Africa employing around 200 000 people. In 2013, the contribution to the GDP was 3% (StatsSA) down from a peak of 3.8% in 2008. The key user segment for zinc is in various agricultural products (feeds and fertilizers). Zinc is added to NPK at 0.5% within South Africa. Total fertilizer and NPK consumption figures are shown in **Figure 33**. Overall NPK consumption has been static for some years at around 618 000 tonnes (requiring 3 500 tonnes of ZnO addition). The adoption of ZnSO₄ in fertilizers remains disappointingly slow. A similar size market exists in other agricultural areas where ZnSO₄ use is increasing (foliar sprays, general use by deciduous fruit growers, etc). Another key market for agricultural zinc use is in animal feeds where the new European Guidelines (EFSA Journal 2014;12(5):3668) provide for additions ranging between 70 to 150 mg/kg of final product. The size of the animal feed market for South Africa during 2014 was given as 6 431 tonnes (4.1% greater than 2013). It is interesting to note that beef, sheep and pig feed grew by over 10% y-o-y.

Other key zinc containing products are oxide (rubber products (tyres, conveyor belting) paints, pharmaceutical products, hydrometallurgy, etc.), powders (paints), chloride (batteries chiefly) and various nano-products which are growing in importance but represent small volumes. Oxide flows are the largest part of these products with around 1000 tonnes imported in 2014 and 3 500 tonnes exported.

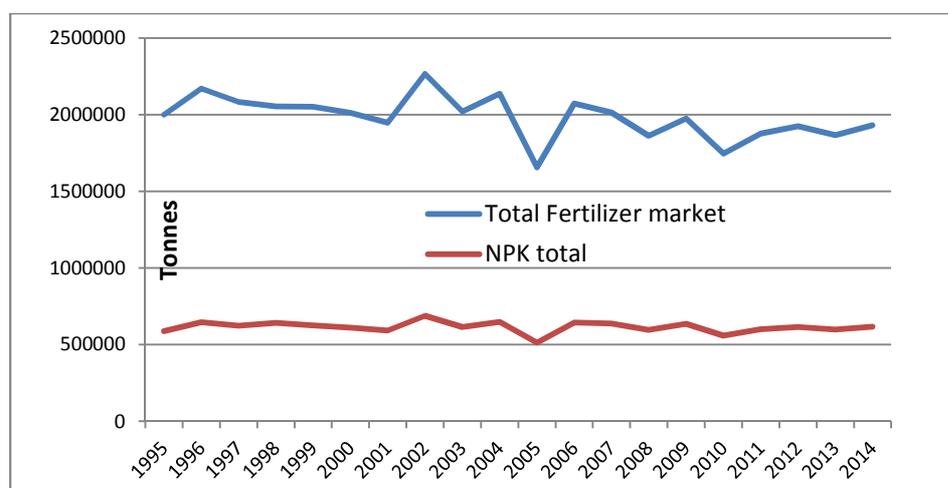


Figure 33. Total fertilizer and NPK market for South Africa (source FertASA)

Other – South Africa

Two remaining key markets for zinc in South Africa are electroplating and the use of zinc sheeting for the cladding of buildings. There are some 300 platers in South Africa, considerably less than in the past. In addition, total tonnage for electroplating is now estimated as 250 tonnes per year of around half the number in 2000. The rolled zinc market has grown in size and interest from the rest of SSA is promising. In 2014, less than 200 tonnes of imported product was used in prestige construction projects.

POTENTIAL ZINC DEMAND (AND FUTURE)

For the Southern Africa region as a whole consumption is of the order of 98 000 tonnes. The 2014 market for the selected African countries outside of SADC was some 75 000 tonnes. It is likely that the latter figures are conservative and Sub-Saharan Africa outside of SADC may well have consumed 80 000 to 95 000 tonnes. In addition, local sourcing of transmission towers offers a potential of at least 30 000 tonnes with a growth rate projected at 10 – 15% per annum. Thus, taking a baseline figure of 200 000 tonnes for SSA could be reasonably assumed for 2014. The rest of SSA is now consuming more zinc than South Africa and has growth rates exceeding 10% per annum. International interest in the locally produced zinc ash trade corroborates the growing importance of the region and it is hoped that much of the locally generated residues can be used to provide the inputs into the burgeoning agricultural market.

The largest market for zinc (especially in Africa) is construction. Continuously galvanized sheet is almost exclusively used in construction. This market is booming and sheet galvanizing plant establishment is occurring in almost every country in Africa. Infrastructure development is continuing apace and despite concerns that perhaps there will be a softening on lower commodity prices, development is being driven through consumer need and robust foreign direct investment. Although West Africa may experience a hiccup in growth as government revenues decline with the softer commodity prices, the rapid growth in consumer spending may off-set this. East Africa will continue its growth trajectory as oil import costs have declined and infrastructure projects are fully funded. Outside of South Africa, Southern Africa is showing rapid growth in zinc value adding facilities.

Estimates of future demand are shown in **Table 10**. The market figures provided previously proved to be far too conservative. As data gathering improves, more reliable figures are obtained. Therefore, the forecasts given have more confidence than those provided before.

Table 10. Direct zinc sales forecast to 2017 (zinc tonnes)

	Forecasts Low				Forecasts High		
	2014	2015	2016	2017	2015	2016	2017
South Africa ¹	92 000	92 000	92 000	92 000	92 000	94 000	97 000
SADC ²	6 000	6 000	8 000	8 000	6 000	7 000	9 000
East Africa ³	43 000	45 000	47 000	50 000	51 000	62 000	74 000
West Africa ⁴	30 000	31 000	33 000	35 000	30 000	36 000	43 000
Total SSA zinc	171 000	174 000	180 000	185 000	179 000	199 000	223 000

Notes:

1. South African growth rates between 0 and to a maximum of 3% pa
2. Known new installations in SADC region
3. Known new installations in region with growth rates from 5 to 20% per year
4. Known new installations in region with growth rates from 5 to 20% per year taking into account current political issues