

Chapter 2

Energy and Africa

Abstract This chapter focuses on the current energy landscape in Africa as well as the challenges the continent is currently facing. It also highlights the energy demand and resources, the renewable energy policy, investment and corruption.

Keywords Energy · Africa · Renewables · Investment · Corruption

South Africa is only one out of 54 countries making up the African continent. Now with over 1.1 billion people, the continent is being seen by China, Europe and increasingly the US, as the next major trading partner. This in itself represents a tectonic shift of emphasis away from the more historic image of the continent as a passive recipient of development funds. Whilst the continent still faces any number of challenges, in terms of energy, transport and deployment of the critical Information and Communication Technology (ICT), all of which are somewhat inextricably linked, the focus on a value add for Africa itself is underway.

One of the biggest challenges policy makers, aid bodies and analysts in this area face is the lack of in-depth up-to-date information on what the on the ground energy issues are. With gathering of statistics being far down the chain of day-to-day needs, it is only in very recent times that any kind of systematic gathering of data on the energy landscape, needs, outputs and inputs from Africa has started to change. Of the data available the World Bank and the International Energy Agency (IEA) are the two best sources, but even they admit that there are a number of gaps, including an understanding of the actual scale of use of back-up power generators and the level of use of more traditional power sources, such as wood stoves and biomass. Along with the overall energy landscape in Africa this is changing, but often when using data on Africa there is a caveat of a 50 % statistical variance on the information, which could in itself have major ramifications for policy!

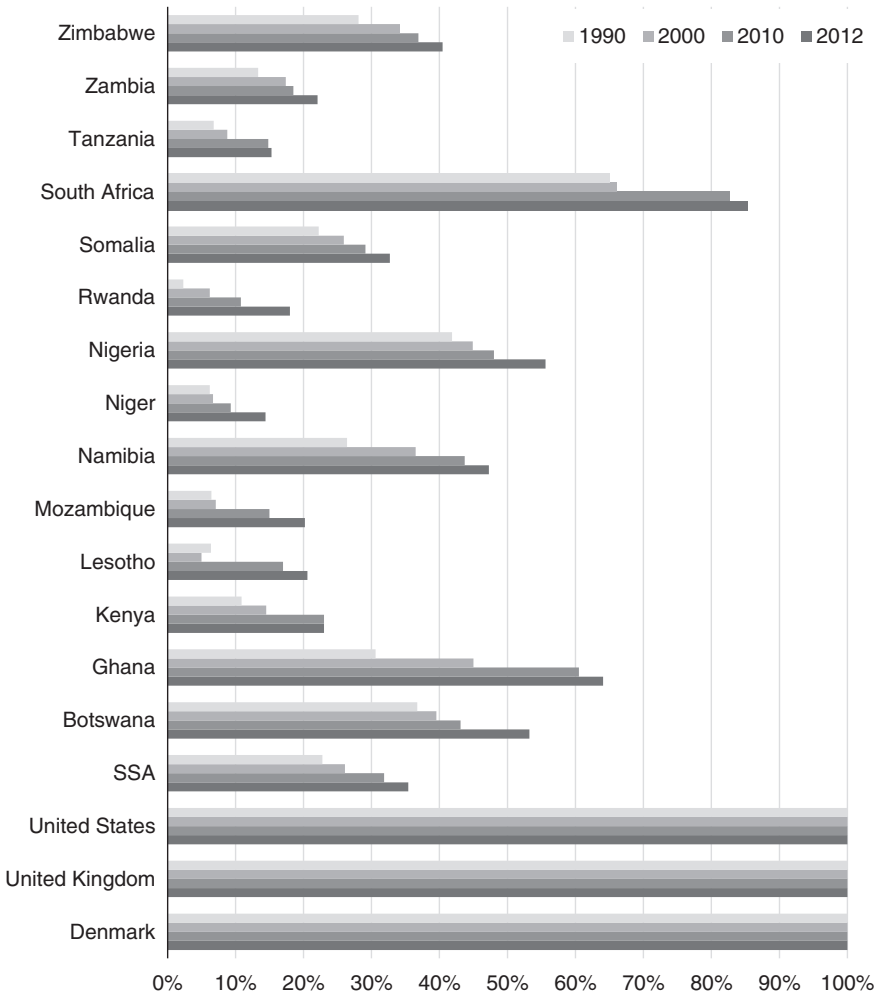


Fig. 2.1 Access to electricity for selected SSA countries, 1990–2012 [1]

As of today though, and mentioned earlier in the brief, it is thought that 65 % of the population has no access to electricity. This though is very unevenly distributed across the continent, with North African countries having over 90 % access to electricity, but in sub-Saharan Africa (SSA) in many countries this drops to 50 % or under. Figure 2.1, using World Bank data, shows the increase of access to electricity over time for selected countries in SSA. For reference Denmark, the US and UK are used as comparators across charts in this section.

As the waterfall chart clearly shows, RSA is in a comparatively strong position, especially when compared with a number of its trading neighbours in the SAPP. Using the World Bank data, up to 2012, Tanzania was the worst off in the Southern African Power Pool (SAPP, see later), with only 15 % of the country's population having access to electricity and Zimbabwe, Namibia and Botswana were all between 40 and 53 %.

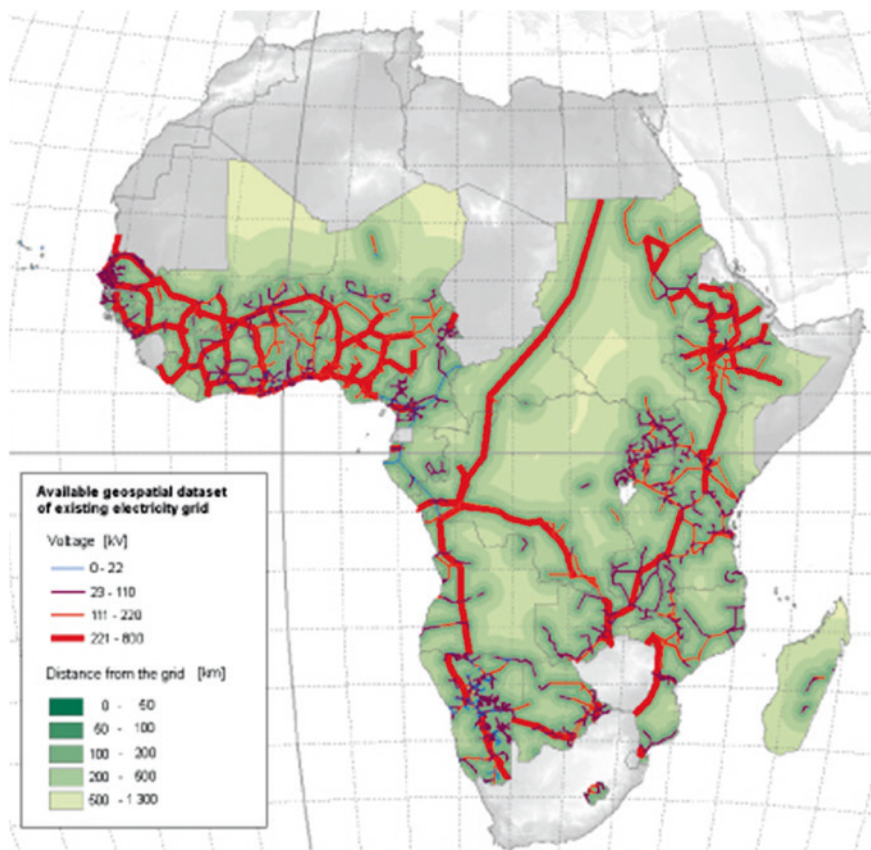


Fig. 2.2 Geospatial mapping of electricity power lines in SSA, 2011 [2]

To put this in context though, according to the IEA data over 145 million people have gained access to electricity since 2000. This has been led by improvements in Nigeria, Ethiopia, South Africa, Ghana, Cameroon and Mozambique.

One of the clear reasons for the lack of access to power has been till date the fundamental lack of a modern energy infrastructure. Figure 2.2, a much quoted chart by development agencies, clearly shows that whilst some trunk networks do exist, the connecting infrastructure for residential use, at between 2 and 30 kV, is non-existent in the many parts of the continent.

For settlements that have no grid access the more traditional energy use is that of biomass, or biofuels. As quantifying the level of this use is agreed up by the development and statistical agencies as being one of the largest challenges in baselining the current energy mix in Africa, the data shown here need to be taken with some caution. The key point to take from this chart is the level of reliability that many countries in Africa still have on traditional forms of energy as part of their Total Primary Energy Supply (TPES). Figure 2.3 shows the biofuels and waste as part of selected African countries' Total Primary Energy Supply.

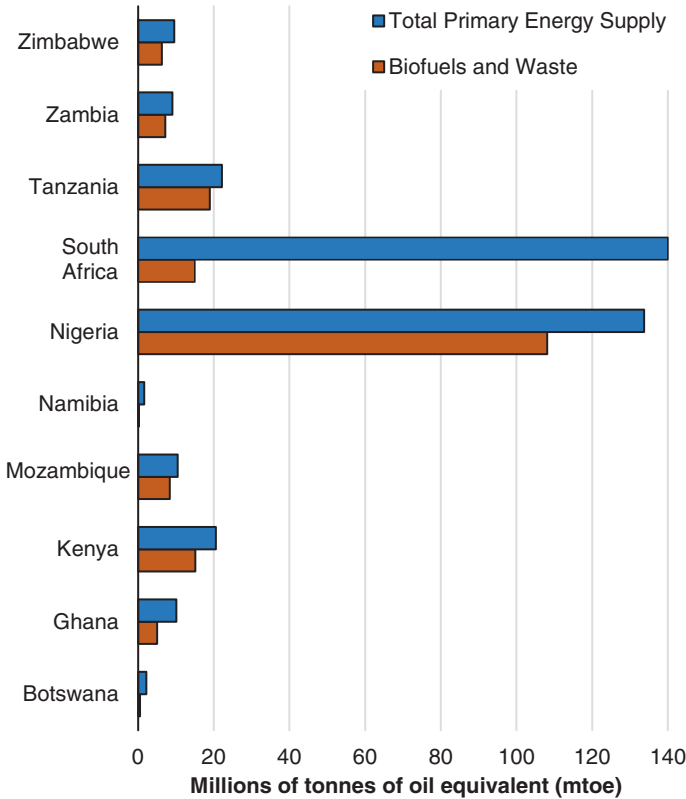


Fig. 2.3 Biofuels and waste as part of selected African countries' total primary energy supply, 2012 [3]

Within this mix, it can once again be very clearly seen the difference in development between RSA and other African countries. What is perhaps surprising is the level of demand for traditional energy sources in the fossil fuel rich nation of Nigeria. The country, which is a net energy exporter of crude oil, has a residential sector which consumes over 95 % of the total of biofuels and waste per annum (Fig. 2.3). This highlights in one sentence the challenge faced by a number of African nations. The difference is between the value to the economy of selling, and exporting its mineral and energy resources, or using them at home.

In terms of use of renewable energy, adoption of non-hydro traditional renewables has so far been very low in Africa, in general. Whilst on a global level the move is a transition to a renewable-based low carbon economy, the cost and prohibitive lack of infrastructure in many parts of Africa has seen adoption at a very low level.

As with many low carbon technologies cost really is an issue, and although when compared with say the price of diesel, many economic cases can be made, the on the ground reality is that till date distributed energy, and micro grids remain so niche that reliable statistics on adoption, and deployment data, are thin to zero on

the ground. According to one IEA dataset [3], adoption of solar PV in the whole of Africa in 2012 was below the threshold to be broken out into its own category and is published together with the data from the Middle East at just 300 installations.

2.1 Energy Demand and Resources

According to the International Renewable Energy Agency (IRENA) [4] just five countries in Africa dominate the current power market (Fig. 2.4). These are South Africa at 21 % of primary energy use, Nigeria 16 %, Egypt 11 %, Algeria 6 % and Ethiopia 5 %. It should be noted that this report uses data from 2009. The rest of the African continent represents only 41 % of total primary energy use.

When we unpack the data from 2012 for these countries we can see that, reading bottom to top, in terms of energy consumption till date, residential and transport energy consumption makes the majority of demand in the majority of African nations. This is primarily due to the lack of high energy consuming industry, aside from mining.

Figure 2.5, again mining data from the IEA, clearly shows this dominance of residential and transport sectors. Note that Nigeria's residential sector has been removed from the dataset, as at 88,935 ktoe (kilotonnes of oil equivalent) it dwarfs all other sectors.

When these are compared with 24,906 ktoe from industry, 16,690 ktoe from transport and 16,500 ktoe from the residential sector in South Africa [3], the scale

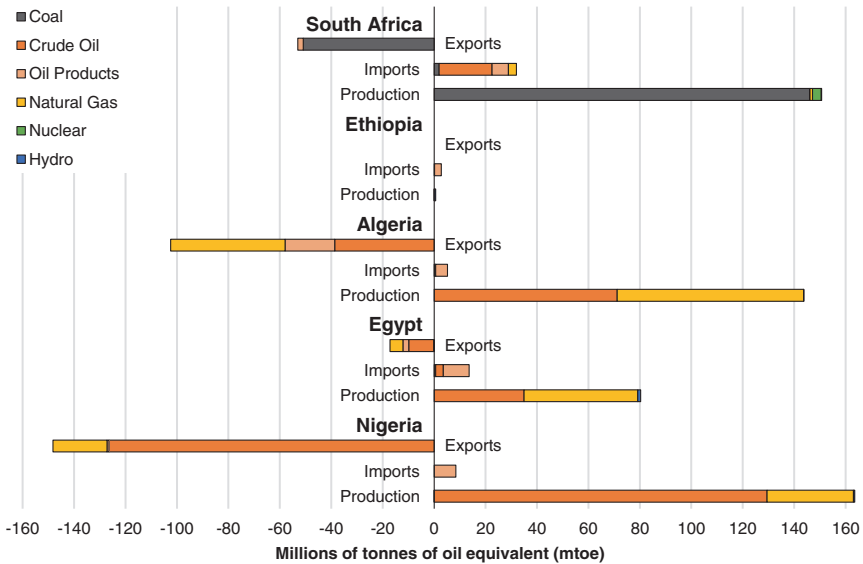


Fig. 2.4 Energy production, import and export from South Africa, Nigeria, Egypt, Algeria and Ethiopia, 2012 [3]

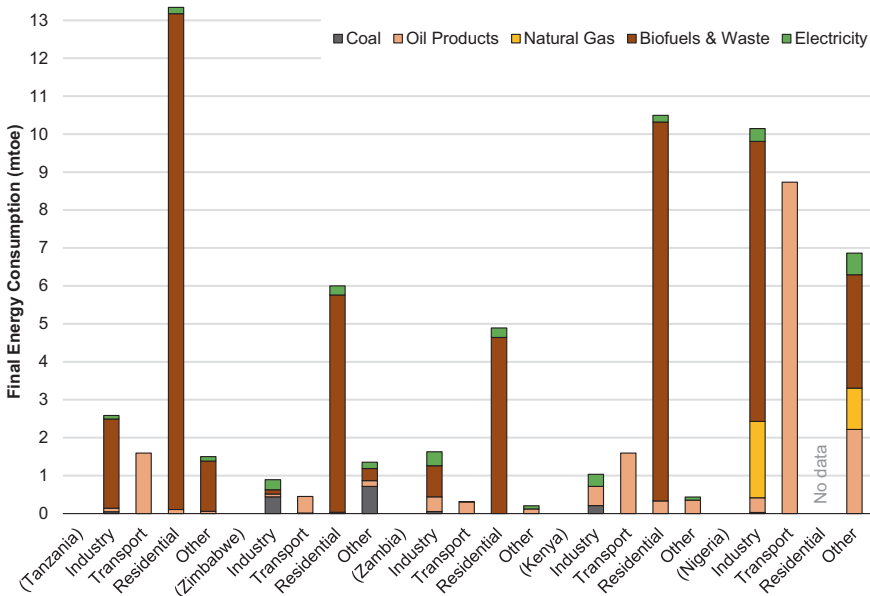


Fig. 2.5 Energy demand by end use, selected African countries, 2012 [2]

of the difference between the energy equation in South Africa and most of the rest of Africa becomes clear.

Africa is not an energy poor continent. Whilst it is not as rich as say the Middle East, Nigeria, Libya, Angola and Algeria especially are locally oil rich. For coal South Africa is the only key supplier across the whole of the continent and natural gas, so far at least, is not a player (Table 2.1).

With boom times in North America over shale oil and gas it is perhaps understandable that there has been a flurry of activity in ascertaining if African holds any potential in this area. According to the EIA, as reported by KPMG [6] that:

- Algeria has 707 trillion cubic feet (almost 20 trillion m³) of ‘technically recoverable shale gas resources’;
- Libya has estimated reserves of 122 trillion cubic feet of shale gas, the the 5th largest deposit of shale oil in the world;
- Egypt has reserves of 100 trillion cubic feet;
- Tunisia, Morocco and Western Sahara also all have proven reserves and
- South Africa has 390 trillion cubic feet of shale oil.

The question of economic viability to extract and process is very much at early stages with many countries starting a programme of drilling and testing.

Turning to renewables, IRENA raises the issue of technical, not economic potential, of renewable energy in Africa [5]. Table 2.2 reproduces an overview of the results. One note of caution that needs to be raised here is that IRENA states a 50 % uncertainty factor in the data.

Table 2.1 African energy proven reserves of oil, natural gas and coal, 2014 [5]

	Oil (2013)—thousand million barrels	Natural gas (2013) tcm	Coal (2013)—million tonnes
Algeria	12	5	
Angola	13		
Chad	2		
Rep. of Congo	2		
Egypt	4	2	
Equatorial Guinea	2		
Gabon	2		
Libya	48	2	
Nigeria	37	5	
South Sudan	4		
Sudan	2		
Tunisia	0		
South Africa			30,156
Zimbabwe			502
Other Africa	4	1	1156
<i>Total Africa</i>	<i>130</i>	<i>14</i>	<i>31,814</i>
<i>Rest of World</i>	<i>1571</i>	<i>172</i>	<i>859,717</i>

Table 2.2 Technical potential for power generation from renewables in Africa [5]

	CSP	PV	Wind	Hydro	Biomass	Geothermal
Central Africa	299	616	120	1057	1572	
Eastern Africa	1758	2195	1443	578	642	88
Northern Africa	935	1090	1014	78	257	
Southern Africa	1500	1628	852	26	96	
Western Africa	227	1038	394	105	64	
Total Africa	4719	6567	3823	1844	2631	88

As stated earlier, whilst there is significant technical potential for power from the sun, in both CSP and PV, in Africa the on the ground reality is that till date it remains a market with potential only.

2.1.1 Renewable Energy Policy

One of the key determinants for overseas investment in Africa, in the energy sector, is clear and actionable government policy. As with other countries in the world the signal from the government that it aims to modernise, liberalise and update the energy infrastructure in its country is a critical first step to moving forward.

In terms of energy and Africa there are few countries in Africa without a policy document looking at energy but in reality fewer of them are being acted upon.

Some relevant examples, with somewhat elastic timeframes are:

- The Nigerian government has put a legislative framework in place under the Renewable Energy Masterplan. Within this off-grid and distributed solar are actively being encouraged. According to some of the frameworks there will be a solar PV target of 500 MW by 2025.
- The Ghanaian government has a 10 % renewable energy target by 2020.
- Zambia has a rural electrification scheme, with a focus on deploying renewable energy. Within this the government is offering a range of fiscal incentives.

This is one area that would significantly benefit from future collaborative endeavours—cataloguing and bringing together policy makers from the different power pools to develop cross border, economic and effective policy on renewable energy, and energy trading in general.

2.1.2 Investment and Corruption

Finally, in this section on Africa the issues of overseas investment and corruption should be addressed. Corruption, which is endemic in some parts of Africa, is often quoted as one of the key roadblocks to unlocking increased overseas investment, in African power and transport projects. Transparency international each year releases a report indexing countries on their corruption levels. Within the index 100 is fully non-corrupt and 0 is fully corrupt. The results for a number of the African nations are shown in Fig. 2.6.

In the report Somalia was ranked the most corrupt country in the world.

In terms of investment the Infrastructure Consortium for Africa (ICA) has been collating and publishing data on investment in Africa in transport, water, energy

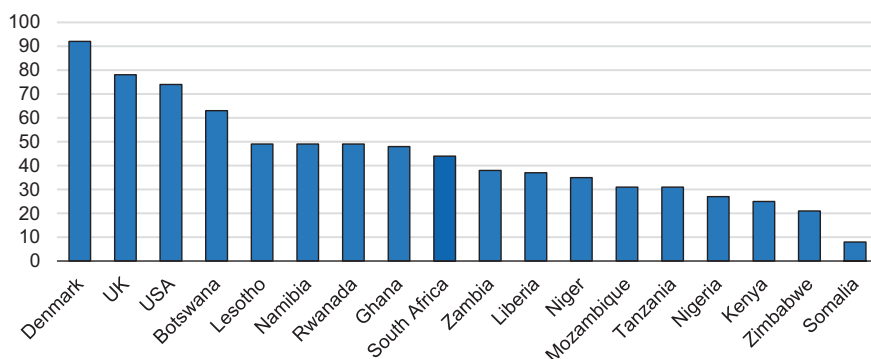


Fig. 2.6 Transparency international corruption scores for selected African countries, 2014 [7]

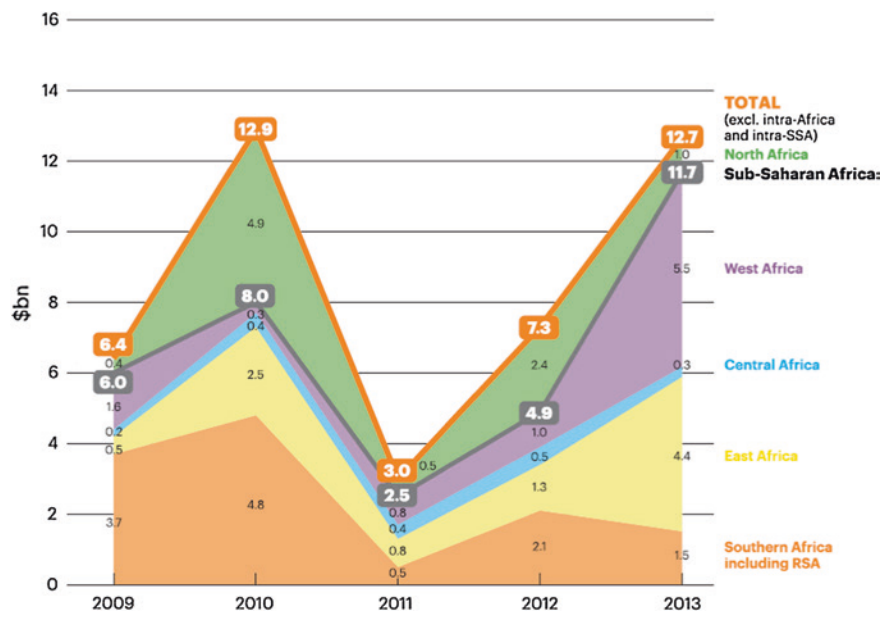


Fig. 2.7 Trends in energy infrastructure finance from ICA Members, 2009–2013 [8]

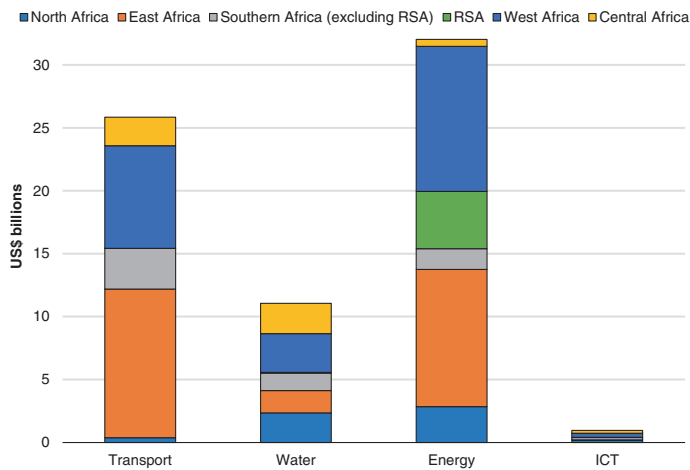


Fig. 2.8 Infrastructure finance from ICA and Non-ICA Members, 2013 [8]

and ICT sectors for the past 2 years. The ICA is a group of the following: the African Development Bank and Development Bank of Southern Africa, World Bank, International Finance Corporation (IFC), European Commission (EC) and European Investment Bank (EIB), the G8 (Canada, France, Germany, Italy, Japan, Russia, UK and the US), and the Republic of South Africa. They represent billions of annual investment in Africa.

The ICA secretariat published the chart given in Fig. 2.7 in the 2014 Annual Report. What the figure highlights is the continued cyclical nature of investment in energy. It should be noted that the 2013 data contains the US 2013 initiative “Power Africa”. This represents an additional \$7 billion from federal government for financial support and guarantees through its agencies, and has leveraged about \$20 billion of private sector commitments.

As well as the ICA, China is one of the biggest investors in infrastructure projects in Africa, but it should be noted that over 50 % of the funding from China goes to transport projects, not energy. When the data from the ICA are combined with other non-affiliated countries and banks, we see that in 2013 energy infrastructure in Africa received \$32 billion from overseas lenders (Fig. 2.8).

What is concerning in this chart is the lack of finance to central Africa, a region where energy poverty is at its worst.

References

1. The World Bank (2015) Statistics. <http://data.worldbank.org/>
2. Szabó S et al (2011) Energy solutions in rural Africa: mapping electrification costs of distributed solar and diesel generation versus grid extension. 2011 Environ Res Lett 6:034002
3. The International Energy Agency. Statistics. <http://www.iea.org/statistics/>
4. IRENA (2015) Prospects for the African power sector. https://www.irena.org/DocumentDownloads/Publications/Prospects_for_the_African_PowerSector.pdf
5. BP Statistical Review of World Energy (2015). <http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html>
6. KPMG (2015) Oil and gas in Africa: reserves, potential and prospects of Africa. <https://www.kpmg.com/Africa/en/IssuesAndInsights/Articles-Publications/General-Industries-Publications/Documents/Oil%20and%20Gas%20in%20Africa%202014.pdf>
7. Transparency International, Corruption Perceptions Index (2014) Results. <http://www.transparency.org/cpi2014/results>
8. Infrastructure Consortium for Africa (2014) Annual report. <http://www.icafrica.org/en/topics-programmes/energy/energy-investment-picture-data/>

The Energy Landscape in the Republic of South Africa

Pollet, B.G.; Staffell, I.; Adamson, K.-A.

2016, IX, 54 p. 24 illus., Softcover

ISBN: 978-3-319-25508-8