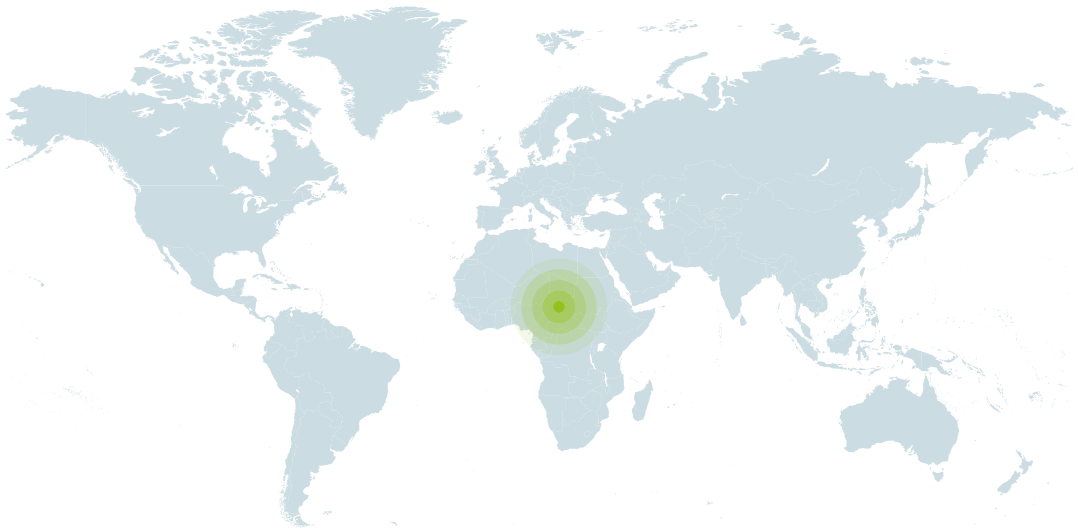


Climate Change and Energy Security in the Anthropocene

Africa in the Light of the
Paris Climate Protection Agreement

Oliver C. Ruppel / Arne Wulff



Africa is affected particularly strongly by the impacts of climate change. The continent, home to 1.2 billion people, many of whom live below the poverty line, is experiencing more frequent instances of drought and torrential rain. The implementation of the Paris Climate Protection Agreement of December 2015 will depend substantially on the steps African states will be prepared to take to drive their further development while making efforts to minimise the emission of greenhouse gases.

In an era shaped mainly by human activity, the so-called Anthropocene,¹ the consequences of human activities are intimately linked to the observable changes in the climate.² With respect to Africa, the Intergovernmental Panel on Climate Change (IPCC) stated in its Fifth Assessment Report that there is likely to be a two degree Celsius increase in temperature compared to the average global surface temperature in the late 20th century. It is also likely that there will be a steeper rise in surface temperatures in Africa compared to global average, particularly in the more arid regions.³ There, the impacts are already being felt today across national borders.⁴

Key Risks from Climate Change for Africa⁵

Figure 1 comprises some of the key risks from climate change for Africa. The information illustrates that lower agricultural yields due to heat and aridity have a strong negative impact on food security and that the existing stress on water resources due to overexploitation and degradation will be exacerbated further through future increases in demand and more frequent droughts. There is a further key risk associated with changes in the incidence and geographic range of vector and water-borne diseases caused by changes in temperature and precipitation. Drivers of the above-mentioned key risks include in particular the warming trend, extreme temperatures, rising sea levels, as well as extreme precipitation events. One of the key statements of the Fifth IPCC Assessment Report is as follows: The higher the rise in temperature, the


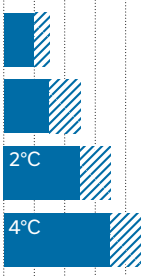

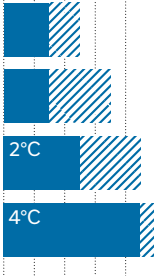

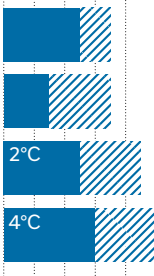
greater the risk. Figure 1 also shows that the more numerous and effective the measures to adapt to climate change will be in future, the greater the chance of minimising the risks.

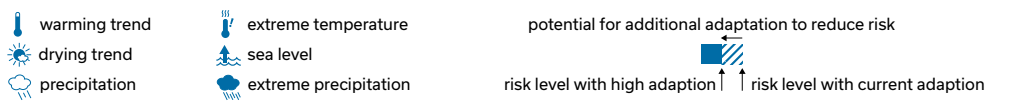
Climate Change, Human Safety and Migration

In Africa, climate change poses a particular risk not only to economic growth but also to sustainable development and various aspects of human safety. It therefore represents a threat to the health, food security and the very existence of people in Africa.

It is difficult to prove a direct correlation between climate change and armed conflicts, particularly as such conflicts are always driven by different and partly linked country-specific, socio-political, economic and cultural factors. That said, it is clear that the climate-related loss of natural resources and the associated overexploitation of remaining alternative resources can cause massive distribution conflicts in Africa. There are indications of this particularly in the Sahel Region, in the Horn of Africa and in East Africa.⁶ And the question as to who controls access to water has frequently played a role in armed conflicts throughout human history. Added to this is the fact that the impacts of climate change cannot be excluded as factors motivating people to migrate – although the ultimate drivers of urbanisation and migration in Africa generally entail interacting social, demographic and economic factors.⁷

Fig. 1: Key regional risks from climate change and the potential for reducing risks through adaptation and mitigation

| Key risk | Adaption issues and prospects | Climatic drivers | Time frame | Level of risk and potential for adaption | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------|--------|-----------|
| | | | | very low | medium | very high |
| Compounded stress on water resources facing significant strain from overexploitation and degradation at present and increased demand in the future, with drought stress exacerbated in drought-prone regions of Africa (<i>high confidence</i>) | <ul style="list-style-type: none"> reducing non-climate stressors on water resources strengthening institutional capacities for demand management, groundwater assessment, integrated water-wastewater planning and integrated land and water governance sustainable urban development |  | present near term (2030–2040) long term (2080–2100) |  | | |
| Reduced crop productivity associated with heat and drought stress, with strong adverse effects on regional, national, and household livelihood and food security, also given increased pest and disease damage and flood impacts on food system infrastructure (<i>high confidence</i>) | <ul style="list-style-type: none"> technological adaptation responses (e.g., stress-tolerant crop varieties, irrigation, enhanced observation systems) enhancing smallholder access to credit and other critical production resources; Diversifying livelihoods strengthening institutions at local, national and regional levels to support agriculture (including early warning systems) and gender-oriented policy agronomic adaptation responses (e.g., agroforestry, conservation agriculture) |  | present near term (2030–2040) long term (2080–2100) |  | | |
| Changes in the incidence and geographic range of vector- and water-borne diseases due to changes in the mean and variability of temperature and precipitation, particularly along the edges of their distribution (<i>medium confidence</i>) | <ul style="list-style-type: none"> achieving development goals, particularly improved access to safe water and improved sanitation, and enhancement of public health functions such as surveillance vulnerability mapping and early warning systems coordination across sectors sustainable urban development |  | present near term (2030–2040) long term (2080–2100) |  | | |



Each key risk is characterised as “very low” to “very high” for three timeframes: the “present”, “near term” (here: 2030 to 2040), and “longer term” (here: 2080 to 2100). In the “near term”, protected levels of global mean temperature increase do not diverge substantially for different emission scenarios. For the “longer term”, risk levels are presented for two scenarios of global mean temperature increase (two and four degrees Celsius above preindustrial levels). These scenarios illustrate the potential for mitigation and adaptation to reduce the risks related to climate change. *Source: Own illustration based on IPCC, n. 5.*



Starvation: In 2005, a devastating drought destroyed most crops in Niger. Consequently, 3.6 million people suffered from starvation, including tens of thousands of children. Source: © Finbarr O'Reilly, Reuters.

As the effects of climate change in Africa increase in intensity, this will also have an effect on the number of climate-related migration processes. Unfortunately, international politics still lack suitable tools and regulatory frameworks to deal expediently with cross-border environmental migration.⁸

What Is Required in Concrete Terms?

Unfortunately, Africa is among the continents most at risk from climate change because of inadequate adaptability, low levels of innovation and technological progress, political deficiencies and ineffective diplomacy.⁹ Consequently, effective measures will be required to cope with the current and future challenges of climate change more successfully.

The risks resulting from climate change need to be minimised. The risk mitigation strategies used in Africa to alleviate the impacts of natural disasters on households, communities and the economy, include in particular early-warning systems, mechanisms for the transfer of anticipated risks, the development of social networks, the setting up of disaster funds and budgeting systems, livelihood diversification and the control of migration movements. Other aspects in need of urgent attention are sustained financial support and technology transfer to address adaptation deficits, the vulnerability of people in rural and urban areas, as well as the weak economic systems.¹⁰ In addition, there is a need to strengthen institutional capabilities and good governance mechanisms in order to strengthen governments and research institutions and to identify and imple-

ment suitable effective adaptation measures.¹¹ One particular challenge arises from the fact that the risks from climate change are not distributed equally and are generally greater for individuals and societies in less developed regions.¹²

While it is now widely accepted that the total of human activities is one of the causes of climate change, the question of how the law deals with it is only just beginning to receive serious consideration. One thing seems clear: the law is reliant on the opinions and warnings of scientists, particularly on their warnings of impending risks. While governments in Africa have already embarked on systematic courses of action to optimise adaptability, for instance through the development of strategies for putting disaster risk reduction on a permanent footing, the adaptation of technologies and infrastructure, the implementation of approaches based on ecosystems, and the introduction of measures to improve the public health system, etc., there is still a great deal more to be done. This includes measures to promote adaptive learning as well as the continuous enhancement of in-depth scientific expertise and training facilities. Consequently, both consultancy and dialogue are essential for initiating political decision-making processes and sensitising those in authority.

Urban development and climate adaptation are also increasingly coming to the fore in the African climate agenda, including the issue of migration movements. In view of the fact that Africa is forecast to experience the largest waves of urbanisation in the world, this is a topic of particular importance in the ongoing development dialogue as well as in connection with financing options and investment interests relating to the improvement of infrastructure and housebuilding, for instance.

The increasing competition for land and water resources in Africa represents a further area where there is a need for developing environmental management expertise, promoting technology transfer and improving competences in extrajudicial conflict resolution and disaster risk reduction. The growing food shortages that are linked directly to the water issue are exacerbated

by the rising demand for biofuels and animal feeds as well as the actions of foreign agricultural companies, which use large tracts of agricultural land particularly in the food-growing region for supplying markets outside Africa. It is estimated that the demand for purchasing African land or for leasing it for lengthy periods will continue to rise. Tracts of agricultural land in Africa are also increasingly attracting foreign direct investments as objects of international speculation. This situation needs to be included in the political debate and questioned, particularly in view of the challenges of climate change in interaction with the issues of climate justice, food security and poverty. This represents a crucial nexus for Africa's future. After all, climate change does not only have an impact on the environment, but also on (virtually) every other sector on the political agenda, which is why climate policy needs to pursue a cross-sector approach. To what extent the African population will be consulted is questionable. The fact is that to be effective, climate policy requires multi-stakeholder processes. Rivaling institutional arrangements are detrimental in this situation, as are lack of transparency and exclusion of the media, lack of expertise among the media with respect to reporting on climate-related issues, as well as the debate being dominated by the economic interests of only a few political African elites.

Climate Change and Energy Security

The issue of energy security in Africa has come under the spotlight of political discussions of late.¹³ Not least because the renewable energies sector is generating an increasing number of jobs.¹⁴ Energy plays an important role in all aspects of daily life; it is, for instance, essential to the smooth running of social and political systems as well as to economic growth and sustainable development. Ensuring a reliable energy supply, which will also be able to satisfy the growing demand in Africa,¹⁵ is one of the greatest challenges for the African continent today. Furthermore, energy security is an essential factor impacting on competitiveness, sustainable development and poverty reduction in African states. The goals of energy security and climate

change mitigation require the use of innovation and technology, smart climate policy-making, high-level government intervention, effective diplomacy and international cooperation.¹⁶ This approach can yield enormous opportunities and synergy effects for accelerated development in Africa. The challenge now is to think with new correlations in mind and to develop climate policy incentives and instruments influenced by development policy goals, which will lead to sustainable economic and social models. The law can be a helpful instrument in this endeavour.¹⁷

The Declaration on the Right to Development represented a new approach to the realisation of the United Nations' goals.

Energy Security as a Right to Development?

As far back as 1986, the international community recognised the need to obtain a comprehensive overview of the issue of human rights and development. The Declaration on the Right to Development represented a new approach to the realisation of the United Nations' goals. In Article 3, the declaration emphasises that states have the duty to co-operate with each other in ensuring development (for the people) and eliminating obstacles to development. Development and law are consequently intrinsically linked, particularly where energy security and climate justice are concerned.¹⁸

Article 22 of the African (Banjul) Charter on Human and Peoples' Rights, for instance, also states that

1. All peoples shall have the right to their economic, social and cultural development [...]
2. States shall have the duty [...] to ensure the exercise of the right to development.

How important is energy for ensuring the exercise of this right? After all, the lack of a reliable,

affordable and sustainable energy supply is one of the largest barriers to economic growth and development in Africa. Only some 20 per cent of the African population currently have an electricity supply. The African continent lags far behind other regions around the world as far as advances in electricity generation are concerned.

According to United Nations forecasts, the African population is set to grow to some two billion by 2050, which means that increased energy demand, besides poverty reduction, food security, water security and measures to adapt to the impact of climate change, is at the very top of the agenda. Energy security is an indispensable prerequisite for economic growth in Africa, for securing the right to development and, not least, for the stabilisation of democracies. A reliable, efficient and sustainable energy supply should be the goal of both national governments and regional communities. Ensuring an adequate energy supply is also seen as one of the means to overcome poverty and achieve the following Sustainable Development Goals (SDGs):

- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all
- Goal 9: Build resilient infrastructure, promote sustainable industrialisation and foster innovation
- Goal 10: Reduce inequality within and among countries
- Goal 13: Take urgent action to combat climate change and its impacts

Access to energy is a human right. Article 22 of the African (Banjul) Charter on Human and Peoples' Rights should therefore be interpreted to mean that African states have the duty to protect individuals' and peoples' right to development. Indeed, every African state must take measure to ensure that the right to development is guaran-



Havoc: Apocalyptic scenario after a gas pipeline explosion in Nigeria in 2006. Promoting the development of renewable energies provides an opportunity to prevent catastrophes of this kind in the future.

Source: © Akintunde Akinleye, Reuters.

teed for people throughout its territory. Energy security is a must for this goal to be achieved, and this is also in line with Article 1 of the African Charter, which states that the “Member States of the Organization of African Unity parties to the present Charter shall recognize the rights, duties and freedoms enshrined in this Chapter and shall undertake to adopt legislative or other measures to give effect to them”. The fact that millions of people in Africa have no access to electricity and are therefore condemned to live in abject poverty is not a natural phenomenon but the consequence of them being denied their right to development.¹⁹

COP21²⁰ in Paris 2015: An Agreement as the Solution?

In December 2015, a new global climate agreement was concluded. The “Paris Agreement” (COP21), which had taken UN diplomats years to prepare, is to be ratified nationally by all UN member states, rich and poor. Some observers have described the situation succinctly as follows: COP21 offers the world the best chance of jointly managing the impacts of global climate change. It remains to be seen, however, what the Paris Agreement will ultimately mean for Africa.



There has been some criticism of the fact that the Paris Agreement does not include any substantial binding commitments regarding emissions reductions. The only binding obligation the agreement comprises is that all states are duty-bound to notify new contributions every five years. The Paris Agreement is to create a framework to allow the regular setting of new national targets. Before the Paris climate summit, 186 states had presented voluntary national climate targets (Intended Nationally Determined Contributions, INDCs) to be achieved by 2025 or 2030.

According to the agreement, every state is to publish a national greenhouse gas report on a regular basis. It thus only sets out a legally binding obligation with respect to the procedure, without any concrete obligations regarding content or outcomes. While the 1997 Kyoto Protocol laid down binding reduction targets for the industrialised countries, the Paris Agreement, while more comprehensive in that it includes all countries, is much less stringent with respect to its binding character.

Some people are of the opinion that the Paris Agreement means phasing out coal, oil and gas. However, the current reduction commitments (INDCs) are insufficient to achieve this goal in the foreseeable future. There are also still some African (and other) states that wish to continue extracting and using fossil fuels. The challenge is to derive concrete decarbonisation strategies from the Paris Agreement and to implement these gradually and globally.

Seeing things from an African perspective, it remains important to mention that the agreement includes (the continued) obligation on the industrialised countries to support developing countries financially in the fight against climate change. Many developing countries (in Africa and elsewhere) only accepted the renunciation of the binary distinction (between developed and developing countries) with great reluctance.

The Paris agreement is by no means static, but subject to gradual, active and ambitious reshaping by the signatories.

Theoretically, the Paris Agreement can evolve into a global climate constitution. However, like any national constitution, the “Paris Agreement” still needs to be fleshed out. The agreement is by no means static, but subject to gradual, active and ambitious reshaping by the signatories. Only then will it be able to develop the qualities necessary for protecting the entire global community,



Top priority: French President Francois Hollande among African leaders at a preliminary meeting at COP21 in Paris, November 2015. Source: © Philippe Wojazer, Reuters.

the strongest and weakest peoples alike, from the consequences of advancing climate change. One issue that is already irritating some African countries is that of the finance pledges, which are still rather nebulous. While billions of dollars have been promised, it is still unclear whether and to what extent these pledges can be honoured in the future. It remains to be seen whether the industrialised countries will succeed in facing up to their historical responsibility and whether they have the political will and economic wherewithal to assume the necessary responsibility. Whatever the circumstances, in view of the climate-related damage and costs to be expected as well as the enormous development potential – particularly in Africa – failure to act in the southern hemisphere is not an option.

The question now is how to go about realising the goals agreed in Paris. The INDCs represent the self-imposed national “implementation directive” of the Paris Agreement. The next step will be to begin implementing measures to achieve the Intended Nationally Determined Contributions (INDCs). In Africa in particular, this will require national governments to develop the firm

political will to act, the African Union and African regional communities to develop and implement means of continental and regional cooperation that will consolidate national goals, and – not least – the world to provide the required support to Africa for its journey towards a green development revolution.

Excursus: Examples from Real Life in South and East Africa

Anyone looking out of the window of the GAUTRAIN, the ultra-modern, electric, high-speed train connecting Johannesburg and Pretoria, will see the innumerable carports for employees and visitors of the retail and manufacturing businesses located along the track. In the glaring sunlight one is struck by the fact that hardly any of the roofs are equipped with solar panels. Just along this stretch of railway, there would be thousands of square meters available for this purpose, but all those hours of sunshine are totally wasted. Instead, South Africans experience regular power cuts imposed by the state-run operator ESKOM as the aging coal-fired power stations can no longer cover demand



reliably. While there are also plans to rely more on renewable energies in future, nuclear power is to become the most important electricity resource.²¹

In Kenya and Tanzania, a substantial proportion of electricity is already generated from environmentally-friendly sources.

The situation in East Africa is similar. The use of solar energy is absolutely underdeveloped in this region. Although the geographic location near the equator means that the region is ideal for installing photovoltaic elements for energy generation and for placing solar thermal collectors on the roofs of people's houses, these forms of energy generation still have far too few supporters.²²

Instead, the businesses have to purchase the electricity at high prices and use diesel gener-

ators during power cuts, adding to the existing considerable air pollution from vehicle exhausts. In other African countries, however, a substantial proportion of electricity is already being generated in an environmentally-friendly manner,²³ and Kenya in particular is making great strides. 66 per cent of the 2.2 gigawatts of capacity installed in Kenya is already covered by renewable energies today, mainly from geothermal sources. East Africa's largest biogas plant is also located in Kenya (2.6 megawatts installed capacity).²⁴ In Tanzania, renewable energies contributed 45 per cent to the energy mix in 2014,²⁵ the majority generated from hydropower.²⁶

Both countries are planning to continue this development. However, and this is not so encouraging, to a lesser extent than previously. While the countries' political visions for 2025 (Tanzania) and, respectively, 2030 (Kenya) foresee an eightfold increase in electricity generation compared to today, renewable energies will then drop to 24 per cent of the energy mix in Tanzania, and to 45 per cent in Kenya.²⁷ Tanzania will rely more strongly on generating electricity from coal instead, which does not play any role currently,

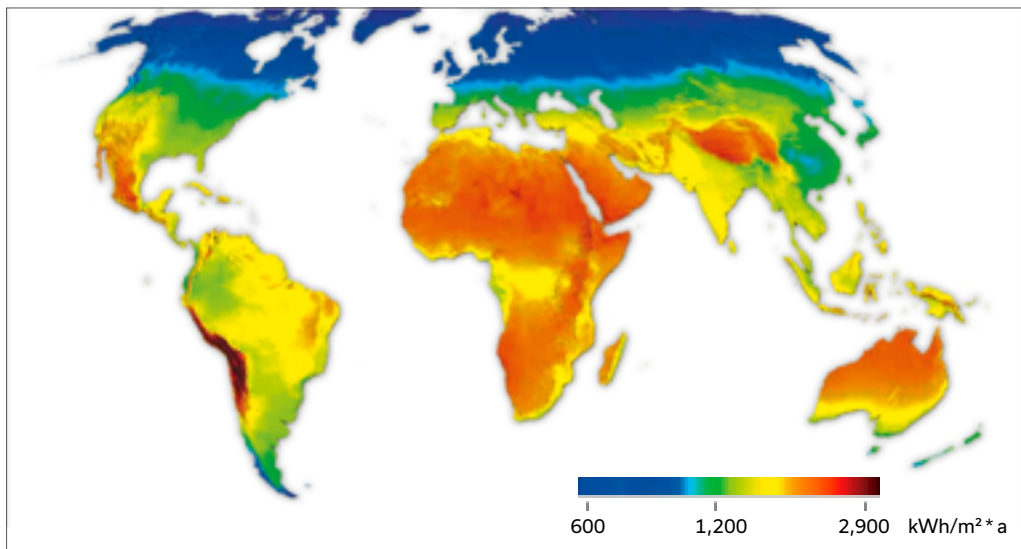
and Kenya intends to generate electricity from nuclear power as well.²⁸ No one can be certain as to whether the envisaged volumes of electricity will actually be required in ten or 15 years' time, particularly as economic development has slowed down. Nevertheless, the programs should take their cue from the Paris COP21 targets. A revision of the energy mix in favour of more renewable energies would be desirable.

The increase in daily traffic volumes and the associated climate-damaging emissions represent an even greater challenge for the East African Community.²⁹ Nairobi sources maintain that the number of vehicles doubles every six years. As the majority of vehicles is not new, but imported second-hand from industrialised countries, most of the vehicles do not conform to modern environmental standards. In addition, many of them are SUVs with large engines, as smaller cars are neither suitable for off-road conditions nor capable of coping with the numerous deep potholes in the roads. Greenhouse gas emissions are consequently high. As the registered vehicles are not subject to any emissions checks either, the CO₂ burden increases year by year. The East African Community is attempting to counter the problem by imposing import restrictions. There is now

a ban on the import of vehicles older than eight years in Kenya and Rwanda (ten years in Tanzania, no age restriction in Uganda and Burundi),³⁰ and an import tax on a sliding scale is payable depending on the age, starting at 20 per cent of the value for new vehicles.³¹ Whether this measure will, in fact, succeed in reducing CO₂ emissions is open to doubt, considering the huge number of new registrations every year. The new middle class in East Africa, which is growing slowly but steadily, will probably simply bite the bullet and pay the tax. Car ownership is such a status symbol that most people are willing to bear the cost. However, at least the regulations will put money into the cash-strapped state coffers, and one cannot help thinking that that is the predominant motivation.

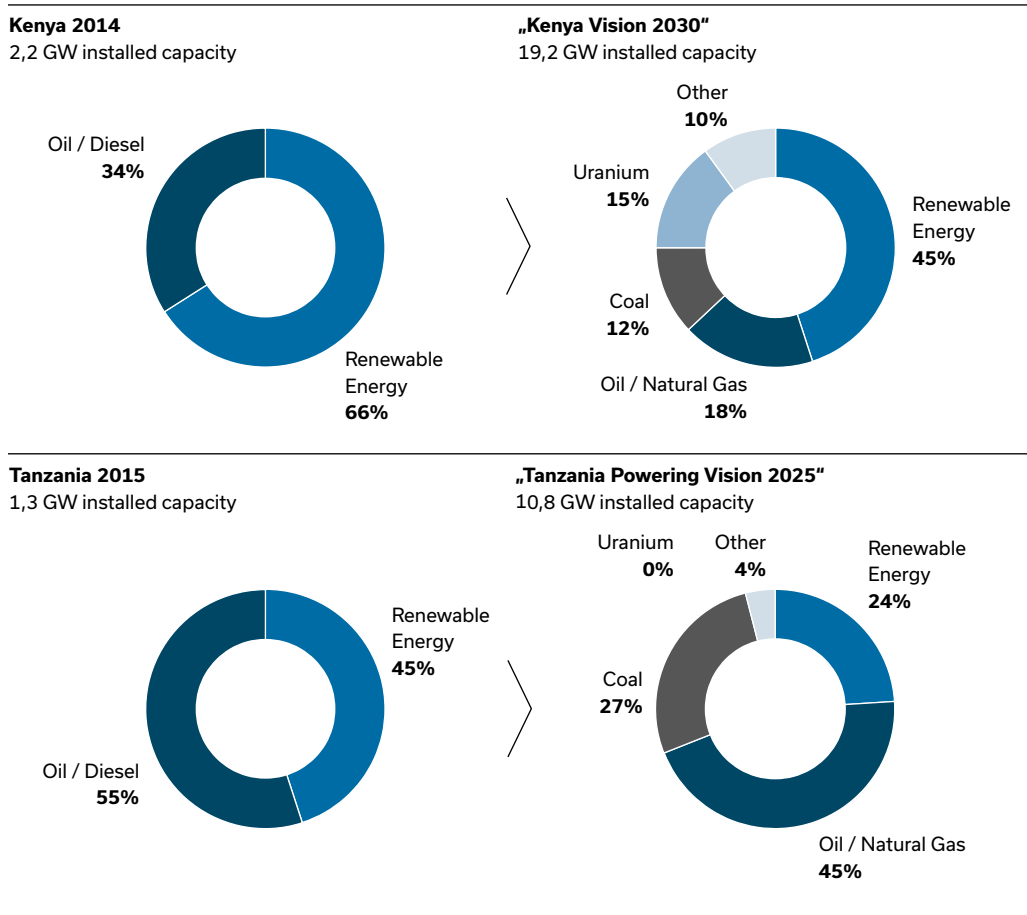
The only way to reconcile the conflicting goals of providing better mobility to people on the one hand and simultaneously minimising the associated burden on the environment on the other is to establish a well thought-out local public transport system that conforms to the latest technological standards. However, the East African states are nowhere near realising such systems. Instead, the streetscape is still dominated by old busses and vans that trail clouds of soot behind them. Ethiopia is the only country that has succeeded

Fig. 2: Global irradiation – Optimal conditions in East Africa



Source: Kaiser, n. 24.

Fig. 3: Energy supply in Kenya and Tanzania – Resource mix 2015 and national expansion plans



Source: Kaiser, n. 24.

in putting a new urban railway into operation in September 2015 with assistance from the Chinese. Along its 17 kilometer stretch, the hybrid of underground and tramway offers a low-cost alternative to the considerably more expensive use of minibuses.³² Particularly once it has been expanded, it will help to reduce the country’s CO₂ emissions, especially as the electricity for operating the trains is intended to be generated from hydropower.

Of course, the above examples are just some of many. Cutting down on waste³³ and waste recovery as well as better building insulation can be mentioned as further means to help achieve the climate protection targets. Not only East Africa

but all states in Sub-Saharan Africa have the opportunity of making essential contributions to the protection of the environment and of mitigating the increasing global warming with the help of the industrialised countries, utilising the existing technological advances.

Expectations and Outlook

In the 2012 Report to the Club of Rome entitled “2052 – A Global Forecast for the Next Forty Years”, the following are listed among the prerequisites for a sustainable, just and “happier” world:³⁴ social values reflected in all economic decisions, a more equitable income distribution between as well as within countries, and ways of

interacting with the environment that are consistent with its biophysical and ecological significance. The world should never again go into “overshoot”.³⁵ To express it in the words of Pope Francis: “The effects of the present imbalance can only be reduced by our decisive action, here and now. We need to reflect on our accountability before those who will have to endure the dire consequences.”³⁶

Due to the inequitable income distribution, almost three-quarters of the 850 million Africans living in Sub-Saharan Africa³⁷ (excluding South Africa) live below the poverty line of two U.S. dollars (1.51 Euros) per day as defined by the World Bank, and 51 per cent even live on less than 1.25 U.S. dollars (0.94 Euros) a day.³⁸ Combating poverty while simultaneously increasing general prosperity in Africa through participation in developmental progress will hardly be possible without detrimental effects on the climate. One cannot deny the Africans these aspirations, neither from a humanitarian and Christian perspective nor in view of the wish to stem the flows of migration. The conflict is obvious – yet the situation offers opportunities for entering a new, ecologically better-balanced era.

Realising further development in Sub-Saharan Africa on the proviso that the general goal should be to limit further global warming to 1.5 degrees will need one thing above all: leadership. African presidents and their governments as well as private enterprise are called upon to make decisions today that will shape tomorrow. In an era when humankind has the knowledge and technical means to counter global warming, these should be deployed without delay. Developing Africa into a continent of the future with assistance from the industrialised countries and private enterprise engagement will be a huge challenge, but also a huge opportunity. Are Africa’s governments prepared for this, and are they, who have frequently shown a lack of good governance, in fact capable of this feat? In Paris, they signed an agreement in which they committed themselves to play their part. The implementation through national measures will now show how serious Africa’s leaders were when they made

the commitments. At a time when urgency is called for, a policy of small steps will definitely not be adequate to meet Africa’s challenges in the Anthropocene in good time.

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Prof. Dr. Oliver C. Ruppel, LL.M., teaches public and international law at Stellenbosch University, South Africa and is a member of the Intergovernmental Panel on Climate Change (IPCC). He is due to take over as Head of the new regional program Climate Policy and Energy Security in Sub-Saharan Africa of the Konrad-Adenauer-Stiftung in September 2016.

- 1 The term was coined in 2000 by the famous Dutch atmospheric chemist and Nobel laureate Paul Crutzen and has its roots in ancient Greek: *anthropos*, “man” and *cene*, “new”. In 2000, Crutzen established that we are living in an era dominated by human activity and that anthropogenic actors have become essential factors driving the changes on our planet. Crutzen proposed the term Anthropocene for this era – the “the epoch of mankind”. See Crutzen, Paul J./Stoermer, Eugene F. 2000: The Anthropocene, *Global Change Newsletter* 41, pp. 12–13.
- 2 For greater detail see Ruppel, Oliver C. 2013: Intersections of Law and Cooperative Global Climate Governance – Challenges in the Anthropocene, in: Ruppel, Oliver C./Roschmann, Christian/Ruppel-Schlichting, Katharina (eds.): *Climate Change: International Law and Global Governance Volume I: Legal Responses and Global Responsibility*, Baden-Baden, pp. 29–93.
- 3 Niang, Isabelle /Ruppel, Oliver C. 2014: Africa, in: IPCC 2014: *Climate Change 2014: Impacts, Adaptation, and Vulnerability – Part B: Regional Aspects, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Barros, Vicente R./Field, Chris B./Dokken, David J. et al. (eds.), Cambridge, pp. 1199–1265, here: p. 1202.
- 4 The consequences of climate change include the impacts of extreme weather conditions on human and natural systems. “Consequences” generally refer to the impacts of climate change on life, livelihoods, health, ecosystems, economic systems, societies, cultures, services and infrastructure within a certain period and the vulnerability of a weak society or weak system. “Impacts” are also defined as consequence and outcomes. The impacts of climate change on geophysical systems through flooding, drought and rising sea levels are a subset of the so-called physical impacts. Cf. the definition of impacts (consequences, outcomes) in IPCC 2014: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, in: IPCC, *ibid.*, p. 1767.
- 5 IPCC 2014: Summary for Policymakers, in: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, in: IPCC, *ibid.*, pp. 1–32, here: p. 21.
- 6 Niang/Ruppel, *ibid.*, p. 1214.
- 7 *Ibid.*, pp. 1238–1240.
- 8 To close these gaps, the Nansen Initiative has investigated legal aspects relating to migration and refugee movements due to climate change. See <https://nanseninitiative.org> [2 Jun 2016].
- 9 Niang/Ruppel, n. 3, p. 1205.
- 10 IPCC, n. 5, p. 13.
- 11 Niang/Ruppel, n. 3, pp. 1238–1240.
- 12 *Ibid.*
- 13 For greater detail, see Ruppel, Oliver C./Althussmann, Bernd (eds.) 2015: *Perspectives on Energy Security and Renewable Energies in Sub-Saharan Africa – Practical Opportunities and Regulatory Challenges*, Windhoek, in: http://kas.de/wf/doc/kas_42170-1522-1-30.pdf [2 Jun 2016].
- 14 According to a recent publication by the International Renewable Energy Agency (IRENA), there are currently already 8.1 million people working in the renewable energies sector, representing a year-on-year increase of five per cent; see IRENA 2016: *Renewable Energy and Jobs – Annual Review 2016*, <http://irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=2729> [27 May 2016].
- 15 Ruppel, Oliver C. 2015: *Sustainable Energy Solutions for Southern Africa: Powering Growth and Prosperity*, Discussion Paper 3/2015, The Brenthurst Foundation, in: http://thebrenthurstfoundation.org/Files/Brenthurst_Commissioned_Reports/Brenthurst-paper-2015-03-Sustainable-Energy.pdf [2 Jun 2016].
- 16 Cf. also World Economic Forum 2012: *White Paper on Energy Security and Global Warming*, p. 12, in: http://www3.weforum.org/docs/WEF_GAC_White_PaperEnergySecurityGlobalWarming_2012.pdf [2 Jun 2016].
- 17 For greater detail see Ruppel, Oliver C./Roschmann, Christian/Ruppel-Schlichting, Katharina (eds.) 2013: *Climate Change: International Law and Global Governance Volume I: Legal Responses and Global Responsibility, Volume II: Policy, Diplomacy and Governance in a Changing Environment*, Baden-Baden.
- 18 See also Ruppel, Oliver C. 2015: *Climate Change, Law and Development in Africa: A Reflection on Selected Aspects, Relations and Responses*, in: König, Doris/Koch Hans-Joachim/Sanden, Joachim/Verheyen, Roda (eds.): *Legal Regimes for Environmental Protection, Governance for Climate Change and Ocean Resources*, Leiden, pp. 89–130.
- 19 Pillay, Navi (UN High Commissioner for Human Rights) 2013, in: *Realizing the Right to Development*, OHCHR, http://ohchr.org/Documents/Issues/Development/PamphletsRealizing_for_TransformativeDevelopment_en.pdf [2 Jun 2016].
- 20 21st session of the Conference of the Parties from 30 Nov to 11 Dec 2015 in Paris.
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- 28 Ibid.
- 29 The East African Community (EAC) comprises the states of Kenya, Tanzania, Uganda, Burundi and Rwanda.
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