ClimDev-Africa

Policy Brief 16

Transforming Africa's Transport Sector with the Implementation of Intended Nationally Determined Contributions

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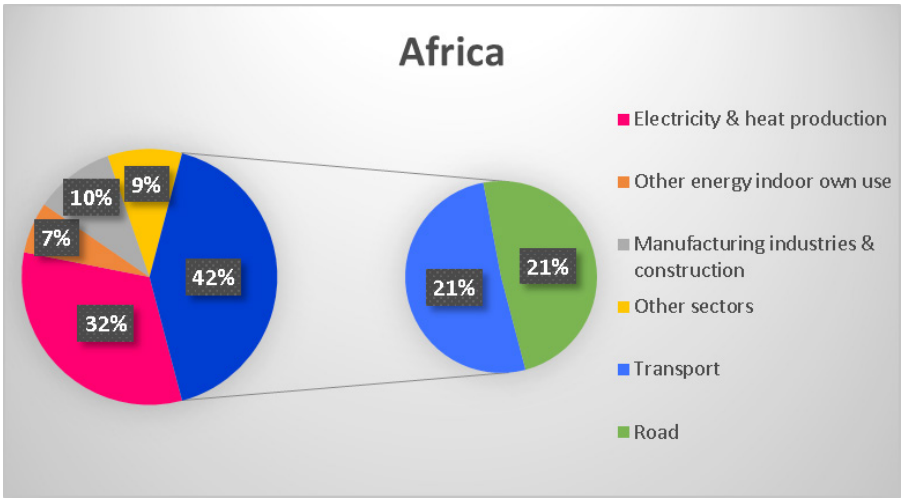
Overview

The transport sector is capable of generating an enabling environment to catalyse economic growth in Africa. The sector has, however, experienced great stagnation in terms of infrastructural improvement over the past decades. Road access presently makes up only 34 per cent of such access in Africa, as opposed to 50 per cent in other developing regions globally (PIDA, 2015). According to the intergovernmental Panel on Climate (IPCC) (2014), energy use accounts for 68 per cent of total global greenhouse gas (GHG) emissions. However, a disaggregation of the energy sector shows that fuel combustion predominates total GHG emissions in the sector, with the transport sector accounting for 23 per cent globally (IEA, 2015).

In the case of Africa, the disaggregation of the GHG emissions resulting from fuel combustion by sector puts the transport sector at the top with 42 per cent, almost twice the global share, and even more than for electricity and heat production (32 per cent) (figure 1 is based on the International Energy Agency (IEA) data from the year 2015). Road transport alone accounts for 50 per cent of total transport sector emissions, while the other 50 per cent comes from aviation, maritime transport and railways. Both air and water transportation systems are still in an early phase of development. Land transportation (roads and railway systems) is accordingly responsible for moving goods and people.

Figure 1: The distribution of CO2 emissions from fuel combustion by sector in 2013 and the proportion from road transport



It is likely that road transport emissions will continue to grow rapidly in Africa as countries strive to improve their road infrastructure networks for economic activities, satisfying the needs of a burgeoning population and of a growing middle class in the continent. For example, in 2011 there were only 29 motor vehicles per 1,000 persons in sub-Saharan Africa, as opposed to a world average of 168 per 1,000 persons (World Bank, 2014). Although increasing the share of renewable energy in the energy mix in the sector is crucial, the transport sector has unfortunately experienced the least progress in recent years in this regard in global terms (IRENA, 2016).

Managing the proportion of transport emissions in Africa is accordingly crucial and urgent. This is the most readily attainable goal in addressing local emissions reduction and adapting to involuntary exposure to the growing outdoor pollution that is currently responsible for a significant number of deaths in Africa. Outdoor pollution accounts for 3.3 million premature deaths globally, and this is expected to double by 2050 (Lelieveld and others, 2015). The mean annual particulate matter concentration (PM2.5) pollution in sub-Saharan Africa is 17ug/m3, as opposed to 31ug/m3 globally (World Bank, 2014). When combined with vehicle density per 1,000 persons, the level of exposure in Africa is 0.739, or three times the global mean of 0.252. Measures to mitigate emissions in the transport sector are crucial in providing Africa with an opportunity to contribute to the global process of emissions reduction under the Paris Agreement. The Intended Nationally Determined Contributions (INDCs) herald a new phase in the global commitment to achieve climate resilience. Fifty-three countries in Africa submitted their contributions on the bases of their national development priorities, capabilities and circumstances. Collectively, the INDCs map Africa's contribution to the goal of the Paris Agreement in limiting temperature increase to 20C above pre-industrial levels. The agreement that opened for signing in April 2016 has come into effect following its ratification by more than the required 55 countries covering 55 per cent of global greenhouse gas emissions. This means that, even if all 54 African states had signed the agreement, it would still not have come into effect, as the signatory countries have to be able to contribute 55 per cent of global GHGs. In line with this expectation, this study unpacks Africa's transport sector NDCs in order to identify and highlight priority actions for both mitigation and adaptation that promote the structural transformation of the transport sector. The paper also seeks to identify and highlight emerging trends in the transport sector across Africa, while also assessing the feasibility of some of these commitments in terms of Africa's capability.

Key messages

1. **The transport sector actions listed for INDCs have the potential to promote structural transformation and to usher in the adoption of clean technologies and infrastructure with dual benefits for mitigation and adaptation in clean air quality, while also boosting opportunities for economic growth.**
2. **Legislative and regulatory measures are highlighted as policy instruments for the costeffective setting up of national standards and for ensuring public compliance with the reorientation of the sector.**
3. **The transport sector remains a key determinant if Africa boldly adopts a low carbon development pathway. This is more so for all countries in the Southern Africa region whose INDCs highlighted the sector as of central importance for mitigation.**
4. **Implementing mass rapid transport (MRT) systems is a very high priority in curbing transport sector GHG emissions in the context of rapid urbanisation in Africa.**
5. **A regional approach to implementing transport sector INDC is feasible building on regional integration and trade that has already been undertaken in the continent.**
6. **Incidentally, African INDCs have failed to highlight the following:**
   i. The impacts of climate change on the transport sector itself as a case for a resilient infrastructure.
   ii. The aviation and maritime transport systems that open new frontiers for economic growth in Africa are seriously under-represented in INDC actions.
   iii. The impact of transport emissions on urban air quality. This is despite growing concern about urban air quality in a context of rapid urbanisation in the region.
   iv. The investments and partnerships, especially private sector partnerships that are required to achieve GHG emission reduction targets in

the transport sector. This is likely to constitute a potential hindrance to the attainment of the INDC actions specified for the transport sector.

7. **The lack of in-country data and research on vehicles, fuel consumption and transport sector emissions, as well as their impacts across Africa, could have made it difficult for African countries to provide robust transport sector commitments in their INDCs.**

8. **It is important to capitalize on promoting the substitution and blending of liquid biofuels in the transport sector, building on the commencement of this practice in some African countries, while avoiding trade-offs and conflict with food security.**

Methodology

Analyses of the content of African INDCs was undertaken using explicit and implicit information gathered to determine the implications of the key actions and measures proposed for transport sector INDCs, for both climate change adaptation and mitigation. Using this information we analysed their strategic relevance for promoting structural reforms of the transport sector, and summarised Africa's transport sector commitments. Our research further stratified the content of the INDCs into the five African subregions, namely North Africa, Southern Africa, West Africa, and East and Central Africa, to check for subregional differences.

Results and discussion

The results of the analyses show how the proposed actions address adaptation and mitigation in the sector. Similarly, the discussion is in the context of their implications in structurally transforming the transport sector.

(a) Mitigation

According to IPCC (2007), there is a high degree of agreement, backed up by a considerable body of evidence, supporting the finding that transport sector emissions have increased at a faster rate than in any other energy-using sector in the last decade. This is repeated in the Africa Progress Panel Report of 2015 that associates this growing trend with accelerated urbanisation and rapid migration. In South African cities alone, the transport sector is ranked as the second largest emitter of carbon dioxide, accounting for 25 per cent of GHG emissions (Sustainable Energy Africa, 2007).

Globally, transport is considered to be responsible for approximately half of all energy-related nitrogen oxide emissions (IEA, 2016), and 20-30 per cent of all other air pollutants (i.e. non-methane volatile organic compounds, sulphur oxide (SO_x), carbon dioxide (CO_2), and particulate matter ($PM_{2.5}$ and PM_{10}) (IRENA, 2016).

Urban air quality in most cities is already compromised by localized air pollution from the transport sector (IPCC, 2014). Motor vehicle emissions include a wide range of volatile organic compounds, which react with sunlight to form ozone. Moreover, many of these pollutants have serious health effects even with short-term exposure such as wheezing, coughing, phlegm and sore throats, as well as complex respiratory conditions such as asthma.

Stockholm Environment Institute (SEI 2013) estimates that about 49,000 people die annually in Africa because of outdoor air pollution. However, the extent of the congestion problem and its consequent economic, social and environmental impacts in the region is rarely quantified or assessed. Furthermore, inadequate vehicle emission standards are poorly enforced. Another growing issue of concern in African cities is traffic congestion.

These are just few indicators of the crucial role that the transport sector will play in determining whether Africa opts for a low carbon future. The African INDCs accentuate this important role, with 45 (85 per cent), of the 53 countries that submitted their INDCs citing the sector as requiring mitigation and/or adaptation.

Intriguingly, the transport sector was more often considered for mitigation than for adaptation. This is evident from figure 2, which indicates that only two countries (Madagascar and the Gambia) viewed the transport sector solely in relation to adaptation.

Nine of the forty-five countries, namely Algeria, Ghana, Kenya, Liberia, Malawi, Mali, Nigeria and Uganda cited the sector as a key source of both mitigation and adaptation, whereas the remaining 34 countries viewed transport alone as a key source of mitigation.

The three most common mitigation actions proposed in African transport sector INDCs are: the acquisition of hybrid mass rapid transportation systems; the promotion of a shift from fossil fuel powered transport to low carbon biofuels and policy formation; and legislation on and implementation of transport codes and low carbon emissions standards.

While the acquisition of hybrid mass transportation systems has emerged as the measure most frequently adopted by several member States to limit transport sector GHG emissions, several other listed actions are considered crucial in structurally transforming the sector. For example, the proposed actions highlighted in figure 2, especially those that are supported by more than 10 per cent of member States, are critical in guiding the sector towards structural reforms and expanding the implementation of multiple strategies to simultaneously achieve mitigation aspirations. This is a commendable approach which costeffectively enables the continent to maximize the synergies from each of the actions.

On a regional basis West Africa leads, with 13 countries citing the transport industry as a vital stage in Africa's low carbon development pathway. Southern Africa then follows, with 11 countries, while East Africa, with 10, and finally Central and North Africa, each with five countries, complete the picture.

Interestingly, all countries in the Southern Africa region explicitly identified the sector as a key to and potential source of reducing greenhouse gas emissions. See figure 3: This is apposite, given that the region's transport sector emissions are said to be generally higher than in the rest of Africa (Tongwane and others, 2015)

Across the five regions the preferred mitigation actions in the transport sector varied. For example, in West Africa over 50 per cent of countries with a transport sector in their INDCs proposed the acquisition of hybrid mass transportation systems to curb GHG emissions. The main measures under this action plan are: promoting public transport through duty exemption (Benin), expanding and scaling up mass transport systems to support inter- and intra-urban transport (Benin, Ghana, Guinea), and investment in multiple mass transport modes to encourage and support the shift to mass transport systems such as trains and buses (Guinea, Nigeria, Senegal and Sierra Leone), as well as soft transportation modes such as cycling (Togo).

Sixty per cent of the countries in the Southern Africa region prioritised in their INDCs the promotion of a switch from fossil fuels to low carbon energy sources. Globally, the use of biofuels to power the transport sector is seen as a move that will significantly curb GHG emissions arising from the booming transport sector.

As of the year 2010, global biofuel market share had increased to 3 per cent from almost no use in 1990 (IRENA, 2016). However, the limited availability of biofuel in nature means that the lack of a clear strategy for sustainably producing and supplying biofuels supported by a comprehensive life cycle analysis can result in serious economic crises such as food insecurity and energy shocks. Serious commitments and consultations involving both policymakers and key energy industry stakeholders will therefore be essential for the streamlining of biofuel production and supply in Africa.

Figure 2: Figure indicating African countries that cited transport in their INDCs

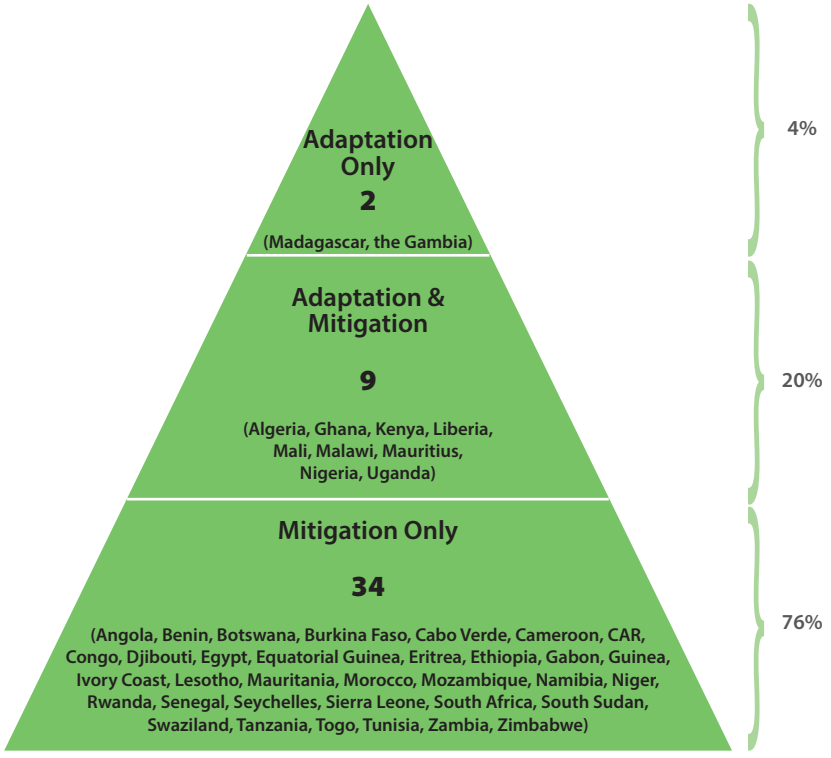
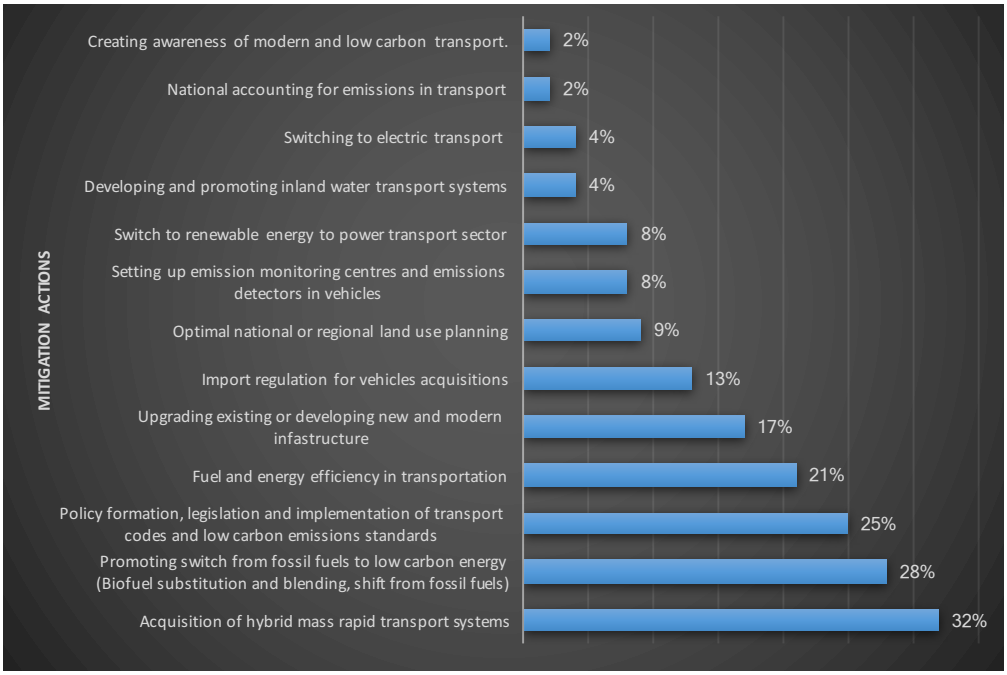


Figure 3: Transport sector mitigation actions listed in Africa's INDCs.



In the Southern Africa region, developing or upscaling ethanol blending stood out as the action most preferred by six countries, namely: Angola, Malawi, Mozambique, Swaziland, Zambia and Zimbabwe. In Africa ethanol has until now been produced from sugar cane. Kahn and others (2007) estimate that 10 per cent ethanol-gasoline blending and 20 per cent biodiesel-diesel blending in the Southern Africa region will result in a reduction of 2.5 MtCO 2 and 9.4 MtCO 2 respectively per annum.

Biofuel production demand for agricultural feedstock to power the growing transport sector in Africa also introduces another dimension to cross-border trade in feedstock. For example, Malawi, a landlocked country whose high dependence on land transport means that its transportation costs are the highest in the SADC region, depends on neighbouring Mozambique for part of the molasses (a sugarcane by-product) supply required to run its ethanol blending programme (ECA, 2016). The development of a regional strategy for mapping potential feedstock zones and infrastructure areas for biofuel production will accordingly boost continent-wide energy security, while also promoting the development of a sustainable cross-border bioenergy trade that is unlikely to compromise the already "brittle" food security status of the region.

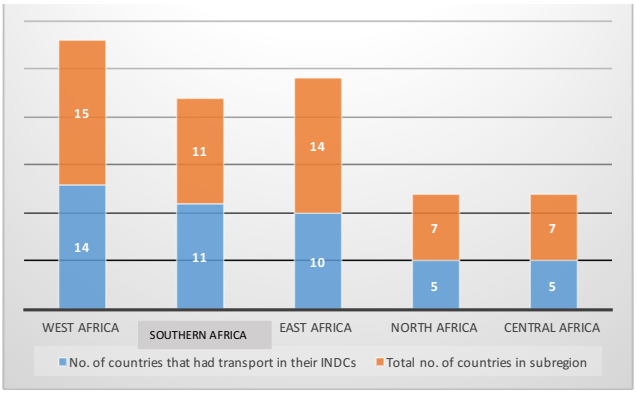
Palm oil blending is also currently being considered for use as a biodiesel transport fuel in West Africa (Liberia, INDC).

Conversely, in East Africa a growing market for second hand vehicle acquisitions, coupled with poor vehicle inspection programmes and weak import regulations, is considered to underscore the increase in GHG emissions, while also compromising urban air quality standards. A majority of the countries have accordingly highlighted fuel and energy efficiencies in the transport sector as the action most preferred to curb GHG emissions in the sector. This is also the case for North Africa, where three of five countries include the transport sector in their INDCs.

The International Energy Agency (IEA, 2011) asserts that vehicle efficiency will be the most important and most cost-efficient means of reducing transport emissions. Fuel and vehicle efficiency should accordingly be a key component of an action plan for Africa, a region where vehicle sales are increasing significantly (IRENA, 2016). In both East and North Africa the measure preferred by a majority of the countries includes investment in energy efficient technologies and improvements in energy efficiency during energy supply and distribution to the transport sector.

Finally, in Central Africa it has been proposed that most actions for emissions reduction in the transport sector are to be achieved through policy formation, legislation and the implementation of emissions standards, transport codes and energy consumption patterns. A few countries in Central Africa also proposed pricing as a means of incentivising the importation of low emission vehicles.

Figure 4: The number of countries in each subregion that have a transport sector in their INDCs compared with the total number of countries in the subregion



(b) Adaptation

Adaptation in the transport sector is vital. However, only 10 African countries listed in their INDCs adaptation actions for the transport sector. This is surprising because the transport sector is a crucial enabler that boosts other production sectors, such as agriculture and mining, that constitute the backbone of Africa's economy. For example, the timely delivery of agricultural products to consumers and markets enhances food security by reducing delays, transaction costs in trade, and integrating more households with the markets. This consequently reduces per capita food waste in Africa, which is currently estimated to be between 6-11 kg /year (FAO, 2011).

In addition to the increasing interdependence of sectors, possible disruptions of transport networks during extreme climate events such as floods can inhibit disaster response and recovery efforts because of their critical role in providing logistical support during such calamities.

IEA (2015) finds that there is a growing concern about rising urban air pollution in the rapidly growing cities in Africa due to rapid economic and population growth and an increase in motorization. Between the years 2008 and 2013, a World Health Organization (WHO) comparative analysis of 795 cities in 67 countries for levels of small and fine particulate matter (PM_{10} and $PM_{2.5}$) found that the highest urban air pollution levels were experienced in low- and middle-income countries. Moreover, the International Renewable Energy (IRENA) (2016) estimates that the impact on human health and agricultural crops of costs resulting from increased demand for fuels to power global transport emissions would grow by about 40 per cent, or United States dollars 640 billion, to US$ 3,300 billion per year in 2030.

Despite these emerging concerns, only 10 African countries considered the issue of urban air pollution in their INDCs. In fact, in most cases, the INDCs failed to establish a direct link between urban air quality and growing transport sector emissions. Kinney and others (2011) attribute this to the relative lack of existing air monitoring data in Africa. They further argue that this hinders health impact assessments and the development of transportation and land use policies that could reduce health burdens arising from outdoor air pollution.

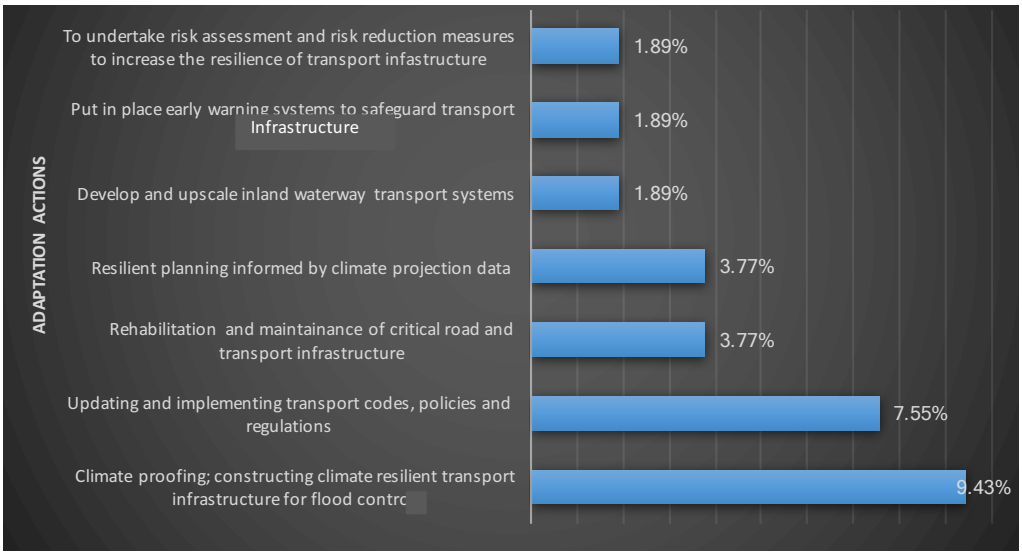
The proposed adaptation action plans in Africa's INDCs are similar across the continent, with most countries proposing climate proofing and strengthening the resilience of existing transport infrastructure through risk assessment, planning, legislation and implementing structural designs and codes. This, they contend, will minimise their susceptibility to extreme climate events such as floods.

It is also noteworthy that very little information is provided on the financial investments required to actualize transport sector INDC actions to achieve the desired mitigation goals. Only six of the 45 African countries that included transport in their INDCs provided estimates of the amount of investment required to meet their transport mitigation aspirations. They include Benin, whose proposed development of an intra- and inter-urban transit between the cities Cotonou, Porto Novo and Parakou will cost approximately US$ 2.78 billion in the period 2011-2030. In addition, Burkina Faso planned to improve its stock of vehicles and to substitute biofuels for hydrocarbons, at an approximate cost of US$ 98 million, while Eritrea's rail improvements are expected to cost approximately US$ 1 billion.

The other three countries are: Lesotho, whose planned improvements in vehicle efficiency and modal shift to public transport will require an additional investment of US$ 1.5 million and US$ 2 million in 2020 and 2030 respectively; South Africa, which will invest US$ 513 billion in electric vehicles between 2010-2050 and US$ 488 billion in hybrid electric vehicles by 2030. Finally, the cost of Togo's promotion of low carbon transport modes is projected to be US$ 40 million. The realisation of these INDC actions will require partnerships, especially with the private sector.

In terms of emissions reductions, only six African countries proposed specific transport sector emissions reduction targets. In most cases countries opted to incorporate transport sector emissions reduction targets in economy-wide energy sector targets. Gota and others (2015) also attribute this failure to include

Figure 5: Transport sector adaptation actions in Africa's INDCs



transport emissions reduction targets to the lack of existing data on the number of vehicles and their usage, fuel consumption and resultant GHG emissions in developing countries.

Conclusion

1. It is amazing that the great majority of African countries (34 out of 45) included the transport sector as a primary target for mitigation, with less emphasis on adaptation. However, we are aware that there are adaptation benefits directly from the mitigation actions proposed in the INDCs. Furthermore, funding pledges for mitigation tailored to address the existing infrastructure deficit in the continent will contribute directly to addressing adaptation needs.

2. So far, the INDC provides a concrete platform with defined actions for African countries to tailor their financial requirements to meet their adaptation aspirations and mitigation targets. This is because the benefits of implementing the INDCs go beyond climate change expenditure to cross-sectoral development benefits. Unfortunately, only a small number of African countries provided details of the funds that they would require in achieving their INDCs obligations for emissions reduction in the transport sector.

3. The lack of concrete information on the amount of funding required, and the expected sources of funding for the corresponding mitigation targets in most African INDCs is perturbing, given that the continent has for long been championing the need for a global climate finance framework that is both predictable and adequate to help in dealing with the negative impacts of climate change. Furthermore, even the few countries that gave an indication of whether the funds were to be sourced internationally (conditionally) or domestically (unconditionally) or from the private sector, still lacked clarity on what channels these countries would pursue to mobilise these funds. This raises questions about how the proposed expenditure figures were arrived at.

4. In-country research and data collection on vehicles, fuel consumption and urban air quality and transport sector emissions across Africa will be necessary to underscore the robustness of future national implementation and reporting of outcomes.

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About ClimDev-Africa

The ClimDev-Africa Programme is an initiative of the African Union Commission (AUC), the United Nations Economic Commission for Africa (ECA) and the African Development Bank (AfDB). It is mandated at the highest level by African leaders (AU Summit of Heads of State and Government). The Programme was established to create a solid foundation for Africa's response to climate change and works closely with other African and non-African institutions and partners specialised in climate and development.

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