



An Air Pollution Information Network for Africa (APINA) Perspective on Air Pollution and Climate Change

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What is APINA?

- The Air Pollution Information Network for Africa (APINA) is a network of African policy makers, scientists, NGOs, industry and other stakeholders interested in air pollution issues formed in 1997
- APINA started as a component of the Regional Air Pollution in Developing Countries (RAPIDC) Programme that was operating in South Asia and southern Africa coordinated by the Stockholm Environment Institute and funded by Sida
- Since its formation APINA has been the driver of a regional air pollution policy process within Africa

Design of APINA

- APINA has been developed to address air pollution issues in Africa on lines similar to those of the the United Nations Economic Commission for Europe-Long Range Transboundary Air Pollution (UNECE-LRTAP)
- It adopts and adapts the methods used by such Conventions to produce regionally specific information for the policy processes in Africa
- Thus APINA is a Science to Policy Network where findings from scientific investigations are translated into information relevant to development of national and regional policies

What is APINA and what has the Network done in the area of air pollution?

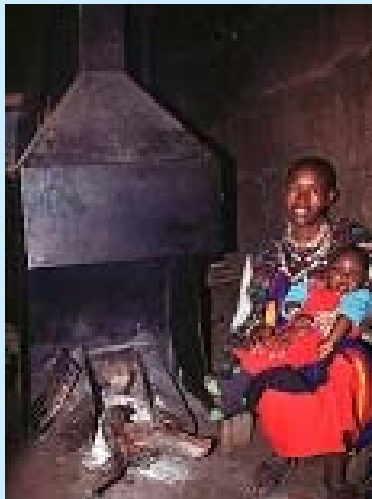
APINA addresses both urban air pollution issues (through Better Air Quality in African Cities) and trans-boundary air pollution issues

- It has many partners that include the Stockholm Environment Institute and other Swedish institutions (e.g. KIMAB, SMHI and IVL), UNEP, USEPA, the World Bank
- It also has strong links to UNECE- LRTAP Convention and other regional networks around the world as a member of the Global Atmospheric Pollution Forum

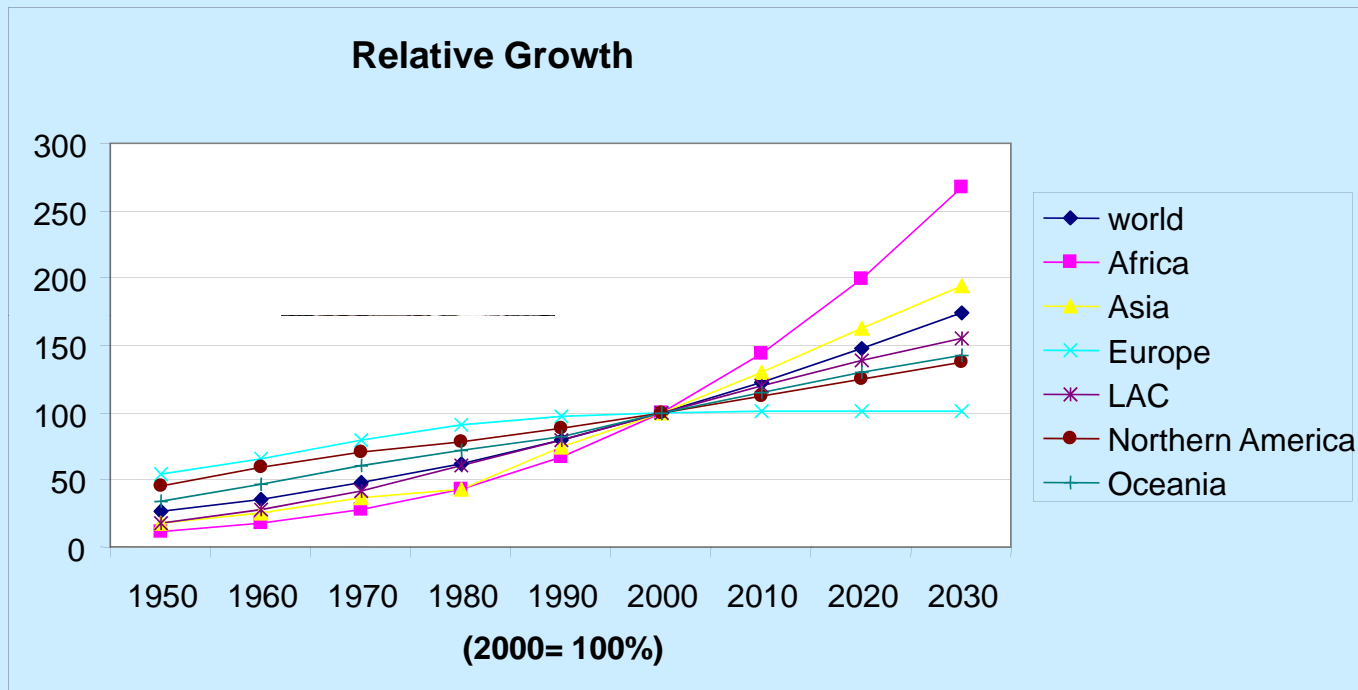
What are the main causes of air pollution in Africa?



- urbanization
- poor waste management
- motorization
- economic activity
- use of wood and charcoal for energy
- open burning including vegetation fires and waste burning



The problem of urbanisation (1950-2030)



- Africa's relative growth in urbanisation is steeply increasing and is now the highest in the world
- The growth rate is approximately 3.3 to 3.7 per cent annually

The problem of waste management

- As a result of the urbanization, waste management is now a problem
- The average annual solid waste generation in Africa is now estimated at 0.3 to 0.5 tonnes per capita
- Thus the continent's total annual generated waste could be as much as 200 million tonnes
- As much as 30 to 50 % of this waste is not subject to proper disposal - presenting severe health and environmental hazards. The waste dumps are also known to emit methane a greenhouse gas



The problem of motorization



- **Motorization is a key source of urban air pollution in most African cities for example in Cairo, Cape Town, Dakar, Nairobi, Dar es Salaam, Lagos etc**
- **Motor vehicle fleets have been doubling every 10 yrs e.g. Botswana, Uganda, Zimbabwe (UNEP, 2006), made up of mainly imported second-hand cars which no longer meet standards in their country of origin**
- **The quality of fuels has been poor in terms of e.g. sulphur levels which are very high on average 2,500 - 5,000 ppm in diesel i.e. too high to allow for application of black carbon filters**

Creating Opportunities for Developing Sustainable Cities

- Because of availability of land, most African cities are sprawling with residential areas varying widely from slums to exclusive suburbs
- Thus there is need to introduce the concept of sustainable cities so that we do not repeat the mistakes made by the developed world
- A sub-set of APINA members are engaged in another Network - the Transport and Environment Science Technology (TEST) Network that is looking at traffic congestion, air pollution (including GHGs and noise) and road safety in Zimbabwe, Zambia, Uganda, Tanzania, South Africa, and Mozambique

The problem of Industrialization

- Air pollutant emissions in Africa are increasing due to economic activities
- Mining and cement production e.g. in Zimbabwe, Zambia, Tanzania and South Africa are significant contributors to regional air pollution
- Power generation is mostly from fossil fuels and contributes to carbon emissions and global warming
- South Africa is responsible for 90.6% of Africa's energy related carbon emissions (IEA, 2004)



The problem of use of wood and charcoal

- Firewood is the main source of energy for the majority of low income rural (and urban) households
- Charcoal is preferred by urban low income households in some countries
- Charcoal is used extensively even in countries with fossil fuels e.g. Angola



The problem of use of wood and charcoal

- Consumption is 0.72 tons per capita 3.5 times higher figure than China and India combined
- From literature, twenty per cent of black carbon comes from biological fuels (wood, dung and crop residues)
- In Africa cook stoves produce the bulk of black carbon, although it also emanates from diesel engines and power plants



The problem of indoor air pollution

- Every year, an estimated 1.6 million people in developing countries die from exposure to stove smoke inside their homes. This is 2.7% of the global burden of disease
- Of this, there are an estimated 396,000 deaths in Sub-Saharan Africa due to indoor smoke
- Cooking with wood, dung, coal and other solid fuels is a major risk factor for pneumonia among children, and chronic respiratory disease among adults



Open burning

- Agricultural practices such as slash-and-burn are the major causes of deforestation and savanna burning
- Open biomass burning contributes 40 per cent of black carbon. The black carbon emissions are transported a long way, mixing with other aerosols to form brown clouds
- Thus biomass burning gives rise to regional-scale problems such as regional haze



Open burning

- Regional hot spots for atmospheric brown clouds include southern Africa, extending southwards from sub-Saharan Africa into Angola, Zambia and Zimbabwe
- SAFARI 2000 demonstrated the river of smoke
- The Atmospheric Brown Cloud is now subject of the UNEP ABC initiative. Components of ABC have both air pollution and climate change impacts



Provided by the SeaWiFS Project, NASA/Goddard Image
Date: 09-04-2000
Image captured by CSIR Satellite Application Centre

APINA has carried out activities on all aspects of the air pollution policy cycle including:

- **Emission inventories**
- **Atmospheric transfer modelling**
- **Deposition Monitoring**
- **Impacts (health, crops, ecosystems, corrosion)**
- **Rapid urban and integrated assessment**
- **Urban Air Quality Management (AQM)**
- **Decision making support information**

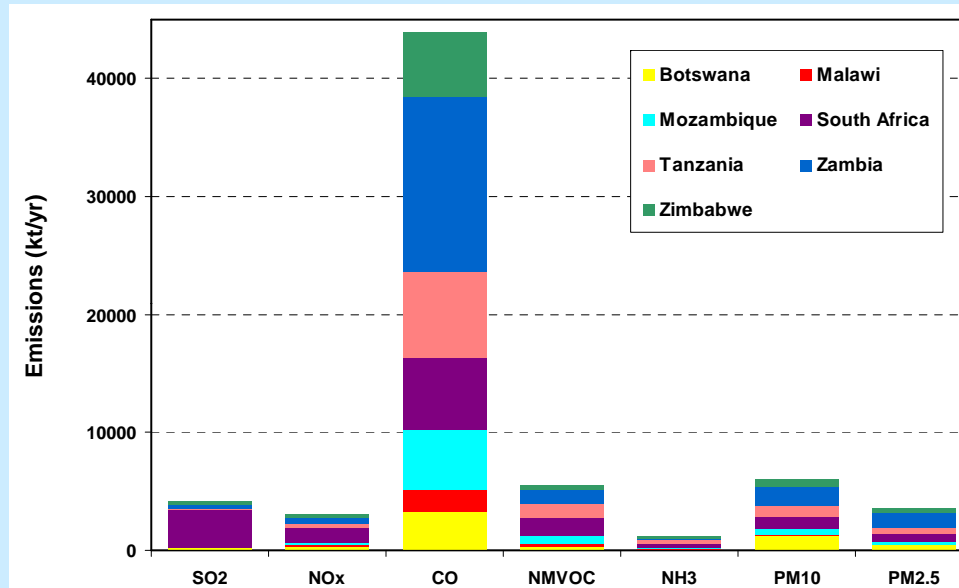
Emission Inventories

- APINA has compiled inventories for 7 Southern African Development Community (SADC) countries (Botswana, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe) using uniform methodology
- A regional emissions inventory was compiled by aggregating the national inventories
- The sectors covered in the inventories are energy, industrial processes, agriculture, vegetation fires and forestry, waste, natural sources and large point sources

Emission Inventories

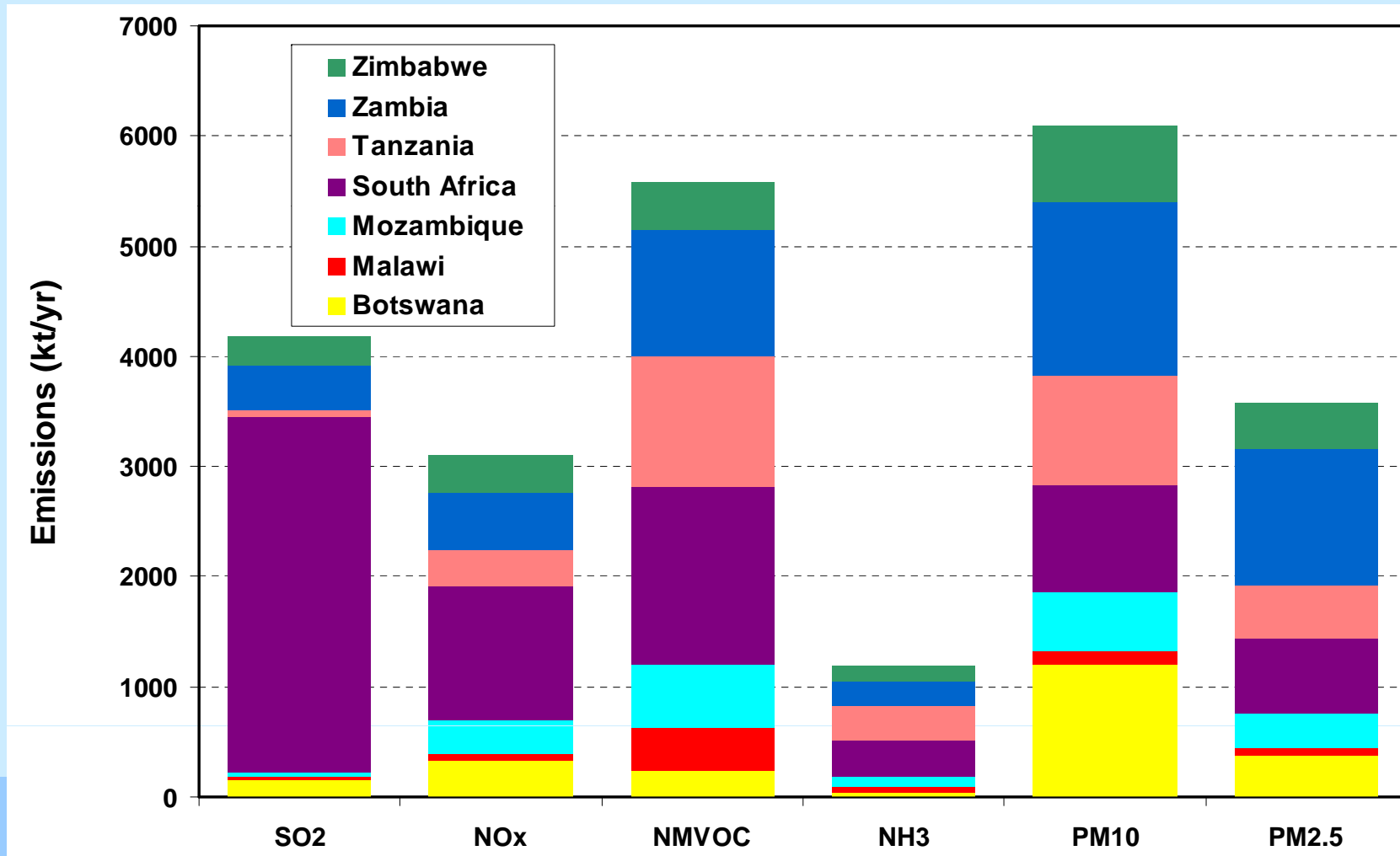
- The major emissions and/or precursors included in the APINA emissions inventory manual are SO_2 , NO_x , PM_{10} and $PM_{2.5}$, O_3 , CO and NMVOCs
- Main greenhouse gases are not included, but same activity data is applied
- Base year is 2000
- Manual adopts practices from Malé Declaration Manual (RAPIDC), IPCC, EMEP/CORINAIR, US-EPA AP-42, SAFARI 2000

Emission Inventories

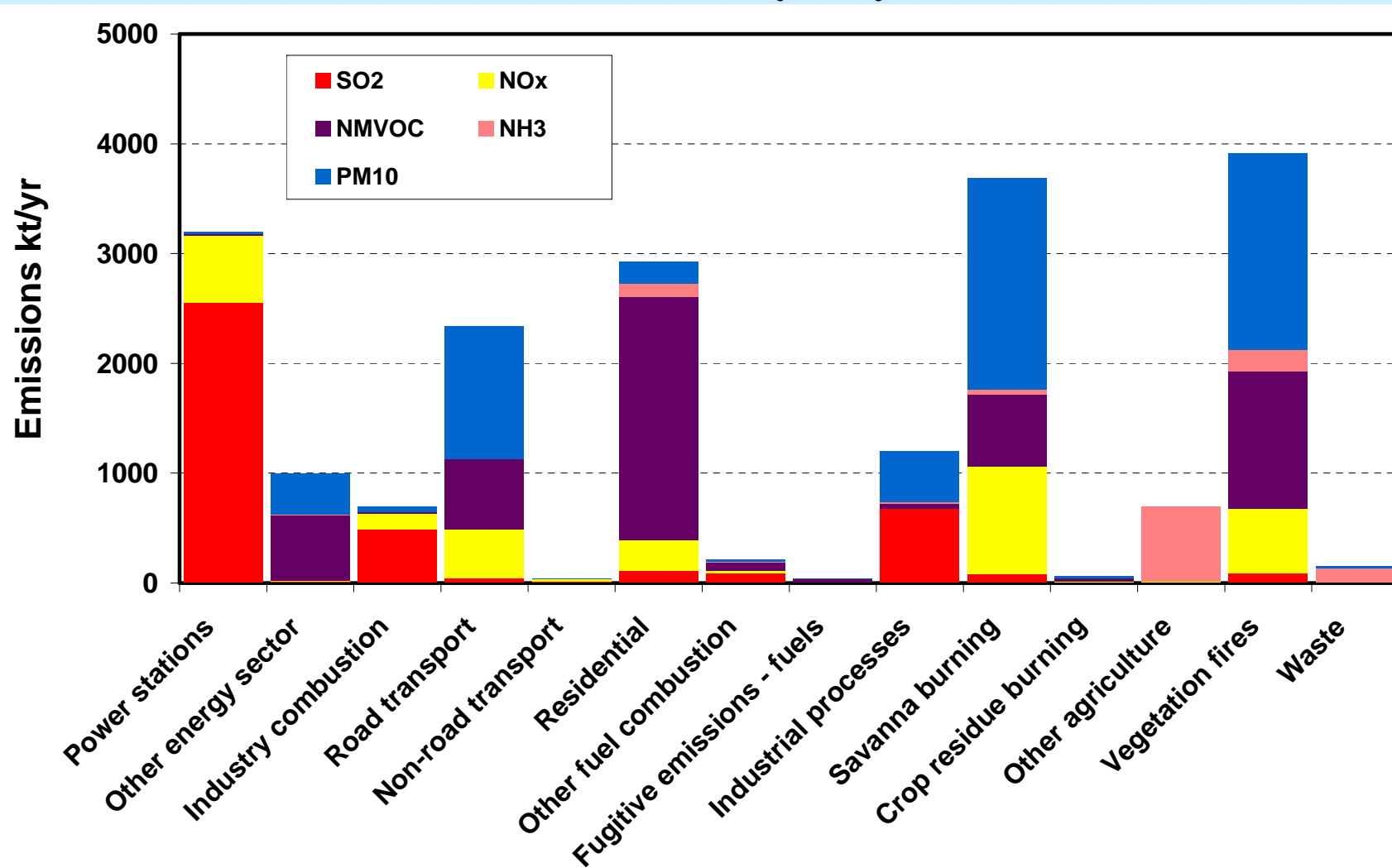


- A total of 64,000 kt of pollutants were emitted in the seven SADC countries in 2000
- Carbon monoxide was the largest pollutant contributing 69% of the total emissions, PM10 9.5%; PM2.5, 5.6%; NMVOC 8.8%; SO2 6.6% and NOx 4.8%

Country contributions per pollutant (without CO)



Regional emissions per sector without (CO)



Main observations

- Vegetation fires, savannah burning and the residential sector (mainly burning of biomass fuels) as well as power stations are the highest emitting sources
- Same sectors also responsible for emitting:
 - significant amounts of NMVOC and NO_x all important precursors of Ozone
 - GHGs - these are inventoried by all countries as an obligation to the UNFCCC
- This offers opportunities for cooperation, sharing of data and other synergies between the air pollution community and the climate change community

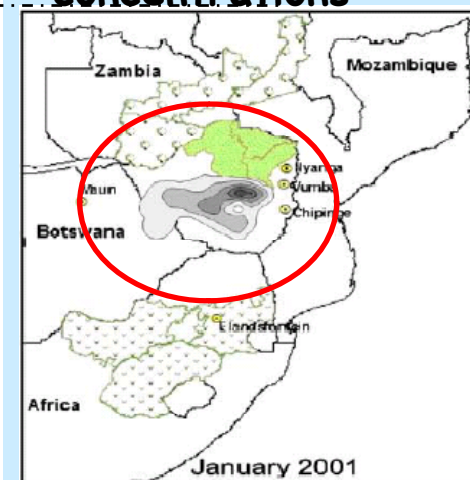
Key short-lived atmospheric pollutants for air pollution and climate change effects

- Ozone (from NO_x, VOC, CH₄, CO): 3rd most potent GHG; health and crop impacts
- Black Carbon/soot: +ve radiative forcing; health effects
- Methane: potent GHG and ozone precursor

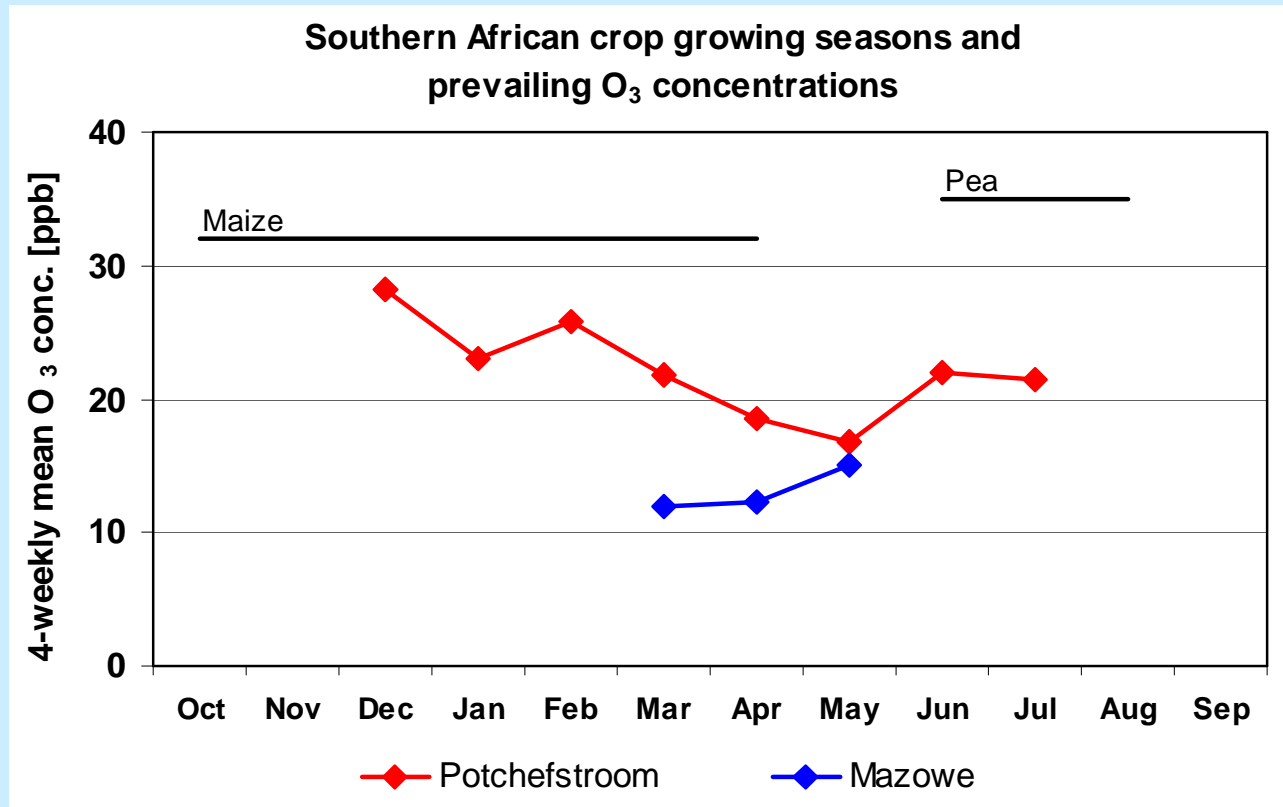
Crops Impacts



Grey shading denotes exceedance of safe levels of modelled O_3 concentrations



APINA studies in southern Africa show that, the maize growing areas at risk from drought are similar to those modelled to be at risk from elevated O_3 concentrations



Limited evidence from APINA bio-monitoring studies also suggests that the southern African growth period for maize growth coincides with the seasonal maximum for ground level O₃ concentrations

Crops Impacts

- As such, maize, the staple crop may be suffering multiple stresses resulting from O_3 and drought which may compromise crop productivity
- Such stress may be enhanced in the future as increased air pollutant emissions lead to higher and more persistent O_3 concentrations

APINA developing the regional policy process

- APINA has been interacting with policy makers at both national and regional level
- It has been facilitating development of regional protocols on trans-boundary and urban air pollution issues together with the other Global Atmospheric Pollution Forum partners
- So far three sub-regional agreements for the Southern, Eastern, as well as West and Central Africa have been signed. The fourth for Northern Africa is in process
- The intent is to end up with a continental agreement for Africa

Participants of the Southern African Development Community Policy Dialogue



The Ministerial Session- Eastern African Region



JAN. SAN PEDRO FERKESSEDOUCOU
2014-2015
RONNEMENT :
SOMMES TOUS CONCERNÉS



Areas covered by the Agreements

1. **Multilateral Co-operation**
2. **Transport Sector**
 - Cleaner fuels*
 - Cleaner vehicles*
 - Urban planning*
3. **Industry**
4. **Open Burning**
 - Vegetation fires, uncontrolled burning and deforestation*
 - Waste Management*
5. **Indoor Air Pollution**
6. **National Environmental Governance**
7. **Public Awareness**
8. **Research, Development and Capacity Building**

SOUTHERN AFRICA POLICY DIALOGUE ON AIR POLLUTION
5-7 MARCH 2008 LUSAKA, ZAMBIA



APINA
RAPIDC
SEI STOCKHOLM ENVIRONMENT INSTITUTE
Sida
UNEP
GLOBAL ATMOSPHERIC POLLUTION FORUM

Creating a Framework for Regional Cooperation on Air Pollution in Southern Africa

DRAFT SADC REGIONAL POLICY FRAMEWORK ON AIR POLLUTION

Lusaka Agreement (2008) - Southern African Development Community (SADC) Regional Policy Framework on Air Pollution

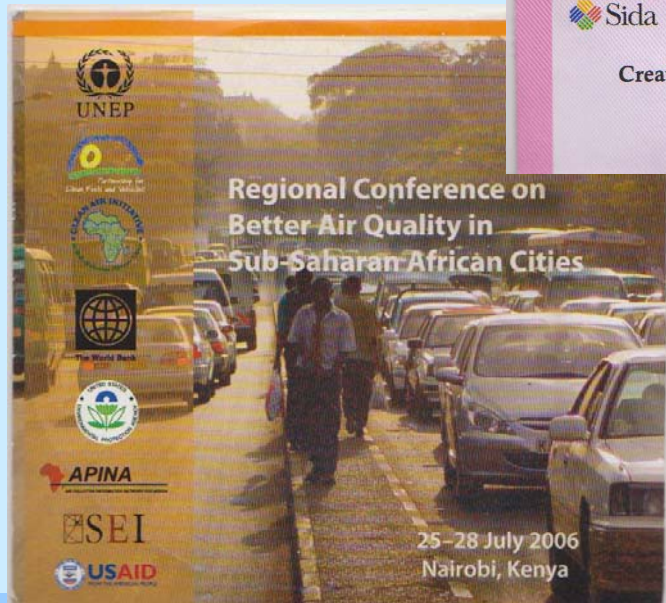
Participants from the 14 Southern African Development Community (SADC) countries, representing governments, industry, non-governmental organizations (NGOs), civil society, international organizations and academia, attended the Southern Africa Sub-Regional Policy Dialogue on Air Pollution in Lusaka, Zambia, during 5-6 March 2008 to develop the following Regional Policy Framework on Air Pollution in SADC that was subsequently adopted by SADC Ministers at the Ministerial Session held on 7 March 2008.

Considering:

- The significant and increasing impacts that air pollutants can have on health, crops, natural ecosystems, man-made materials and visibility, and their socio-economic consequences for SADC countries.
- The most relevant indoor and outdoor air pollutants, that cause significant damage locally, nationally and in a transboundary context, in the SADC region are particulate matter (PM – the most health damaging components characterised as PM₁₀); sulphur dioxide (SO₂); nitrogen dioxide (NO₂); ammonia (NH₃); volatile organic compounds (VOCs); persistent organic pollutants (POPs), such as dioxins and furans; heavy metals, such as arsenic (As), cadmium (Cd), mercury (Hg) and lead (Pb); and fluorides.
- The strong linkages between emissions of air pollutants and greenhouse gases and the co-benefits of reducing air pollution in all sectors for greenhouse gas emission reductions, reducing congestion etc.
- The linkages to the production of secondary pollutants, such as ozone, that can have significant impacts on health and crop yield and quality.

Recognizing that:

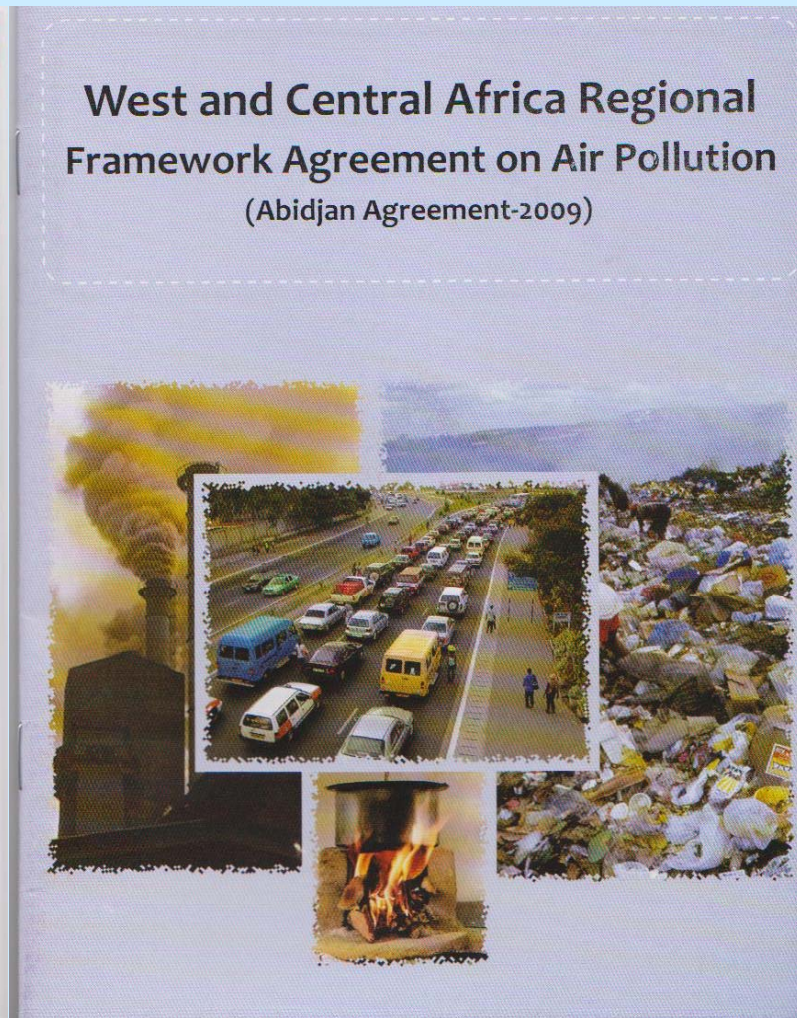
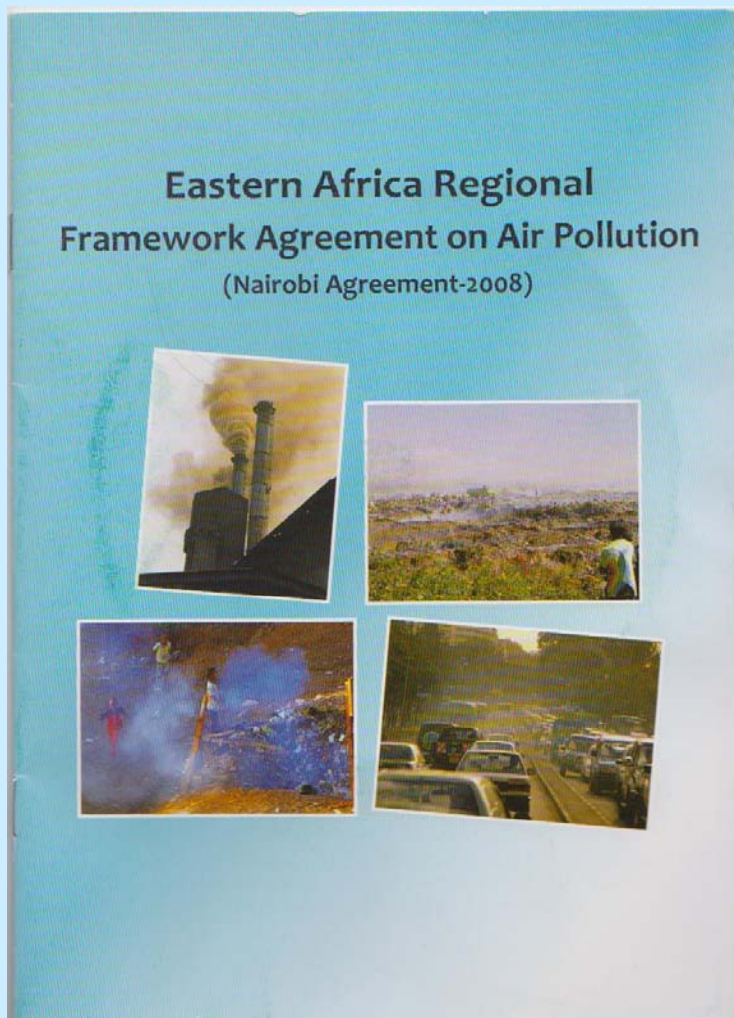
- Air pollution takes a high toll on the health, environment and economies of African countries, and that the transport sector in particular is responsible for rapidly increasing vehicle emissions from the use of high sulphur fuels and older motor vehicles, especially of particulate matter – a major global health concern.
- In African cities more than 50% of all trips are non-motorized, mainly on foot and on bicycle, and this combined with inadequate public transportation, lack of infrastructure for non-motorised transportation and poor urban planning make African roads the world's most dangerous, and a situation that is becoming worse.



Regional Conference on Better Air Quality in Sub-Saharan African Cities

25-28 July 2006
Nairobi, Kenya

UNEP
GLOBAL ATMOSPHERIC POLLUTION FORUM
AFRICAN AIR INSTITUTE
The World Bank
APINA
SEI
USAID



Conclusions

- Abatement of air pollution and mitigation of climate change have generally been treated separately in both developing and industrialized countries
- There are, however, large benefits in considering the control options together
- Such approaches can lead to increased health and/or climate benefits and decreased costs thus achieving win-win solutions

Conclusions

- From APINA's interactions with policy makers in Africa, air pollution is becoming a policy driver in the region (politicians can see its effects particularly on health getting worse)
- They also know that although Africa has low GHG emissions it is susceptible to some of the worst effects of climate change.
- As air pollutants and GHGs sources and effects are often interlinked, tackling air pollution as a priority in Africa with the right measures can keep GHG emissions low and achieve synergies and co-benefits

Conclusions

- However African politicians are likely to get convinced if scientific evidence is generated locally by local scientists with international help
- APINA presents a vehicle that can be used to provide science based evidence to engage African governments in mitigating climate change through the air pollution route
- Already all the sub-regional agreements that APINA has facilitated emphasize that air pollution and climate change co-benefits should be pursued where appropriate

Air pollution/Climate change co-benefits

- **APINA presents a network of people who can with minimum capacity building be able to:**
 - **Carry out assessments of black carbon, methane and ozone**
 - **Carry out assessments of impacts of these pollutants on human health, food security and the environment**
 - **Assess the socio-economic elements of adopting some of the technologies to reduce these pollutants**
 - **Convert the scientific information for policy formulation**
- **Facilitate agreements among African countries to reduce these pollutants**

Conclusions

- Rapid urbanisation and changes to land use in Africa need to be managed in an integrated/holistic way with consideration of ecosystem services provided and their relationship to air pollution and climate change

However promoting co-benefit approaches for air pollution and climate change in Africa will depend on how clearly the multiple benefits approaches can be demonstrated. APINA would like to be part of this process

FINALLY:

'A clever person learns from their mistakes....

....a wise person learns from other people's'



**LET'S PUT OUR HEADS TOGETHER
TO PROMOTE CO-BENEFIT
APPROACHES IN AFRICA**

