

First India-Africa Dialogue and Media Briefing on Air Quality and Mobility

A Press Briefing Note

Traffic congestion and worsening air quality in cities of Africa and India is a cause for concern

But these cities also have the opportunity to plan differently and leapfrog

- **First India-Africa Dialogue on Air Quality and Mobility organized by leading Indian think tank Centre for Science and Environment (CSE) and Nairobi-based Media for Environment, Science, Health and Agriculture (MESHA)-Kenya**
- **Dialogue focused on understanding the experiences of cities in India and Africa, explaining the science of air pollution and its control, and on what and how could the media report on when it looks at these issues**
- **Cities of Africa and India have an inherent advantage in their dominant commuting practices: use of public transport and non-motorised vehicles and walking. Leverage this strength to reduce automobile dependence that causes pollution and congestion**
- **Nairobi, Delhi and most other cities in the Southern world need second generation action, including scaling up of public transport, integrated multi-modal transport options, car restraints and walking and leapfrogging emissions standards for clean air and congestion-free cities**
- **All cities have unique experiences and different lessons to offer to help strengthen action and also avoid mistakes**

Nairobi, February 27, 2015: For cities in Africa and India, controlling traffic congestion, improving urban air quality, and protecting sustainable urban commuting practices are some of the toughest challenges. The cities in the region, while having made some significant strides in meeting air quality challenges, face newer challenges. Nairobi, Delhi and other cities in the South need second generation action, including technology leapfrog, scaling up of public transport, integrated multi-modal transport options, car restraints and walking for clean air.

This emerged out of the media briefing conducted jointly by the New Delhi-based research and advocacy organisation, Centre for Science and Environment (CSE) and Media for Environment, Science, Health and Agriculture (MESHA-Kenya) in Nairobi today. This meeting was organised to understand the emerging stories around the problem of air pollution and congestion and the solutions to the challenges facing our cities. This is part of an initiative by CSE to engage and share lessons from Southern cities to chart the future course of action.

The briefing was addressed by Prof Geoffrey Wahungu, director general, National Environment Management Authority of Kenya; Prof Shem Wandiga, University of Nairobi; Rob Jong, head, Transport Unit, United Nations Environment Programme (UNEP), Nairobi; Prof Nzioka John Muthama, University of Nairobi; Amanda A Ngabirano, Makerere University, Kampala, Uganda; Petro Ahham of Arusha, Tanzania; Otulah Owuor of ScienceAfrica, Nairobi; Anumita

Roychowdhury, executive director-research and advocacy, CSE, New Delhi; Adarsha Kapoor, deputy programme manager, clean air and sustainable mobility programme, CSE, New Delhi; Aghan Daniel, secretary, MESA-Kenya; and Souparno Banerjee, programme director-media and publications, CSE, New Delhi.

The key highlights of the findings from the rapid assessment of issues, challenges and solutions in both the regions were presented by the Centre for Science and Environment today:

1. The air we breathe

Limited monitoring – limited knowledge: In all our cities air pollution monitoring is limited and sometime not existent. Only few cities are better prepared. As a result, it is not always possible to understand the magnitude of the problem. India has close to 5000 cities and towns. But it monitors about 247 cities out of 50000 cities. But only 16 cities have a online monitoring systems to generate real time data. The monitoring grid in the African Nations is still evolving. The recently published database of outdoor air pollution in cities in 2013 the WHO has identified African countries in which particulate matter was monitored include -- Algeria, Botswana, Ghana, Madagascar, Mauritius, Nigeria, Senegal, South Africa, and Tanzania, Ethiopia and Zimbabwe. In addition Egypt, Madagascar, Tunisia, and Morocco have published reports of PM monitoring data. However, from the jigsaw of the limited data it is possible to understand the nature of the crisis.

Air quality trends in Indian cities: In India half of the urban population breathes air laced with particulate pollution that has exceeded the standards. As much as one third of the population is exposed to critical levels of particulate pollution. Smaller and more obscure cities are amongst the most polluted. In cities of African continent the problem though not well assessed yet and not expected to be as bad as that of India is showing a rising trend. Indian cities are also facing multi-pollutant crisis. Nitrogen oxide levels have started to increase in several cities, even ozone levels are high in cities like Delhi. There is also mixed trend. Several Indian cities have shown significant increase, some stabilisation, and others improvement.

Air quality trends in cities of the African Nations: Most cities in Africa have not yet adopted air quality standards. The WHO guidelines are the key benchmarks. Though the reported particulate matter (PM10) levels in most cities in Africa are lower than some of the worst hit cities in India, their levels are still much higher than the stringent WHO guidelines. The WHO database of 2013 shows that while PM10 levels are 7.5 times the WHO standards in Dakar, 5 times higher in Accra, 6 times higher in Lagos, and more than 3 times higher in Jo berg and Tunis. But comparatively the levels in Delhi, India are 10 times higher.

Air pollution had hit the headlines way back in on October 12, 2005 when the first-ever smog in Lagos Nigeria had occurred. This led led LAMATA to facilitate the Lagos Air (vehicular emission) Quality Monitoring Study (LAQMS) in 2007. Delta State University examined ambient particulate pollution and its possible health implications in Nigerian cities. It found over 70% of Nigerian cities with a high rate of daily mean/annual mean ambient PM10 of over 120µg/m³. Similarly, significant differences exist in PM10 concentrations across different land-use types, between the built-up areas and those of the surrounding rural areas. These are important evidences to inform policy action.

Even at the comparatively lower levels of pollution than those in Indian cities the African cities have a cause of concern. The Global Burden of Disease estimates show that the most of the health effects occur at lower levels. There is no reason to think that the risk in these cities is less.

Good air quality monitoring practices in the two regions to track air quality: Good practices are evolving in both the regions. For example, the Senegalese Ministry of Environment and Sanitation has set up a Centre for Management of Air Quality. This has 5 fixed monitoring stations in Dakar and a laboratory. They also have a portable air quality

monitoring van. The air quality data is communicated to the public through a simple air quality index. Similarly, Delhi in India has set up six online monitoring stations that report real time data in a properly laid out format for people to understand. There are over 10 monitoring stations in residential, industrial, commercial and road side locations in Accra, Ghana. Roadside and commercial sites recorded highest pollution levels.

Need inventive action to expand air quality monitoring in the two regions: Globally there are efforts to support development and use of new but low cost monitoring technologies and develop guidelines for it to meet requirements of regulatory monitoring. This can be widely deployed at lower costs to supplement the conventional monitoring system that are very expensive for our regions. Our cities need to bridge the gap in data availability to citizens and also assess personal exposure. It is important to invest in data generation to inform policy action on health protection.

2. Our health matters

Air quality has significant impact on public health in both the regions.

Health risk in Indian cities have taken a scary proportion: According to the Global Burden of Disease outdoor air pollution is the fifth largest killer in India. About 627,000 premature deaths occur every year in India. More than 18 million healthy life years are lost due to air pollution. Air pollution triggers stroke, cardiovascular and respiratory diseases, and cancer. Since 2000, at least one study a year has been published in Delhi to give clinching evidence of smog's toxic risk. Many of these studies have been carried out by doctors from prominent hospital. They have widely reported prevalence of chronic respiratory symptoms; increase in emergency room visits during winter for asthma, chronic obstructive lung disease, and acute coronary event. The reports show the genotoxic effects of vehicular fumes; vitamin D deficiency among Delhi children in polluted localities which increases risk of developing rickets; and significant increase in eye symptoms and disorder in polluted areas. Most extensive scary evidences have come from the 2012 epidemiological study on children in Delhi carried out by the CPCB and the Chittaranjan National Cancer Institute of Kolkata. This study had covered 11,628 school-going children from 36 schools in different parts of Delhi and in different seasons. It found that every third child has reduced lung function. There is evidence to show greater exposure to particulate pollution. Sputum of Delhi's children contains four times more iron-laden macrophages than those from cleaner environs, indicating pulmonary hemorrhage. The levels of these biomarkers in children have been found to be higher in areas with high PM10 levels.

Health risk in the African region: According to the Global Burden of Diseases estimates about 176,000 deaths occur every year due to outdoor air pollution in Africa. This is still less than Europe at 279 000 deaths. But this signals why Africa region needs to be preventive and precautionary.

There are several indicative results from studies that signal a serious public health risk. The UN Economic Commission of Africa has estimated that the cost of air pollution in a number of African cities can be as high as 2.7 per cent of GDP. A study finalised by the University of Nairobi shows that the economic loss per year in Kenya of vehicle emissions and associated air pollution is 115 million KSh from related illnesses and deaths. In Ghana acute respiratory illness is among the top 10 causes of out patient hospital visit. Adisababa Study has identified that more than 18 air pollutant elements in the biomonitor samples (lichen) in highly polluted area affected mainly by traffic air pollution. The Africa is also reporting one of the highest death rates from non-communicable disease. Air pollution can exacerbate this.

This is very serious in low income neighbourhoods located close to roads. Poor have a higher prevalence of some underlying diseases related to air pollution and proximity to roadways increases the potential health effects. Road users, public transport users, walkers and cyclists are the most exposed groups – they are also the urban majority.

There is enough evidence locally as well as globally to act urgently to reduce the public health risks to children, elderly, poor and all. Our cities do not have to reinvent the wheel but take action to reverse the trend of short term effects as well as the long term toxic effects. For toxic effects to surface there is a long latency period therefore exposure will have to be reduced today. Air pollution will damage the health of current as well as the future generation.

3. Motorisation aggravates air pollution and health risk in all our cities

Cities have many sources of outdoor air pollution and all require mitigation action. But vehicles pose a special challenge. In the future cities will witness rapid increase in vehicular traffic. Cities are not expected to locate new industry or power plants inside the city. This means in terms actual exposure people will be more vulnerable to vehicular fume while traveling and in close proximity to roads. Vehicular emissions contribute to significant human exposure. Even though pollution comes from variety of sources vehicles need special attention as they breathe in our breathing zone.

Pollution concentration in our breathe is three to four times higher than what it is in the ambient air. People residing 500 metres from roads are the most exposed to vehicular fumes, says the Health Effects Institute of the US. For instance, about 55 per cent of Delhi's population lives within that zone; so it runs a serious risk of exposure. Air quality monitoring and studies conducted by the Centre for Science and Environment in New Delhi shows that the particulate levels that people are exposed to while traveling on the roads or while walking can be 2-4 times higher than the ambient concentration. Studies by University of California in Berkeley shows PM_{2.5} concentration inside vehicles while travelling in Delhi can be 1.5 times the background levels.

Vehicular fume is also extremely toxic. This can be further aggravated by rapid increase in use of diesel in cars and expansion of freight traffic. In June 2012 the WHO has reclassified diesel emissions as class I carcinogen by putting it in the same bracket as tobacco smoking for its strong link with lung cancer. Diesel also has short term respiratory and cardiac effect. International studies, including one carried out in London, show diesel emissions have worsened the lung function in people with asthma. Given the poor quality of diesel in India, this is of special concern.

In cities of Africa the rudimentary data from sporadic studies show high exposure. A specific medical study of patients and their exposure to the pollution level was done in Addis Ababa. Out of the top 20 leading causes of out patient visit by region in all health centers and hospitals of Addis Ababa, the occurrence of acute respiratory infections was of prime concern. The study concluded that this may be largely attributed to the noxious emissions of the vehicle transportation. Data shows that cases of acute respiratory infection were about 148,000 in 2006-2007, which reached up to 207,000 in 2007-2008.

Air pollution is expected to worsen with increased dependence on personal vehicles and erosion of pollution neutral modes. Studies by the Asian Development Bank show if a city like Bengaluru in India succeeds in increasing bus ridership share to 80 per cent, it can save equal to 21 per cent of fuel consumed in a business-as-usual scenario. This can lead to 23 per cent reduction in total vehicles; it will free-up road space equivalent to taking off nearly 418,210 cars. This can bring down particulate matter in the ambient air by 29 per cent, and nitrogen oxide by 6 per cent.

4. Road injuries add to health impacts of motorisation

The recent estimates of the global burden of disease (GBD) have changed the way health impacts of motorization are conventionally understood. This has included deaths and illness from both accident risk as well as air pollution risks linked with motorization. This GBD ranks road injuries as the world's eighth-leading cause of death and the number-one killer of young

people aged 15 to 24. If deaths due to road injuries and air pollution from vehicles are combined then motorized road transport deaths exceed those from HIV, tuberculosis, or malaria. The World Health Organisation now classifies disability, unproductive life years, and premature deaths related to road injuries as a significant health impact of motorization.

Road injury impact very high in India: There is already very high death and injury impact of vehicle bulge in Delhi and other Indian cities. A rate of 16 deaths per hour and 58 injuries in India is equivalent to wiping out about 40 per cent of population of Maldives in a year. Despite the nominal reduction in total number of accidents over the last two decades, the share of fatal road accidents have increased phenomenally as the Indian cities are prioritising high speed roads for vehicles over ensuring safe access for all.

High road injury risk in African cities: It is said that Africa has less than 3% of the world's motor vehicles, but more than 11% of global road fatalities. This estimate can even be more. Both India and African Nations face the problem of under reporting of accident data. Countries in Sub Saharan Africa are estimated to under-report road crashes by over 500%. Reported data in African region is only 7.2 per 100,000 people. But the modelled data shows it is as high as 32.2 per 100,000 people – a five time increase. The 2009 WHO Global Status Report on Road Safety suggested significant under-reporting of the problem. It was found in 2013, India under reported road death estimates by 78% when official estimates were compared with death registry data.

Kenyan Statistics - 2012 shows that motor cycles and 3-wheelers cause 55% of road deaths and buses/mini buses about 1%. Pedestrians are the biggest victims of road accidents – more than half.

Several steps are being taken now to address road safety risk. This needs to gather momentum. In Kenya, National Transportation Safety Authority established to manage road safety; in Uganda the non-motorised transport policy is expected to address this; Gambia is developing an inter-ministerial committee on road safety but does not have funding to implement anything yet; Tunisia has set up a Road safety observatory which brings together many parties; Senegal has put in place an inter-ministerial committee to look at the issue and is working with driving schools; and Nigeria has initiated Road safety programme

India is framing a Road Safety Bill for more stringent action.

5. Mobility crisis in cities of African countries and India

Mobility crisis begins to build up when an increasing share of our daily trips are being made by cars that occupy more road space, carry fewer people, pollute more, guzzle more fuel. They edge out pedestrians, bicycles, and public transport. This is now happening across all cities of Africa and India/Asia.

Explosive numbers: Vehicle numbers growing rapidly in both Indian cities as well as in the cities of Africa. Although the levels in Asia and Africa remain comparatively low compared to other regions, the growth rate is high. However it is also said that if the estimates of personal vehicles include two-wheeled motorcycles then the rate of motorization is more than the developed countries.

In Indian cities like Delhi vehicle numbers have crossed 8 million and the city is adding 1400 vehicles a day. This trend is dramatically reducing the share of public transport in Indian cities. In India the Indian Institute of Technology, Kanpur has estimated that between 2011 and 2030, daily travel trips will double; but the share of public transport trips would fall from 26 per cent to 16 per cent; the share of personal vehicle trips might increase from 34 per cent to 51 per cent; and peak traffic might crawl at 8km per hour, compared to 16kmph right now. Cities are losing battle of car-bulge. Unfortunately, most cities are losing their inherited strength in high usage of

sustainable modes. The loss is most stark in Delhi, where buses catered to 60 per cent of the transport needs in 2000, but have now dropped to 40 per cent.

Comparatively the vehicle numbers are lower in most cities of African countries but they are recording faster growth rate. For instance, in Addis Ababa car ownership is still very low. In Ethiopia just last year, a total of 30,128 cars were imported into the nation, showing an increment of more than 7,000 cars compared to the previous year. In June 2014 the total stock of registered cars in the nation was 519,816. But this motorization based on uncontrolled and aged vehicles, poor maintenance practice, poor fuel quality, inefficient public transport are affecting the public health and the environment.

Most African and Indian cities were originally designed on a human scale – with small block sizes and high street density; short travel distances that made cities more walkable and accessible. But car-centric street design and urban sprawl are increasing travel distances, severing neighbourhoods, removing people and activities from streets. This is discouraging walking, cycling and public transport usage by design. CSE's assessment of signal free Roads in Delhi has shown how short walking distances are getting steadily converted to longer motorized trips within neighbourhoods, locking up enormous pollution in the road infrastructure.

Congestion impacts: Cities are paying a very high price for congestion. Traffic jams lead to fuel wastage, more pollution and serious economic losses. A normal commuting time has increased significantly during peak hours. On many arterial roads the traffic volume has exceeded the designed capacity and the service level of the road. A quick glance at the city development plans and other sources bring out the nature of mobility crisis in the cities.

Traffic congestion is of growing concern in many cities. Transport policies in sub-Saharan African tend to favour automobiles. Kenya imports around 200,000 vehicles every year in the country. Kenya allows import of vehicles less than 8 year old. As of 2013, Kenya has a registered vehicle fleet of 2.25 million comprising of saloons, station wagons, vans, pick ups, mini buses, buses, lorries, trailers, motor cycles, three-wheelers, wheeled tractors and other vehicles. Of these nearly 30% per cent vehicles are in Nairobi. As of 2013, Kenya has a registered vehicle fleet of 2.25 million comprising of saloons, station wagons, vans, pick ups, mini buses, buses, lorries, trailers, motor cycles, three-wheelers, wheeled tractors and other vehicles. Of these nearly 30% per cent vehicles are in Nairobi. As much as 85.5% registered vehicles in the country are personal – motorcycles and cars. Motorcycles are much higher than the car numbers. In Kenya alone, rapid urbanisation is projected to double Nairobi's car fleet in just six years.

Traffic jams cost the Nairobi City County approximately KSh 50 million daily in fuel consumption, manpower time wasted and cancelled business appointments. The county is estimated to lose 37 billion shillings annually in terms of productivity, pollution and fuel. On a Monday morning it takes 2 to 3 hours to reach CBD In Nairobi. Same is the case with other cities as well. These jams have had an effect on business. Companies are now moving out of the CBD to less congested locations such as Upper Hill, Kilimani, Ngong road, Westlands and Gigiri, citing ease of access as the main reason for moving out. It is thus expected that with this trend of heavy traffic, there will be decreased demand and pricing in potentially prime areas in the CBD which have the highest concentration of new buildings.

In Lagos it is estimated that if ownership rates grow from 0.05 per capita to 0.06 over the period from 2010 to 2025 then there will be an 80% increase in the numbers of vehicles owned to around 850k. A study conducted by the Lagos Metropolitan Transport Management Authority (LAMATA) on air quality between 2003 and 2007 indicated that vehicles contribute approximately 43% ambient air pollution in Lagos.

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Learn from Delhi's dilemma -- only more roads and flyovers are not the answer. We need mobility transition: Learn from Delhi's mistake. Delhi has not been able to solve its problem of pollution and congestion by building more roads and flyovers for cars. Delhi is most privileged to have more than 21 per cent of its geographical area under road space. Delhi has built the maximum roads and 70 flyovers. Yet its roads are gridlocked. Peak hour traffic has even slumped to below 15 kmph. Cars and two-wheelers in Delhi occupy 90 per cent of the road space, though they meet less than 20 per cent of the travel demand.

More roads are not the answer. The limited urban space used for parking can have other, more important uses. Newly registered cars increase the demand for land for parking each year. This requires land equivalent to 310 football fields.

Cities need to improve the capacity of roads to carry people by influencing travel choices. Even during peak hours, a car carries only 1.5 persons as opposed to a bus carrying at least 40-50 people. Two cars occupy same space as one bus, but carry 20 times less people. If this trend continues, the capacity of roads to carry more people will reduce drastically. The planning challenge is to improve modes of mass transit and the people-carrying capacity of roads, as per the principle of the National Urban Transport Policy that states 'plan for people, not vehicles'.

6. Cities in African countries and India have begun to act

It is not that Indian cities or cities in African countries have not done anything to control air pollution. Air pollution management has taken root but they are different stages of progress showing different results.

First generation action to control air pollution in Indian cities: Delhi is the most notable example. Delhi got rid of its polluting industry, shut and replaced two coal-based power plants, brought in force one of the largest public transport systems based on cleaner natural gas, capped the age of commercial vehicles and improved vehicular emissions standards. It resulted in stabilising Delhi's air pollution trend between 2003 and 2008. Nearly, all the big Indian cities that have initiated pollution control measures show respite and stabilisation, followed by a rising trend.

The first generation action has helped many of the cities to stabilize the air pollution problem. But cities are in danger of losing the gains as particulate pollution levels are once again rising and are elevated and newer pollutants like nitrogen dioxides are also rising steadily. The cities now face the second generation challenge.

First generation action in cities of African countries: In Sub-Saharan African countries about 27 countries have adopted Environment Protection Acts; they also specify vehicle fuel parameters, emission standards and air quality. Several countries in the region have operational routine air quality monitoring systems. Sixteen have set fuel specifications for gasoline and 14 for diesel. Several countries have sulphur content between 2,000 and 5,000 ppm, or even above 5,000 ppm. Only five have promulgated emission standards for vehicles, and only eight have set air quality standards (another two have proposed them). The phaseout of lead has now been essentially completed across the region. Air quality monitoring is used to test compliance with air quality standards. Only eight countries have operational routine monitoring systems: Botswana, Ethiopia, Ghana, Madagascar, South Africa, Tanzania, Zambia and Zimbabwe.

Air quality management is considered comprehensive in South Africa, and advancing in Ghana; it is at an intermediate stage in Botswana, Madagascar, Zambia and Zimbabwe, and either at an initial or early stage or entirely absent in the other countries.

In Kenya for instance the government has set the age limit for imported vehicles at eight; reduced the standard limit of sulphur in fuel from 10,000ppm to 500ppm. In 2014 air quality

regulations draft to regulate vehicular emission limits as stipulated in the Kenya Standard KS 1515; completed construction of the Eastern, Northern and Western by-passes to decongest the city Centre; Rehabilitate and extend the commuter rail transport within the Nairobi city;

All cities will have to leap ahead to keep ahead of the problem and if it does not want to wheeze, and suffocate.

7. Vehicle technology and fuel quality roadmap to reduce vehicular emissions

India and countries in Africa are motorising at a level of technology and fuel quality that are not so clean and can lock up enormous pollution in the vehicle stock and compound health risks.

Concerns over technology and fuel quality roadmap of India: India has implemented Euro III emissions standards in about 30 cities and Euro III in the rest of the country, This is 10 to 15 years behind Europe. If the rapidly growing number of new vehicles is not linked with the best available technology it can have serious pollution impact.

This also increases worries over the toxic impact of growing use of diesel in the transportation sector in India. The International Agency for Research on Cancer (IARC), a wing of the World Health Organization (WHO), have reclassified diesel emissions as class I carcinogen for strong link with lung cancer and put it in the same bracket as tobacco smoking. Evidence on diesel's toxicity has been mounting over the past 20 years, which has already compelled stringent regulatory action on diesel quality and emissions standards in other regions of the world. India and African countries need to respond to this science and accelerate roadmap to get clean fuels and vehicle technologies.

Emissions standards roadmaps in Africa: One of the biggest success stories in Africa is the elimination of lead in petrol. The countries in the continent have also begun to reduce fuel sulphur levels in fuels to enable use of emissions control technologies. In 2002, there was no country in Africa which had 50 ppm sulphur in diesel. Since January 2015, Kenya, Uganda, Rwanda, Burundi and Tanzania have moved to 50 ppm sulphur fuel within East Africa. South Africa and Nigeria have already implemented the Euro 2 standards. South Africa has passed the regulation to implement 10 ppm by 2017. Morocco, Tunisia and Mauritius have met 50 ppm or below target.

Now these countries are looking at the future roadmap for the entire Africa to have unleaded & Lead Replacement petrol grades; Diesel & petrol sulphur to be reduced to 10 ppm max; EU 5 Vehicle emissions and introduce metal free petrol.

Find fiscal strategies to clean up fuels and vehicles: While some countries in Africa entirely import fuels, a few like South Africa and Nigeria produce their own fuels. India also produces its own fuels. Fuel producing and importing countries therefore need different strategies to accelerate the emissions standards roadmap. But fiscal solution will be critical for the make over. There are important good examples in the region.

Investments in fuel upgradation is justified based on the health benefits expected from that investments. For instance, available estimates show that while fuel quality improvement in Kenya is expected to cost USD 6 billion, the benefits from this is expected to be USD 43 billion – to be saved from the reduced health cost of its citizens. In fact, Kenya started by giving subsidy to its refinery to improve quality achieve 500 ppm sulphur fuels. But subsequently, along with other oil importing countries have decided to move to 50 ppm sulphur fuels from January this year. South Africa has also started by giving subsidy to the refinery to improve fuel quality.

In India as well there is a proposal to find a fiscal strategy to move to 10 ppm sulphur fuel by 2020. An additional tax on fuels and diesel car can bring additional revenue that can be used to

create Clean Fuel Fund to meet the cost of refinery costs. Such inventive strategies are needed to prevent pollution disaster.

8. Fuel substitution strategy – the CNG initiative

As the mainstream fuels of diesel and petrol are taking time to improve, several cities in both the regions have leveraged availability of CNG to run vehicles to cut pollution. Fuel substitution is a unique opportunity in cities of Africa and India that have natural gas to step around the problem of toxic diesel. This is also an important strategy to leapfrog to move forward quickly.

Delhi CNG programme: Delhi has implemented one of the largest natural gas vehicle programme. Close to 6000 buses, 60,000 three-wheelers and substantial numbers of taxis are running on CNG in the city. This has helped to curb the toxic diesel emissions. This had also helped Delhi to stabilize pollution problem. Today about 40 cities of India have access to CNG and have implemented CNG programme of some scale. But Delhi experience shows that for successful implementation of this programme it is important to set up appropriate emissions and safety regulations, and introduce fuel pricing policy that allows to maintain an effective price differential between CNG and diesel to ensure people prefer to use CNG and not diesel.

CNG programme in African cities: The launch of the Clean Energy Transport Scheme in major cities across Nigeria has commenced. The scheme involves the introduction of Compressed Natural Gas (CNG) run vehicles and retrofitting of diesel engine to CNG. The Clean Energy transport scheme has Asiko Energy as the lead Partner in the Gas flare down programme introducing CNG to Borno State, Kaduna. Nimco and the PPMC have already started operations in Benin city of Edo State with over 50% of taxi operators converting to CNG. Tata Motors and Tower Group have delivered a new investment package to complement government's Green Entrepreneur Scheme, a scheme that empowers unemployed youths to run only CNG buses on a hire-purchase basis.

This drive resulted in significant infrastructure development within and around Benin City. Use of natural gas instead of petrol translated into significant savings for taxi drivers in the area, as Green Gas refuels over 4,000 taxis and cars with natural gas and this is growing on a daily basis. Policy and regulatory support from the government is needed to launch incentives similar to those of other fuels in the country as well as to speed up the construction of needed fueling infrastructure

9. Address the unique challenge of old second-hand vehicles

This is a special challenge of African cities where import of second hand vehicles dominate. Secondhand vehicles from Japan, Europe and other countries swamp. Because of the high price of new vehicles, people prefer buying second hand vehicles. Very few vehicles are new. Some of them are locally assembled or manufactured as in South Africa or in General Motors assembling plant in Ethiopia.

For example, Addis Ababa faces a rapid increase in air pollution due to increasing number of automobiles which do not follow emission standards set by various environmental agencies. Lack of retirement policy for the vehicles worsens the problem. It was found that 53.5% vehicles are more than 20 years old, while 29.3% were more than 30 years old. As much as 85% of all taxis are 22 years old. This causes enormous emissions.

Several governments in the African region have begun to take steps to address this problem – either by fixing the age of vehicles and putting higher taxes on the older vehicles and also by introducing vehicle inspection programme for in-use vehicles:

- **Addis Ababa:** According to the Traffic Law owners of mass transport vehicles (e.g. taxis) that are greater than 20 years old are not eligible for operating licenses. This programme was initiated as a voluntary programme in 2009. About 50,000 taxis are

eligible for replacement. Financial incentives are being provided to the fleet owners to purchase a new vehicle.

- **Angola:** Motor companies not allowed to import used vehicles; individuals allowed to import regardless of age
- **Botswana:** Maximum of 100,000 kms on the vehicle
- **Burkina Faso:** No import restrictions on vehicle age basis
- **Mali, Malawi, Zambia, Ethiopia, Central African Republic, Democratic Republic of Congo, Cameroon:** No import restrictions on vehicle age basis
- **Chad:** vehicle inspection upon importation
- **Côte d'Ivoire:** A fine of FCFA 150.000 is imposed on vehicles older than 10 years and an additional FCFA 10.000 for every year.
- **Gabon:** Used vehicles must be less than four years old
- **Ghana:** Used vehicles over five years old pay graduated penalty according to year of manufacture and capacity
- **Seychelles:** Used vehicles must be less than five years old
- **Sudan:** -imported second-hand vehicles are illegal, except for immigrants, vintage and racing cars, vehicles adapted for physically disabled, and donated vehicles for welfare organizations
- **The Gambia:** Import of second hand vehicles restricted through taxation – increases in vehicles exceeding 10 years and roadworthiness must be proven before import
- **Mauritius:** Has a three year age restriction

Efforts are being made to organize the vehicle inspection centre to address the problem of in-use emissions. There are 19 vehicle inspection centres across Kenya including one at Likoni Road, Nairobi. Mainly public service vehicles and commercial vehicles – matatus, buses, tuk-tuks, taxis and trucks come for annual inspection. From January 2015, all private vehicles more than 4 years will also have to undergo the inspection. At present only visual tests are done. Its basically seen if the vehicles are fitted with a speed governor and are in good mechanical condition. There are plans to do emissions testing.

10. Majority still walk, cycle and use public transport; they are part of the solution

Despite growing dependence on cars, walking and cycling and public transport share dominate travel in our cities. Among key big Indian cities walking, cycling, and public transport trips still make up 60-78% of all trips. In several Indian cities the walking and cycling trips are still more than car and two wheeler trips.

In Nairobi, a 2007 survey of the Ministry of Roads and Public Works Report, Kenya showed that while private vehicles are 36% of the vehicles on the roads and occupy more road space they carry only 15.3% of commuters. Matatus that are 27% of the vehicles carry 29% of commuters. Another 47% of the city residents walk to their work places. The commuter share of Matatus is stated to have increased substantially since then – it could be carrying as much as 70 per cent of the motorized trips in the city today.

This is the low polluting and low carbon mobility paradigm that the world is trying to achieve today to be more sustainable. All our cities must be made conscious of this strength. The cities have advantage because it has closely built, high density environment. This has reduced travel distances that foster low emissions and low carbon transport like walking, bicycling, paratransit and bus/metro based transport.

All cities in African region and in India need to retain their compact city design that has helped to reduce travel distances. In most cities the average travel distance in Indian cities is around 3-4 kms. This enables very high level of walking, cycling and public transport usage. Only in bigger cities the average distance is longer.

But as noticed in Indian cities the sizeable share of the transportation infrastructure is being spent to facilitate vehicle movement and not people's movement. All our cities need to

transform the infrastructure for the walkers and public transport users to prevent dependence on cars.

11. Scale up comfortable and reliable public transport

Buses will play a crucial role in the mobility transition in the big and medium rung cities. Cities need well managed, well organised modern buses that deliver efficient public transport services at affordable rates. Cities need buses because these allow greater flexibility, greater geographical coverage, cost effectiveness, and space efficiency. New bus routings can flexibly and easily meet the needs of changes in demography and land use in cities. It can also cover areas with lower travel demand. A bus occupies twice the road space taken by a car but carries 40 times the number of passengers. Bus can displace anywhere between 5 and 50 other vehicles and allow enormous oil and pollution savings.

However, bus reforms and investments are just not about buying new buses but about efficient deployment of reliable and attractive services. Cities require immediate improvement in service level of bus service in terms of frequency, reliability, coverage, reliable information, ITS enabled passenger information service, improvement in ticketing system, bus priority, signaling, GPS enabled deployment strategy, among others. These service conditions will have to be fulfilled. This will also determine the costs. Some Indian cities have begun to move in this direction. For example Bangalore in India has made considerable progress in improving bus operations.

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Dynamics of bus transport in African and Indian cities: Bus service is still very inadequate in most cities in African region. According to the World Bank's Urban Transport Indicators database, the average number of bus seats per thousand urban residents of Latin America, Asia, the Middle East, and Eastern Europe is around 30 – 40. In Africa the average number is only 6 bus seats per thousand residents. The average cost of a one-way trip is about 0.30 \$, which is high in relation to the average household budget. These unaffordable fares are clearly linked to poor people's decision to walk in an environment with poor facilities for non-motorised transport.

A step forward in Kigali city: Kigali city has recently adopted a net cost contracting method to procure privately delivered bus services from three firms to serve four zones and its central business district (CBD). The restructured bus services have definitely improved service coverage and quality of vehicles, but service schedules, fares, and customer care are failing to meet the performance standards of the contracts. A recent reorganization of privately run public transport services has improved service coverage, but the reliability and level of service remains inadequate due to the peak hour congestion, shortage of vehicles, and inadequate service provision by operators; furthermore, bus transport is still not affordable for all

In most African cities the bus service is part of the unorganised sector that is not very amenable to proper regulations and service quality control. Only a few cities in India and African countries have begun to organise these services to improve.

Delhi for instance has phased out the informal bus system and replaced it with corporate and centrally operated large fleets. This requires monitoring of service trips, penalty if there is any violation etc.

BRT transition: Cities in Africa are making more strident move towards introducing Bus Rapid Transit system. There are more success stories in BRT transition in African cities than in Indian cities. Johannesburg's Rea Vaya BRT is the first BRTS system in South Africa. By 2020, the City plans to roll out 122 kilometers of mainline BRT corridors served by 150 stations and 250 kilometers of formal feeder routes. The long-term objective is to provide a network of some 330 kilometers (of lanes that are easily accessible to more than 80% of the people of Johannesburg. It has also successfully addressed opposition from the informal sectors and taxi operators on that route and integrated them with the new system. The ultimate goal was to ensure that those who were operating or getting affected by the BRT will be the shareholders in the bus operating companies that will take over the BRT system. As the existing operators were involved for negotiations, the department had to give them loss of income allowance to get them to negotiate. In addition, technical support and independent facilitators were provided to facilitate during negotiations.

Under a PPP project – Lagos Metropolitan Area Transport Authority (LAMATA) has also provided the framework and infrastructure comprising bus depot garage, 3 bus terminals, 65% segregated busways, 28 bus shelters, road markings and other traffic management measures while the selected private sector operator (First BRT Cooperative Limited) accepted regulatory enforcement, commitment to procurement of buses, operations and maintenance.

Dar es Salaam has made exemplary effort to sensitise people over a period of time to win public support for BRT.

These initiatives are critical for improving network of formal public transport systems.

12. Walk and cycle

In most of our cities in India and Africa people who commute by walking outnumber those who use vehicles. Yet, there is continuous erosion and destruction of the space meant for walkers. Our cities have inherited strength in their dominant walking and cycling practices. Cities in India, most of Asia and Africa were originally compact in urban design and high population density. This kept most trips within walking and cycling distance. Moreover, due to high incidence of urban poverty a large part of the urban population is too poor to pay for any other mode of transport. Also any attempt to improve the share of public transport will lead to correspondent increase in walking. Even 50 per cent increase in kilometer traveled by public transport will lead to massive increases in the quantum of walking. Roads will have to be planned with more space for walking. This needs urgent intervention to meet the present and future demand for walking in the city.

Our cities still have the chance to plan its future growth differently and avoid the path of pollution, congestion and energy guzzling.

The mega cities in India have one of the highest walk and cycle trips. 34 per cent in Delhi and 53 per cent in Mumbai walk to work. Government should mandate pedestrian plans and make it conditional to infrastructure funding:

Walking in African cities: In African cities where a majority of people (nearly 50% of the population) walk, not much emphasis is given to these vulnerable road users. The share of walked trips in Kigali has reached 60-70%. In Nairobi, 60-70% commuters walk. People even walk large distances 7 to 10 km.

Not enough and proper designated areas for pedestrians and other non-motorised traffic. Roads where people walk in large numbers do not either have sidewalks or are not adequate. City authorities are now making sidewalks and cycle tracks on new roads. According to the Nairobi city county official, the county is planning investment in public transport facilities to improve walking infrastructure. Their proposal involves Improvement in traffic signals;

construction of 11 foot over bridges; every urban road to have a footpath; enable cycling. And prepare master Plan to integrate landuse and transport.

Government of Uganda has framed a national policy for improving non-motorised travel. With the support of UNEP's Share the Road programme, the policy recommendations were designed to increase awareness of walking and cycling in transport planning, and supporting effective design and infrastructure provision at a national level. The policy recognizes walking and bicycling as non-polluting, sustainable, environmentally friendly and healthy transport options, and the promotion of these modes is part of its environmental policy. This recognizes universal accessibility principles for all transport infrastructure. Also establishment a National Road Safety Authority (NRSA) responsible for road safety, management and coordination.

Need action: All our cities need reform in engineering and environmental guidelines for walkways and make them mandatory: Ensure these guidelines are incorporated by all road building agencies. Need a comprehensive Road users act for targeted pedestrianisation; segregation of space by users; system of penalty to prevent encroachment in pedestrian space; prevent usurpation of pedestrian space for motorised traffic without proper justification. Urban local bodies must implement walkability audits of pedestrian ways. Public transport plans must include pedestrian plan for multimodal integration. Zero tolerance policy for accidents.

Street design guidelines must give priority to the comfort of the movement of people. Increasingly, cities are trying to remove people from the roads by barricading medians and putting foot overbridge to minimize conflict between people and vehicles. This will be counter productive. If people cannot cross at frequent distance, or are forced to climb foot over bridge it will discourage walking and public transport usage. A survey in Nairobi showed that the most common reasons cited for not using the pedestrian crossings and foot bridges were ignorance of traffic regulations (26%), people being in a hurry and laziness (23%) and lack of road safety awareness (11%). Others reasons cited were that footbridges are not strategically placed. But as the experience in India has shown that foot over bridges are very inconvenient for people and this force people to walk on the roads and get exposed to safety risk. People must always remain on surface and be given safe crossings.

13. Intermediate public transport system

Cities of India and African countries must not make the mistake of destroying the intermediate public transport system – Matatus, Boda Bodas, auto rickshaws, cycle rickshaws: In most cities of India and Africa intermediate public transport system are the most important form of transportation system.

In Nairobi for example, *Matatus* or mini buses are the only form of public transport operating in Nairobi. This today meets nearly 70 per cent of the travel demand. These are very important for last mile connectivity and as feeders to public transport. These systems should be reorganized well to improve efficiency and deployment.

A good example is the effort to create reorganize as cooperatives and their routes and manage them well. 87 cooperatives or *Saacos* have been formed in Nairobi. Across Nairobi, Matatu routes were organized into eight major corridors used to codify clear routes and bus stops. This structure was used to develop a coding system based on branching and rotation to give each stop and route a unique, logical identifier. The initiative of Digital Matatus is an important one. This transit data is over the publicly accessible GTFS exchange.

In Delhi similar efforts are being made to reorganize the auto rickshaws with GPS systems, permit rationalization etc to integrate them with the overall transportation system.

14. Get the taxes right

The scale of transition that is needed will require enormous investment. This demands innovative fiscal strategies. Implement polluter pay principles. Motorists should pay the full external costs that include congestion, pollution, ill health, and climate change. This can bring additional revenue to pay for the alternatives like public transport, walking and cycling infrastructure

It is ironical that across our regions – India and several African countries buses are made to pay more taxes than cars. Almost all state governments tax the buses higher than cars. This will have to be reversed. Currently bus operations are treated as commercial operations and taxed high. But cars will have to be taxed higher than buses. In Delhi for instance, cars pay a miniscule amount of one time road tax when they are purchased. But buses are made to pay much higher taxes annually. This increases bus fares.

Similarly, in Kenya for instance, vehicles have to pay a varied range of taxes when they are imported in Kenya. But minibuses up to 29 seater have to pay all taxes as applicable on cars. Buses more than 30 seaters and above are required to pay import duty and VAT like cars. This should be rationalized. Public transport services are for public good and should pay lower taxes. Cars that are part of unsustainable modes should pay higher taxes.

If bus fare increase people will easily move to motorcycles that have much lower operational costs than even the bus fares in most of our cities. This will aggravate the problem of motorization and pollution.

15. Parking restraints

Globally, the government are adopting measures to restrain use of cars. This is being done either through tax policies, road pricing or parking policy. The first generation restraint measures include parking policy as a demand management tool reduce parking demand and also use of personal cars. This is easier to implement in developing cities.

Conventional parking policies in most of our cities have aimed at increasing parking provisions to meet the growing demand for parking by earmarking as much public land as possible; by constructing multi-level car parks; and by mandating all buildings to provide minimum parking spaces. The underlying assumption has been that demand for parking will continue to grow with motorisation and therefore the local governments should set aside adequate parking spaces to meet this demand. But this policy assumption is now under attack.

Decades of experience across the world has shown that parking demand is insatiable that only locks up valuable urban land that have more important usages. Moreover, uncontrolled parking supply incites more driving, more car ownership and defeats the purpose of reducing automobile dependence, pollution and congestion. This has led to serious policy rethink. Parking policy can be redesigned in such a way that instead of encouraging unlimited parking supply and car usage it can be leveraged to restrain parking demand and thereby personal vehicle usage.

But there is very little policy or public understanding of the key elements and principles of parking policy that can make it a tool for reducing parking demand and car usage to cut decongestion and pollution in cities.

Unlimited parking supply lead to more automobile dependence and congestion. This increases pressure on public land. For as much as 95 per cent of the vehicle lifetime these vehicles remain parked somewhere. This creates enormous demand for urban land which is limited, valuable and is needed for more important usage. Depending on the size of the cities and rate of motorisation the annual demand for additional parking spaces can be equivalent to as much as 310 football fields in Delhi.

The number of vehicles that are registered in Nairobi annually can create additional demand for land areas as big as 100 football fields. Cheap and free parking is a subsidy to rich car owners and loss to the local government exchequer. The costs of using valuable urban land for parking of personal vehicles are not recovered through proper taxes and pricing. Parking rates even in expensive parking structures are minimal and are not adequate to recover the cost of investment. This is a subsidy. This subsidy amount will work out to be much larger if the rental or the land cost is taken into account. Increased investment in expensive and prime areas of the city further enhances this subsidy as the parking rates are not expected to recover this cost.

A step forward in Nairobi: Nairobi has taken the lead to introduce priced parking to reduce demand for parking and car usage. Parking in Nairobi is managed by the Nairobi City County. The city has 13,000 on-street and 460 off-street parking lots. Off-street parking lots are mainly in the CBD area. Entire Nairobi has priced parking though unauthorised parking lots also coexist. Parking charges vary -- Cars have to pay 300 KSh for an entire day in an on-street parking whereas in case of off-street parking, one has to pay 50 KSh for entry and thereafter 30 KSh every 30 minutes. This comes to 12.5 KSh every hour in case of on-street parking and 110 KSh for an hour in an off-street parking lot. Nairobi City County has initiated a pilot project of cashless parking pricing system. One has to pay the parking fee using phone. The system asks for details such as parking duration and zone and also the type of vehicle. The parking fee will be deducted and the car owner/driver will receive SMS notification. People who do not pay for parking, their cars are clamped and a penalty of 2000 KSh is charged which is to be paid within 2 hours of clamping the vehicle. Thereafter, the car is towed and impounded for which the car owner has to shell out 2500 KSh for towing and 3500 KSh for impounding. On successful implementation, there are plans to go for hourly charging. Aimed to increase the parking revenue, this system was not favoured by the cars owners/drivers initially.

This is an important learning curve in the region. Indian cities can also learn from this strategy. A combination of restraint measures like this and improved public transport system can help to reduce congestion on roads.

A few steps forward in Indian cities: Indian cities are also framing several strategies. These include variable and increased parking pricing; parking district management plan, no car without proof of parking; barring parking on green areas etc.

The way forward

- **Strengthen air quality monitoring, and establish public information system with health advisory:** Cities should strengthen monitoring grid. Implement air quality index system and health advisory for informing people about ill effects of poor air quality.
- **Tighten fuel quality and emissions roadmap:** Tighter emission norms have become the necessity to ensure that pollutants are cut at source. Accelerate upward harmonization of emissions standards and create schedule for introducing tighter emissions standards. Frame fiscal policies to enable the transition.
- **Scale up and accelerate bus transport reforms. Integrate public transport, and non-motorised transport. Cities need to integrate bus, cycling, walking and para-transit systems.**
- **Adopt street design guidelines to build pedestrian infrastructure:** Mandate pedestrian plans and make it conditional to infrastructure funding. Investments must be linked with explicit pedestrian and cycling plans. Implement walkability audits. Public transport plans must include pedestrian plan for multimodal integration. Need zero tolerance policy for accidents.

- **Develop parking policy and parking area management plan to reduce demand for parking and use of personal vehicles:** Organise legal parking, enforce high penalty for illegal parking; cap absolute supply of parking spaces; Parking plans need to account for the changes in parking demand with improvement in public transport in different zones; Parking should be public, shared and priced; Need good on-street parking management; protect walkways from car parks; design parking for multimodal integration and improving public transport usage; create “Park and Walk” facilities; do not allow free parking and link car purchase with proof of parking
- **Use tax measures to discourage personal vehicle usage and use of poor quality fuels and vehicles.** Additional revenue from these taxes can help to generate additional resources to improve public transport and fuel quality.

ABOUT CENTRE FOR SCIENCE AND ENVIRONMENT

Centre for Science and Environment (CSE), established in 1980, is one of the foremost think tanks in India working on some key issues of environment and development. It was founded by the late Anil Agarwal, one of India's and the Southern world's best known environmental thinkers and activists.

The Centre's research and advocacy activities span subjects such as air pollution, climate change, sustainable urban transportation, mobility and road safety, water pollution, water and wastewater treatment and management, industrial contamination, renewable energy and toxins in food and environment.

The Centre has an extremely vibrant media programme which interacts with over 4,000 journalists in South Asia through regular media fellowships, briefings and workshops, and press conferences. This India-Africa media briefing is CSE's first such initiative in Africa. The Centre plans to conduct similar briefings on other subjects in Africa and India, with the second such event being planned on the issue of water and wastewater management, to be held in Addis Ababa this year.

The Centre has recently launched a media fellowship programme for African journalists. For details of CSE's activities, programmes and resources, please visit www.cseindia.org.

CSE has two offices – both in New Delhi. It is currently headed by Sunita Narain, a leading environmental thinker.