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# The need for UN climate change policy reformation

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## Abstract

This paper endeavours to understand the climate change phenomenon and identify measures taken to contain it. It discusses global warming causes and consequences and assesses effectiveness of the United Nations (UN) policies following failure of the Kyoto Protocol to reduce greenhouse gas emissions. In pursuing this course of action, this paper utilizes data collected from East Africa region.

Key issues discussed in the paper include findings of the Intergovernmental Panel on Climate Change and the role of urbanization in global warming as cities emit most of greenhouse gases. Special reference is made to developing cities which are growing extremely fast and will consume more energy in future. They are becoming economic engines and adopting industrialization as an economic model while developed cities are experiencing de-industrialization. Developing cities have neither the ability to adopt green technology nor the capacity to establish large capacity public transport systems to reduce carbon dioxide (CO<sub>2</sub>) emissions.

It is evident that UN efforts to combat climate change are not effective because past experience shows that CO<sub>2</sub> generation cuts weren't near enough. The recent Paris Agreement may restore a faith in UN process if implemented but doesn't reduce temperatures as needed unless all drivers of climate variability are considered, particularly the abortive role of developing cities. The UN Programme appears to be focusing on attaining urban resilience rather than targeting grassroots causes. Urbane-bias global policies drive the rural population to leave their land and flood cities while over-usage of natural resources by the rich is left unchecked.

A new UN strategy making the countryside a more appealing place to live in and work whilst normalising urban growth is needed as well as mobilizing local leaders who enjoy more autonomy to enact regulations. It should also alleviate poverty, deter excessive practices and put science and technology under community control.

**Keywords:** Climate change, Global warming, Energy, CO<sub>2</sub>, GHGs, Cities, Urbanisation, IPCC, COP, UN

## Introduction

### Global warming and its consequences

Scientists have spent decades searching the causes of global warming and the consequential climate change, and now it is widely believed that natural and anthropogenic substances and processes that alter the Earth's energy budget are drivers of climate change (CC). Radiative forcing (RF) quantifies the change in energy fluxes caused by changes in these drivers. The total RF is positive, and has led to an uptake of energy by the climate system. The largest contribution to total RF is caused by the increase in the atmospheric concentration of Greenhouse Gases (GHGs) and Aerosols including carbon dioxide, methane, water vapor,

nitrous oxides, chlorofluorocarbon and halocarbons. A stronger greenhouse effect will warm the oceans and partially melt glaciers causing the sea level to rise. Ocean water also will expand if it warms, contributing further to sea level rise. Warmer conditions will probably lead to more evaporation and precipitation overall, but this may vary at individual regions, some becoming wetter while others become dryer. Currently, extreme weather events in different parts of the globe such as extreme precipitation rate, severe draughts, floods, hurricanes, typhoons and cyclones are frequent and increasing in ferocity and frequency according to reports presented to the Conferences of the Parties (COP). Also, satellite images and research findings have revealed that the ice caps are melting faster and our sea levels are rising higher.

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Cities and towns are heavily vulnerable to climate change where hundreds of millions of people in urban areas across the world will be affected by rising sea levels, increased precipitation, inland floods, more frequent and stronger cyclones and storms.

**Findings of the Intergovernmental Panel on Climate Change (IPCC)**

The IPCC was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in order to provide scientific view based on the information, observations and data available on CC and its impact on the environment and socio- economic conditions worldwide (IPCC website [1]). Apart from IPCC, the gateway to the UN systems and links to the UN Partners on climate change, including UNEP, WMO, United Nations Framework Convention on Climate Change (UNFCCC) and United Nations Development Programme (UNDP) are all working on projects to mitigate the effect of climate change.

The findings of IPCC on climate change were accepted in its second assessment in 1995. Since then it has been undeniable that the Earth’s climate is warming, which is evident from models and observations at global and continental levels, IPCC [1]. According to IPCC Report of 2013:

- The globally averaged combined land and ocean surface temperature data show a warming of 0.85 [0.65 to 1.06] °C. The total increase between the

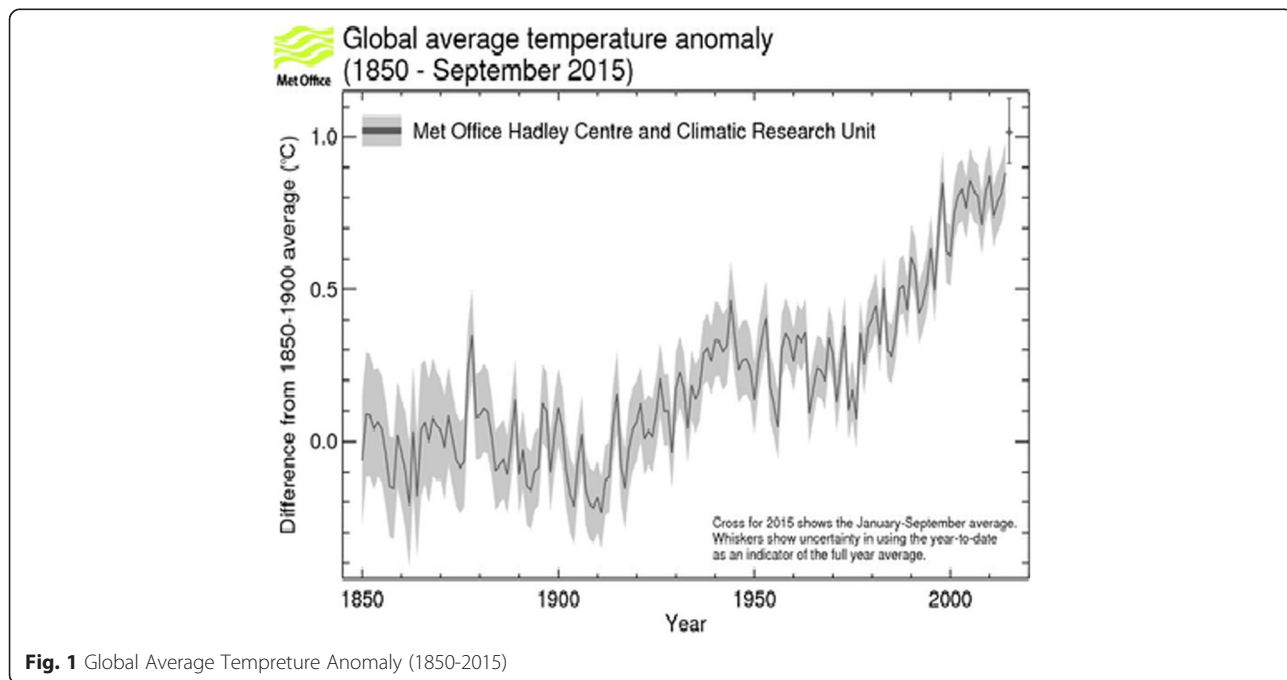
average of the 1850–1900 period and the 2003–2012 period is 0.78 [0.72 to 0.85] °C.

- Continued emissions of GHGs cause further warming and change in all components of the climate system and limiting climate change effects will require substantial and sustained reductions of GHGs emissions.
- The ocean has absorbed about 30 % of the emitted anthropogenic carbon dioxide, causing ocean acidification

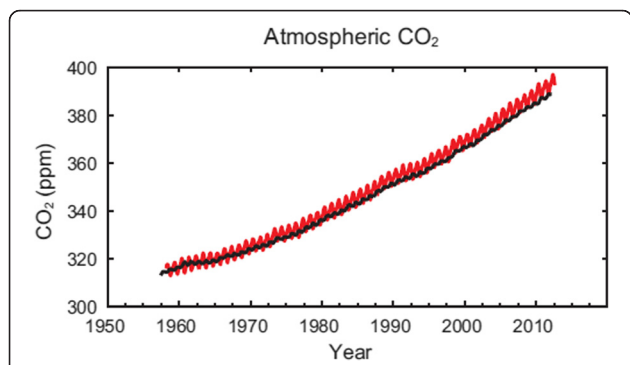
The above findings are in agreement with Met Office of Hadley Centre and Climatic Research Unit [2] which stated that the total increase in temperature between the average of the 1850–1900 period and the 2003–2012 period is 0.78 [0.72 to 0.85] °C as indicated in Fig. 1

IPCC anticipates that global surface temperature change for the end of the 21st century is likely to exceed 1.5 °C relative to the 1850 – 1900 period. This will be caused by a combination of the continued growth in most GHG concentrations, particularly CO<sub>2</sub> noting that cumulative anthropogenic CO<sub>2</sub> emissions have accumulated in the atmosphere, in natural terrestrial ecosystems and have been taken up by the ocean. The atmospheric concentrations of carbon dioxide have increased to unprecedented levels as indicated by Fig. 2, produced by the IPCC

According to IPCC report (IPCC website [1]), the concentration of CO<sub>2</sub> in 2011 was 391 parts per million (ppm), rising from 280 ppm in 1750. The average annual concentration of CO<sub>2</sub> in the atmosphere at present



**Fig. 1** Global Average Temperature Anomaly (1850-2015)



**Fig. 2** Source: IPCC Report on CC - the Physical Science Basis, 2013

(2014) is 398.55 ppm, 0.522 % up from 2013 figures and since 1990, worldwide yearly emissions have gone up by about 6 billion metric tons of “carbon dioxide equivalent”, more than a 20 % increase.

The values of annual CO<sub>2</sub> concentrations provided by the IPCC Report are in conformity with the values produced by Earth System Research Laboratory (ESRL) [3] of US Department of Commerce which are exhibited in Table 1. This laboratory has grown to become the premier long-term atmospheric monitoring facility and it is a credible laboratory for measuring the concentrations of global atmospheric carbon dioxide.

It can be observed from ESTL figures that the annual increase in CO<sub>2</sub> concentration in the period 1959 to 2006 was at 1.4 ppm, while this value has increased to 2.1 ppm in the period from 2006 to 2014. This clearly indicates that the rate of CO<sub>2</sub> concentration is increasing, regardless of all

**Table 1** Annual trend of Carbon Dioxide (CO<sub>2</sub>) concentrations as measured by the Earth System Research Laboratory

Year	CO <sub>2</sub> (ppm)	Notes
2015	400.38	
2014	398.55	
2013	396.48	
2012	393.82	
2011	391.63	
2010	389.85	
2009	387.37	Copenhagen Accord
2008	385.59	
2007	383.76	
2006	381.90	
1997	363.71	Kyoto Protocol
1992	356.38	Earth Summit in Rio de Janeiro
1987	349.16	The year when the annual CO <sub>2</sub> level was less than 350 ppm
1959	315.97	The first year with a full year of instrument data

Source of Annual CO<sub>2</sub> Data: NOAA-ESRL Data File Created January 6, 2015

the efforts made to mitigate it. This is also mirrored in the 5th report of IPCC which was produced in October 2013.

**The vital role of urbanization in global warming**  
**Intensive Emissions of Greenhouse Gases (GHGs) is cities’ trend**

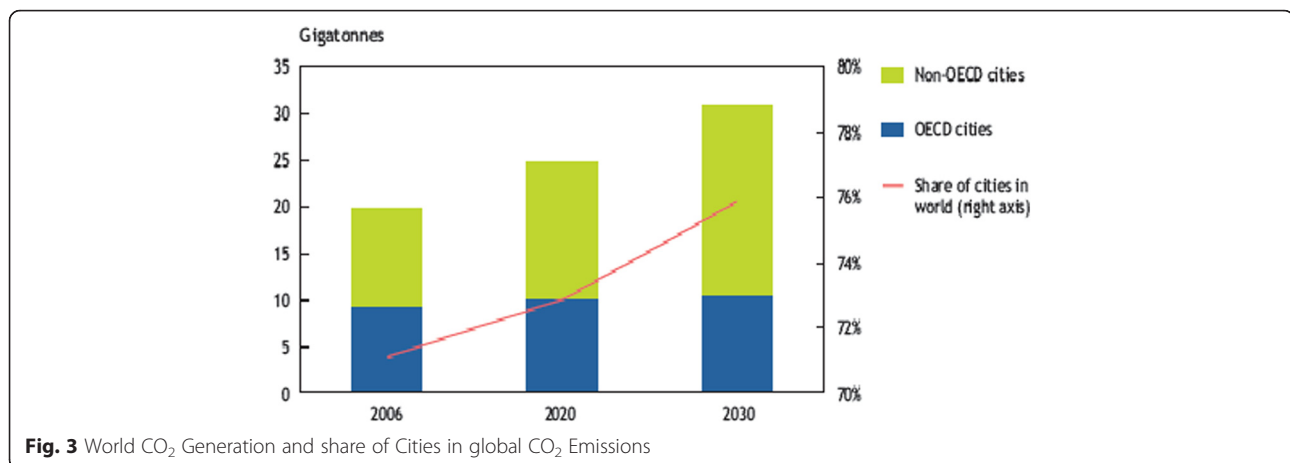
Cities, which are driven by energy, have been incessantly burning fossil fuel and similar nonrenewable energy products which are the major sources of GHGs- leading to global warming and the consequential trends of climate variations. These are significantly intensifying the severity of the great sufferings of our time. Cities use energy in transportation, electricity generation, industry and many activities including activities at homes, workplaces and their usage is associated with increased rates of energy consumption amounting to several times greater than villages. Khartoum city energy consumption for example amounts to 70-75 % of total Sudan national energy consumption despite the fact that it accommodates less than 20 % of the Sudanese population.

Anna Tibaijuka [4], Executive Director of UN-HABITAT, addressed the High Level Plenary in Bali (COP 13), and stated that three-quarters of global energy consumption occur in cities, and an equally significant proportion of GHGs emissions are produced by these cities. Hoornweg who is the lead urban specialist at the World Bank, at al [5] considered the majority of total global energy to be consumed by cities and that more than 80 % of greenhouse gas emissions was produced by urban centres.

According to the European Institute for Energy Research (EIFER) [6] cities are responsible for the largest consumption of energy resources worldwide – between 60 to 80 % – and account for a roughly equal share of global CO<sub>2</sub> emissions.

The International Energy Agency (IEA) [7] stated that carbon dioxide emissions from energy use in cities grows by 1 8 % per year (versus 1 6 % globally) under business-as-usual scenarios between 2006 and 2030, with the share of global CO<sub>2</sub> from cities rising from 71 to 76 % as shown on Fig. 3

Another contributor to GHG effect is the “Dust Domes and Heat Island Effects”, a local mega city phenomenon called the “Urban Microclimate”, which usually evolves as a result of city intensive industrialization, its location characteristics and the population habits. The dust clouds and smoke that hang over the city in the biosphere and accumulate in the air (sink) don’t disappear except at great altitudes and thus - form smog. The suspended particulates and the smoke together with water vapour, create an “urban dust dome” or what is known as ‘Urban Heat Island Effect’ or ‘Greenhouse Effect’. The term “Urban heat island”(UHI) describes urban built up areas that are hotter than nearby rural since cities surfaces are prone to release large quantities of heat. The temperature difference is usually



greatest at night, and is most apparent when winds are weak. The main cause of the urban heat island effect is from the modification of land surfaces. However, it is unlikely that any uncorrected urban heat island and land use change effects have raised the estimated centennial globally averaged land surface air temperature trends by more than 10 % of the reported trend as considered by scientists. This is an average value; in some regions that have rapidly developed urban heat island and land use change impacts on regional trends may be substantially larger.

Therefore, since cities drive the vast majority of the world's energy use and are major contributors to global GHG emissions it is obvious that cities are the prime driver of global warming. Thus, climate change is a creation of cities and the frontier in the fight against climate change lie on normalizing urban growth and developing the countryside to sustain rural life for the people who work the land and perform reforestation. This is because cities will continue to consume energy and generate CO<sub>2</sub> as discussed in the following paragraphs.

#### Cities are economic engines

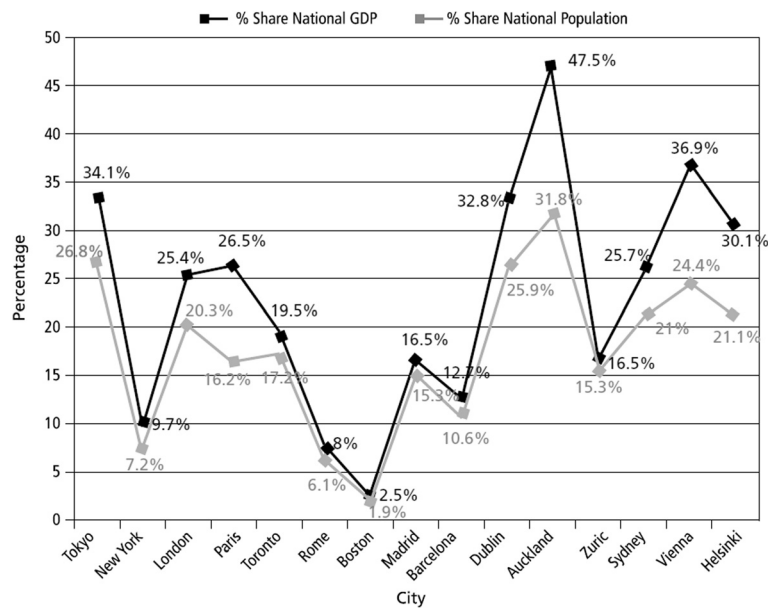
Developed cities are known for their high economic contributions including developing cities which are becoming hubs of economic activity and despite their weakness and the high rates of their residents' unemployment, they still offer daily activities for the residents' life and are the main places for production and economic growth. Cities are normally more productive than rural areas in the same countries. They are concentrating disproportional parts of the economy, resource consumption and the decision making power in most countries. Developed cities being the centre of industrial activities or trade and transport they produce more than their countries average as exhibited in Fig. 4. However, the central role of cities in national economies is more significant in developing countries than in developed countries. This is clearly emphasized in Table 2 which was

produced in 2001 by UN-HABITAT [8]- it - shows that per capita production in a developing city may reach 500 % compared to its country national average GDP/Capita as the case in Kinshasa, Congo.

According to Richard Dobbs and others [9] from McKisey Global Institute 80 % of the global economic production takes place in urban areas.

When considering cities' energy consuming activities as integral parts of the process of urbanization, the issues of:

- Transportation is of particular importance in countries where motor vehicle ownership is expanding rapidly. The increased dependence on private motorized vehicles is a major source of urban GHG emissions
- Engineering networks are essential. They add to the sources of GHGs since they constitute a large percentage of energy used from power generators. These networks include electricity supply, production and distribution of fresh water, collection and treatment of wastewater, and the reclaimed water recycling and discharge, collection of solid waste etc.
- Industrial activity is very significant because it increases the amount of carbon in the atmosphere, mainly in the form of carbon dioxide, primarily from burning fossil fuels for different manufacturing activities. It has to be noted that many polluting and carbon intensive manufacturing processes have now been sited elsewhere in developing cities to take advantage of lower labour costs and the relaxed environmental regulations. Developing cities will therefore be in need of energy whether renewable or not to catch-up with developed cities and serve their residents. Table 3 reflects the huge deficit in energy consumption in most developing countries when compared to that of the developed ones. United



**Fig. 4** Share of National Population and GDP in Key Cities in Developed Countries. Source: UN – HABITAT: The Economic Role of Cities

States (US) or Canada presently consumes more than 20 times that of an IGAD country.

**Loss of arable lands to urban development**

Loss of forests and vegetation covers to urban development is a continuous malpractice undertaken by cities which are associated with endless sprawl because of the rapid annual urban growth, namely developing cities. Squatters are incessantly encroaching on arable land that may previously have been covered with vegetation – thereby reducing its potential to absorb CO<sub>2</sub> through trees and other plants that collect CO<sub>2</sub> from the atmosphere. Added to that is the construction sector which is fundamentally impacted by

**Table 2** Contribution of Cities to National GDPs

City	Population of the city vs. the state in percentage	Contribution to GDP
Sao Paulo	10.5 %	19.5 %
Buenos Aires	32.5 %	63.2 %
Dhaka, Mumbai and Khartoum		Each generates more than 200 percent higher GDP than their population share
Addis Ababa		Generates more than 360 percent higher GDP than its population share
Hanoi		Generates 460 percent higher than its population share
Kinshasa		Generates more than 500 percent higher than its population share

Source: UN – HABITAT: The Economic Role of Cities

people’s daily life and this contributes to carbon emissions, particularly cement manufacturing.

Fuelwood from the countryside is another source of GHG, as many families consume charcoal and fuel wood in households. For example, in Sudan, forests contribute to between 70 – 80 % of the total energy consumption,

**Table 3** Energy use (kg of oil equivalent per capita) in Selected Countries

Country name	2008	2009	2010
Australia	5779	5739	5593
Canada	7946	7434	7380
Finland	6639	6227	6787
Iceland	16868	16905	16882
Luxembourg	8610	7939	8343
Norway	6250	5831	6637
United States	7488	7057	7164
Benin	392	400	413
Congo, Dem. Rep.	356	357	360
Eritrea	137	142	142
Ethiopia	396	398	400
Kenya	461	476	483
Mozambique	421	428	436
Nepal	332	338	341
Senegal	261	270	272
Sudan	364	374	371
Tanzania	449	446	448

Source: IAE Statistics and World Bank Data

as it is the easiest way of producing energy for cooking. This results in deforestation in rural areas, causing permanent removal of trees from forests without planting new ones and the consequential increase in levels of carbon dioxide in the atmosphere because trees absorb CO<sub>2</sub> for photosynthesis. Agriculture is another cause of deforestation - farmers remove large number of trees to increase acreage for crops and livestock, affecting the carbon cycle.

Also nearly all residents rely on inward flows of food and consumer goods that may result in GHG emissions from areas outside the city

**Developing cities are growing extremely fast and so will consume more energy**

In 1970, 37 % of the world population resided in urban areas. In 2014 this increased percentages have changed to 54 % as indicated in Fig. 5 produced by the Population Division of UN Department of Economic and Social Affairs [10]. In 2030, the urban population is expected to grow and reach 60 % of the total population. The growth is expected to be highest in the less developed countries as shown by Fig. 6 which is based on data from UN Department of Economic and Social Affairs [10].

It is to be noted that more than 20 cities worldwide are with a population exceeding 10 million, and the pattern is on the increase particularly in less developed countries, as shown in Fig. 7.

It is noted that most of the mega-cities and large urban centers are growing in the South and that large cities such as Bangalore, Mexico City and Cairo are found morphing into new spatial configurations in which they amalgamate other cities and towns of various sizes within their economic orbit. In other cases, two or more large cities, such as Mumbai and Delhi in India, Sao Paulo- and Rio de Janeiro in Brazil, or Ibadan-Lagos and -Accra in Africa form transport corridors for the purposes of industrial development, business services and trade.

Rapid urban growth habitually could end up with serious social and environmental challenges, such as urban poverty and various forms of pollution. In order to keep up with rapid urban expansion and urban population growth, more resources and production are required. The ever-increasing production and consumption in cities result in serious environmental problems in terms of the pollution of air, water and land as well as the degradation of ecosystems.

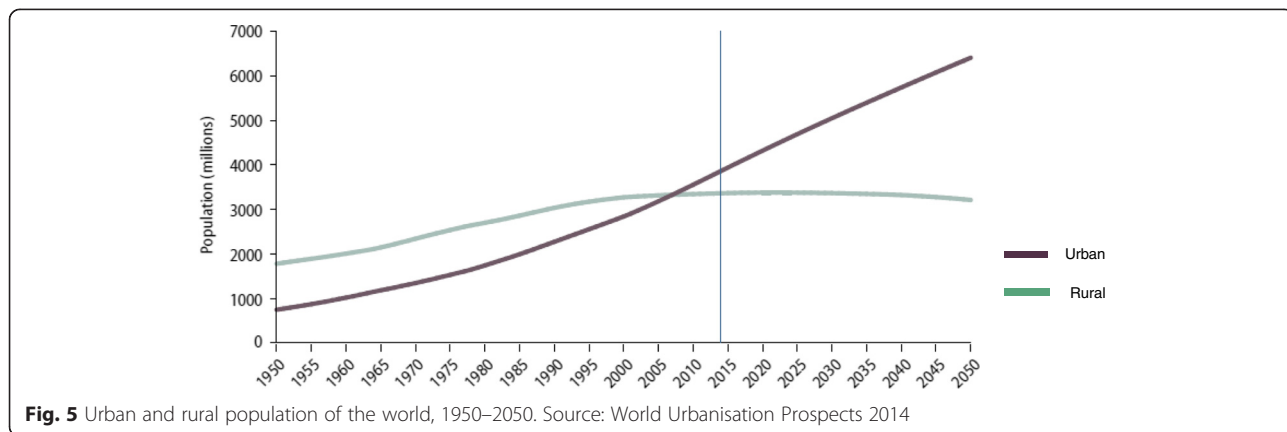
**Adoption of industrialization as a model of economic growth by developing cities**

Developing cities are following the steps of the industrial ones and most of them prefer industrial development as a means for economical growth. Developing countries have rushed for implementing industrial programmes despite the fact that they are well equipped for expansion in agricultural activities rather than for industrial development. This is because industrial products are more valuable and profitable than agricultural commodities.

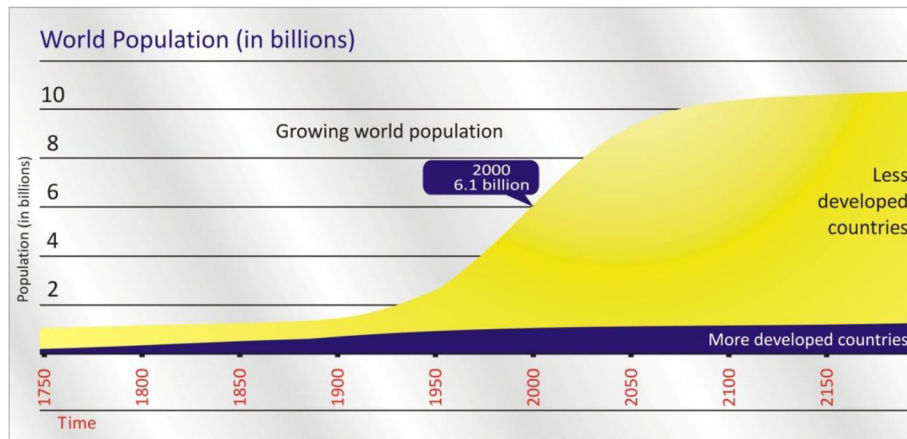
While manufacturing has declined in importance in developed countries, it has expanded rapidly in some developing countries. Countries such as Brazil, China, India and South Africa – encouraged by economic and geopolitical changes – are now centres for global manufacturing. Their industries have been intensified, expanded and their production is increased to meet the needs of the global market. Even the peripheral areas in some cities in the developing world receive global funding, in terms of the high tech industries and other industrial service, which are concentrated and developed without feasibility studies or prior planning, as is currently happening in some cities of East Asia.

**Inability to implement climate change mitigation measures by developing cities**

Developing cities are in need of the use of whatever source of energy. They can't:



**Fig. 5** Urban and rural population of the world, 1950–2050. Source: World Urbanisation Prospects 2014



**Fig. 6** Rate of population growth in developed countries compared to less developed countries. Based on data from UN Department of Economic and Social Affairs, 2001

- Afford green technology

Poor countries are unable to implement policies that provide safe energy supply because of the prohibitive cost envisaged for the reduction of GHGs which requires use of alternate or renewable energy. They will not consider using alternative energy unless it becomes affordable to their nations - they are in need to run their factories and provide mobility to their urban dwellers which is already in limited supply.

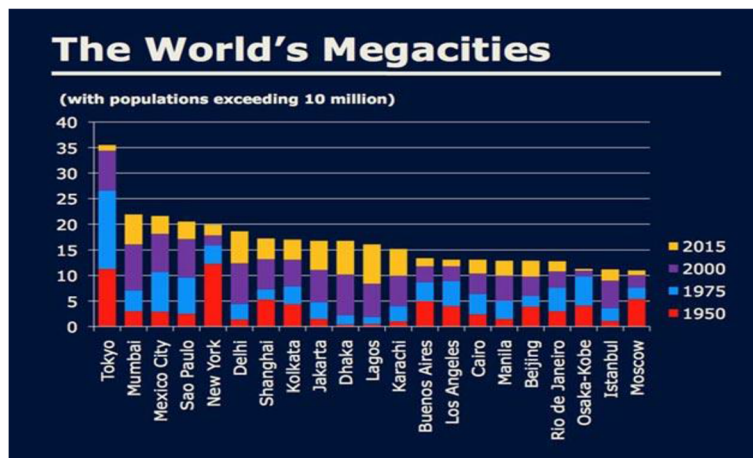
- Establish large capacity public transport systems

Nothing can be done by most developing countries to solve the transportation problem – there is - insufficient public transport capacity and low traffic speed in addition to a limited network of paved roads. Growth rates of private vehicle ownership in the developing world continue to soar

despite the fact that the rates of private cars ownership in the developed countries is exceptionally high and more than tens times the rate in the developing countries. According to Table 4, for example the number of motor vehicles in some European countries e.g; Finland and the United States varies between 612 and 797 vehicles per 1000 people respectively, while this number is in the range 3 - 27 in Ethiopia and Sudan respectively. Large capacity systems such as trains, metros, transit rails, and large capacity buses are not expected to operate in the near future, but instead - private vehicles utilization rates will increase because cities will not inhibit their use due to absence of alternatives.

- Adopt “Compact City” model of physical development

It is known that a negative correlation exists between population density and atmospheric GHG emissions;



**Fig. 7** Population of the world Megacities. Source: <http://www.megacitiesproject.org/images/perfect-chart.jpg>

**Table 4** Number of annual Deaths and Number of Vehicles for Some Countries in 2002 or 2004

Country	Number of deaths per 100'000 of population	Number of vehicles per 1'000 persons
Australia	9.3	616
Belgium	13.9	522
Canada	9.3	585
Germany	8.8	572
Japan	7.4	677
Netherlands	6.7	427
UK	5.6	434
USA	15	779
Norway	7.7	559
Denmark	9.5	424
Costa Rica	20.1	162
Colombia	24.2	67
Egypt	7.5	35
Thailand	21.0	280
Ecuador	16.9	47
China	19	80
Panama	16.4	112
Mauritius	14.7	195

Source: Compiled from different sources including World Report on Road Traffic Injury, World Health Organisation, Geneva 2004 and World Bank Data, 2003

spatially compact and mixed-use urban developments have generally significant benefits in terms of GHG emissions reduction. The development pattern adopted by the majority of developing cities is urban sprawl which is contrary to 'Compact City' model resulting in reduction of energy and services cost. The incessant displacement of rural people, the continuous exodus towards cities; and the excessive expansion of makeshift settlements and uncontrolled development produce huge subdivisions of sprawled physical development overwhelmed by poor dwellers living in shanty settlements. The substantial horizontal expansion of Greater Khartoum in Sudan and Addis Ababa in Ethiopia is a typical example and has been encouraged by abundance of land serviced with water,

construction of cheap building forms and lack of development control. In both cities the population density decreases by time as indicated in Table 5.

In conclusion, when considering the above prevailing situations in developing cities and the expectation that these cities become centres of powerful forces of economic growth and wealth so they will be expected soon to emit very large volumes of GHGs more than what developed cities are generating. This argument is supported by the circulated data produced by reputable agencies. According to data from Statista [11], three of the largest five producers of CO<sub>2</sub> emissions worldwide in 2014, based on their share of global CO<sub>2</sub> emissions and which were not expected to generate CO<sub>2</sub> more than the industrial countries were China, India and Brazil. The five largest producers were China 23.4 %, USA 16.69 %, India 5.7 % - Russia 4.87 % and Brazil 4.17 %. Also, the evidences from the IEA Annual Reports [12] - and the 2015 data on the Statista Website show that the CO<sub>2</sub> emissions of OECD countries dropped from 66.1 % in 1983 to 41 % in 2010 and - 38 % in 2012. The CO<sub>2</sub> emission of Non-OECD Europe and Eurasia dropped from 16.2 % in 1973 to reach 8.6 % in 2012 while the CO<sub>2</sub> emissions of China increased from 5.9 % in 1973 to 24.1 % in 2010 and 26 % in 2012. The CO<sub>2</sub> emissions of Africa have almost doubled from 1973 at 1.8 % to 3.3 % in 2012, while that of Asia has more than tripled, increasing from 3 to 11.6 % in 2012. The CO<sub>2</sub> emissions of Middle East have jumped from 0.8 % in 1973 to 5.2 % in 2012. In addition, the CO<sub>2</sub> emissions of North America and Europe were almost equal to the rest of the world in 1990 but currently they are less than one third as indicated in Fig. 8 showing that emissions from developing countries are constantly increasing from year to year.

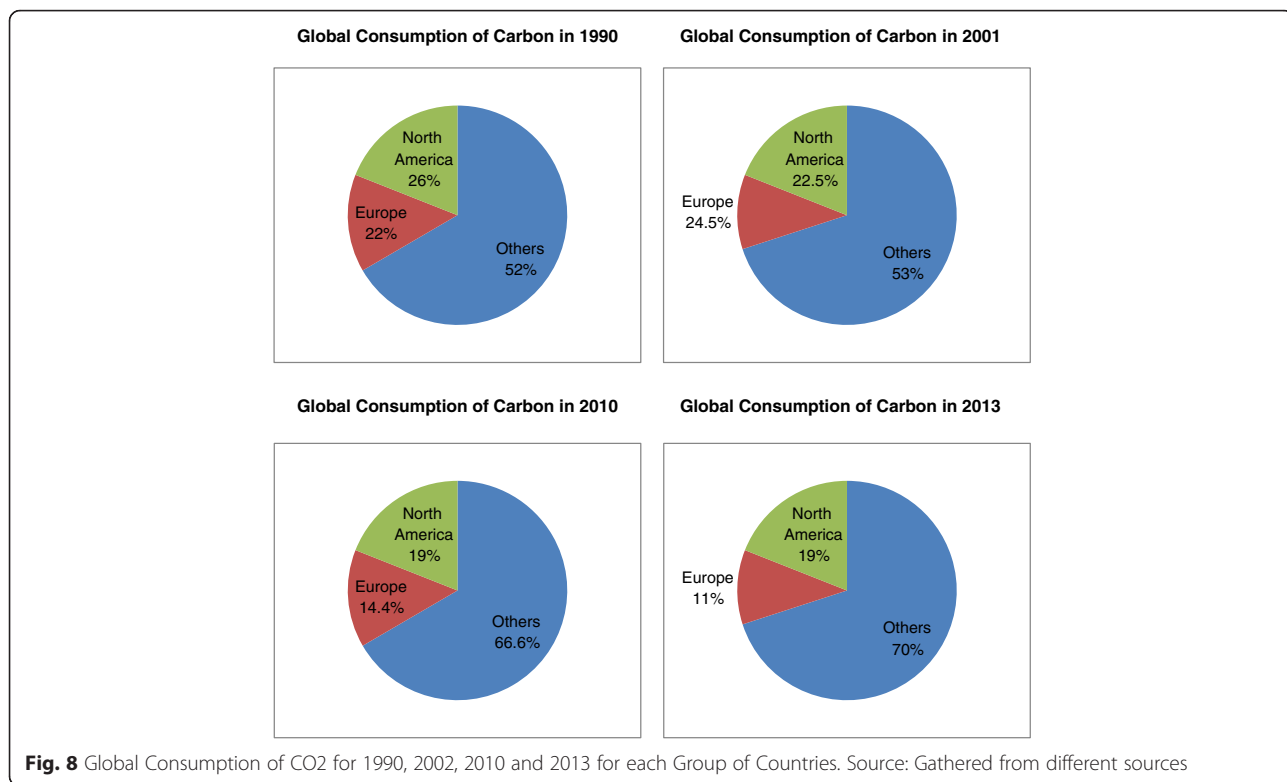
Although they were not part of the binding framework to reduce emissions, the substantial emissions from Brazil, China, India, Indonesia and South Africa - has compelled them to take a more progressive role in international climate negotiations.

For all the above reasons, climate change cannot be combated without the exertion of enough efforts by

**Table 5** Growth of the Physical Block and Population Density in Khartoum and Addis Ababa

Year	1955	1970	1980	1984	1994	1998	2000	2002	2005	2006	2010
Population in (000) KRT	0250	0640	1170			4372		5139	5761	6010	7000
Total area in (ha) KRT	1680	3000	22840			80250		NA	NA	132300	165000
population density in person/ha KRT	149	213	51			55		NA	NA	45	42
Population in (000) ADDIS	036			1423	2113		2495				
Total area in (ha) ADDIS	460			2240	4350		6154				
population density in person/ha ADDIS	783			635	486		405				





developing cities or finding cheaper alternative energy affordable to them.

**UN efforts and their effectiveness in combating climate change**

**UN efforts to combat climate change**

The United Nations Framework Convention on Climate Change (UNFCCC), is an international environmental treaty, and its objective is to “stabilize GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”. The treaty provides a framework for negotiating specific international treaties called “protocols” that may set binding limits on GHGs. The parties to the convention have met annually from 1995 in Conferences of the Parties (COP) [13] to assess progress in dealing with climate change. In 1997, the Kyoto Protocol was concluded and established binding obligations for developed countries to reduce their GHG emissions. The Kyoto Protocol has had two commitment periods, the first was in the period 2005-2012, and the second is in the period 2012-2020. By the time the first commitment period expired on the 31st December 2012, the Protocol had 83 signatories worldwide, unfortunately; only 55 of the original signatories ratified the agreement. The US is one of the largest polluters and among those who did not ratify the Kyoto Protocol.

One of the first tasks set by the UNFCCC was for signatory nations to establish national GHG inventories of

emissions and removals, which were used to create the 1990 benchmark levels for accession of Annex I countries to the Kyoto Protocol and for the commitment of those countries to GHG reductions. Updated inventories must be regularly submitted by Annex I countries.

The COP18/CMP8 meeting held in Doha, Qatar, in November - December 2012 was considered fruitful since it opened up a new gateway driving governments to take the essential steps in the global response to climate change. Countries in Doha endorsed the completion of new institutions and agreed ways and means to deliver scaled-up climate finance and technology to developing countries and are committed to implement COP18/CMP8 as follow:

- Continue the Kyoto Protocol’s Market Mechanisms – the Clean Development Mechanism (CDM), Joint Implementation (JI) and International Emissions Trading (IET) as of 2013.
- Continue operating JI with the agreed technical rules allowing the issuance of credits, once a host country’s emissions target has been formally established.
- Speedily work toward a universal climate change agreement covering all countries from 2020, to be adopted by 2015, to curb emissions so that the world can stay below the agreed maximum 2 degrees Celsius temperature rise.

- Establish a pathway to provide the most vulnerable populations with better protection against loss and damage caused by slow onset events such as rising sea levels.
- Implement national adaptation plans for least developed countries including linking funding and other support
- Further clarify ways to measure deforestation, and to ensure that efforts to fight deforestation are supported.

The 20th COP took place in Peru in December 2014 which gave way for the new 2015 agreement on climate change to be signed in Paris and harnessed the action by all nations.

It should be noted that the overall processes of the UNFCCC and the adopted Kyoto Protocol have been criticized by not having achieved its stated goals of reducing the emission of carbon dioxide as discussed above. The failure to achieve meaningful progress and reach effective CO<sub>2</sub> reducing-policy treaties among the parties over the past eighteen years have driven some countries like the US to never ratify the UNFCCC's because according to US the treaty didn't cover developing countries which some of them are now considered the largest CO<sub>2</sub> emitters. Other air polluting countries may follow US as reported in COP documents but for different reasons. In 2010 in Cancun, Japan stated that it will not sign up a second Kyoto term, because it would impose restrictions on it not faced by its main economic competitors, China, India and Indonesia. A similar indication was given by the Prime Minister of New Zealand in November 2012 in Doha. At the 2012 conference in Doha, last minute objections at the conference by Russia, Ukraine, Belarus and Kazakhstan were ignored by the governing officials, and they have indicated that they will likely withdraw or not ratify the treaty. These defections place additional pressures on the UNFCCC process. However, a positive attitude was noticed in the Paris Agreement, which was concluded in the last minute of the COP 21 Conference.

The Paris Agreement, which has been adopted by 195 countries, is the first-ever universal, legally binding global climate deal. The most essential provisions of the agreement are:

1. Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C.
2. Providing support to developing countries in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing countries' Parties will allow for higher ambition in their actions.

3. Parties shall take into consideration in the implementation of Paris Agreement the concerns of Parties with economies most affected by the impacts of response measures, particularly developing countries' Parties.

### **Ineffectiveness of UN current policies**

Throughout the past years, polluting countries have announced individual commitments to cut carbon dioxide emissions in hope these cuts will keep global temperatures from rising by more than 3.6 °F (2 °C) by 2100. The statistics show the pledged emission cuts aren't anywhere near enough to combat climate change. The recent Paris Agreement may restore a faith in UN process if implemented but does not reduce temperatures as needed unless all the drivers of climate variability are considered and in particular the abortive role of developing countries. This is in addition to the defections expected from some polluting countries that may not fulfill their obligations if their competitors are not complying. On Saturday 12 December 2015 Professor James Hansen, Department of Earth and Environmental Sciences at Columbia University and a leading climate scientist - credited as being the "father of climate change awareness" - denounced the Paris Agreement. He told the Guardian, a British news paper, after the Paris Agreement was concluded that "as long as fossil fuels appear to be the cheapest fuels out there, they will be continued to be burned". The author shares Professor Hansen's opinion that developing countries will accelerate the rate of energy consumption and this situation will prevail in the near future if preventive measures are not imposed to control CO<sub>2</sub> emissions by these countries. Other reasons include:

- UN Program appears to be concentrating on mitigating the impacts i.e. the symptoms of climate change rather than targeting the main grassroots causes of climate variations. All UN efforts are primarily focused on assisting communities to cope with adverse effects of climate change and mitigate its impacts thus, engaging countries to climate change adaptation through facilitation of a number of actions that reduce GHG emissions and improve urban resilience. The main cause of climate change is that the World is making more cities than villages and ruining the countryside by deforestation and clearance of the vegetation covers. This phenomenon is disturbing the environmental balance of our ecosystems which is formed by a community of animals, plants and microbes performing the activities of living, feeding, reproducing and interacting. The ecosystems are organized in a state of stability where species coexist with other species and with their environment. This

balance is sustained by the relationship that exists between all the components of an environment as stated by the Great Creator “And the earth - We have spread it and cast therein firmly set mountains and caused to grow therein [something] of every well-balanced thing, Verse 19 of Al-Hijr.

Therefore, we ought to seek answers in the divine books descended by almighty the Great Creator who ordered and instructed mankind to keep this balance.

The Quran, the final revelation of God’s word among the four divine books states: “Disperse within the land”, Al- Jumua, (10). “My earth is spacious”, Al-Ankabut, (56). “And whoever emigrates for the cause of Allah will find on the earth many [alternative] locations and abundance”, Al-Nisa (100). Almighty also forbids mankind from being excessive. The Quran states: “Do not spend wastefully”, Al-Isra (26). “Eat from the good things with which We have provided you and do not transgress”, Ta-Ha (81). “Children of Adam, take your adornment at every masjid, and eat and drink, but be not excessive, Al-A’raf (31). “And do not obey the order of the transgressors”, Ash-Shu’ara (151). “Then remember the favours of Allah and do not commit abuse on the Earth”, Al-A’raf (74)

The situation is better described by the Verse: “Have you not considered those who exchanged the grace of Allah for thankless and settled their people [in] the home of ruin”? Ibrahim (28)

- UN has not yet fully mobilised cities for Combating CC despite their spearhead role in this process and the risks they are subjected to. Many cities have not yet genuinely addressed climate change and particularly developing cities. The reasons include lack of capacity and resources in developing cities together with lack of public and local governance awareness on climate variability. In addition, one of the key goals of urban sustainable development is to promote energy and resource efficiency in the building sector and to provide good, healthy and affordable buildings for people in cities and these have not been tackled in the majority of cities worldwide. The majority of these cities lack implementation of relevant city policies and action plans; the prevailing regulations on urban development and environment have not been adjusted to combat climate change.
- UN policies together with climate change impacts are driving rural populations to leave their land. Drought has affected the physical, social and economic life of most African communities for recurrent and prolong periods of droughts in some developing countries are now lowering the yield of

crops, decreasing animals’ grazing areas and causing poverty, death of livestock as well as triggering social, economic and political tensions and repetitive armed conflicts. It is known that the poor will always be a threat to the environment through their malpractices. Some go searching for firewood as it is the easiest way of producing energy for cooking besides cutting the scattered trees for building their shacks, using the available few grass for roofing and forage for their animals. The outcome of this process is the uprooting of rural population and further migration towards cities.

- Urban bias global policies that encourage rapid urbanisation have not been reformed to normalize the process of urban growth. These include:
  1. The structural adjustments packages imposed by international financial institutions on the developing countries to integrate into the international economy have opened the door for the capitalist economic model and pave the way for industrialization through utilization of science and technology while retarding traditional economies and agriculture. Also the multinational giant companies increased their role and strengthened their power in the global economy..“Science and Technology” is almost in the hands of giant international companies and lack of control by the community is encouraging these companies to over-exploit resources for profit.
  2. The World Trade Organization and the current system of trade, monetary flows, production and consumption, allows few of the rich people to increase their wealth at the expense of others. Opportunities of exports from developing countries to the international markets are substantially reduced because cost of agricultural production has increased. In addition, agricultural products produced by farmers in industrial countries are subsidized and this lowers the prices of agricultural commodities in the international markets.
  3. Over-usage of natural resources through excessiveness of the rich is not checked. The basic environmental problem thus, facing humanity is the continual extravagant usage and depletion of natural resources by developed countries. On the other hand, giving assistance to the poor is seen by the rich as charity, not a right or social justice. Since 1986, international organizations and the UN agencies have talked about poverty reduction but in fact the poverty rate in developing cities has increased and the rich countries have become richer. In Table 6, the

**Table 6** Percentage of poor families in selected cities 1993/1998/2003

CITY	Country	Percentage of the poor families 1993	Percentage of the poor families 1998	Percentage of the poor families 2003
Porto Novo	Benin	22 %	32 %	49 %
Kigali	Rwanda	65 %	50 %	52 %
Dakar	Senegal	38 %	13 %	55 %
Mombassa	Kenya	23.6 %	27.2 %	31.3 %
Lagos	Nigeria	53 %	66 %	62 %
Sana'a	Yemen	14 %	53 %	63 %
Nairobi	Kenya	20.8 %	30.0 %	41.1 %
Kumasi	Ghana	26 %	31 %	29 %
Rio de Janeiro	Brazil	17 %	19 %	30 %

From different sources

percentage of poor families in Porto Novo, Benin has increased from 22 % in 1993 to 49 % in 2003. Likewise the poverty figures have increased in Sana'a, Yemen from 14 % in 1993 to 63 % in 2003. Even in countries with high GDP such as Nigeria, the percentage of poor population in Lagos has increased from 53 % in 1993 to 62.5 % in 2003. In Rio de Janeiro in Brazil, the poor families' percentage increased from 17.5 % in 1993 to 30 % in 2003, as noted in the global urban Observatory [14] and World Bank reports [15].

- The UN has not pushed hard to implement good governance worldwide to bring national governments closer to people in developing countries so as to abandon policies triggering wars where fighting has been going on in a number of developing countries and some of these wars are still raging because external forces stock them with arms and ammunition - the result is uprooting of huge influxes of IDPS and migrants who flood developing cities and desert the countryside. National governments shall also be aided to implement water harvesting projects in arid regions and provide social and public services to keep native people in place

### UN policy reformation

A major shift in climate change combat approach by UN, state governments and the international community is urgently required. A new UN strategy targeting the main causes of climate change, which is the imbalance between urban and rural environments, should be put in place supported by sound policies that make the countryside a more appealing place to live in and work with the aim to normalize urban growth, restore rural life, promote reforestation and enhance eco-agriculture. Wolfgang Buermann [16], a geographer at Boston University, confirms that plant growth can have a considerable effect on the climate. He

identified several ways through which plants can alter the temperature of the Earth's atmosphere. The data are available in one or more of NASA's Earth Science Data Centers.

Through the process of photosynthesis, plants use energy from the sun to draw down carbon dioxide from the atmosphere. Plants also cool the landscape directly through the transpiration process. They often release excess water into the air from their leaves when the surrounding atmosphere heats up and by releasing evaporated water, plants cool themselves and the surrounding environment.

It is worth mentioning that the concept of restoration of the countryside environment should be engraved in the minds of those who draft UN Climate Change Programme.

Financial support to developing countries alone is meaningless without reformation of the global and national policies that retard climate change combat.

It is high time that mobilisation of Sub-national Governments is sought because cities and other localities can make up the difference since local leaders often have more autonomy to enact regulations and enforce government resolve.

Most importantly is to bring justice to all Earth inhabitants by enforcing good governance worldwide, alleviating poverty and pushing for a dramatic change in the developed nations' lifestyle associated with excessiveness while putting science and technology at community service

### Endnote

This paper bears no endnotes.

### Abbreviations

CC: climate change; COP: Conferences of the Parties; EIFER: European Institute for Energy Research EIFER; ESRL: Earth System Research Laboratory; GHGs: Greenhouse Gases; IEA: The International Energy Agency; IPCC: Intergovernmental Panel on Climate Change; NOAA: National Oceanic and Atmospheric Administration; PPM: parts per million; RF: radiative forcing; UNDP: United Nations Development Program; UNEP: United Nations

Environment Programme; UNFCCC: United Nations Framework Convention on Climate Change; WMO: World Meteorological Organization.

#### Competing interests

The author has no interest and is not influenced by personal or financial relationship with other people or organizations.

#### Author's information

Dr. Bannaga is a graduate of *Loughborough University, UK* with MSc and PhD in 1974 and 1977, respectively and he was granted BSc from Faculty of Engineering, University of Khartoum in 1971.

HE started his practice in many international and national firms and institutions, in his early stages of practice, worked at the reputable international consultancy firm, *Sir Alexander Gibb and Partners Consulting Engineers* in London and supervised many international projects. Later he joined the *Saudi Arabian National Guard* in Riyadh in 1979 where he managed and supervised many housing and infrastructure projects for the Saudi National Guards. After gaining great experiences, Dr. Bannaga joined the UN in mid eighties and worked as expert for *UNDTCD* and participated in regional planning projects and other engineering projects undertaken by the Physical Planning Agency, Ministry of Municipal & Rural Affairs, Riyadh KSA.

In 1989 Sudan Government called Dr. Bannaga and appointed him a *Minister of Engineering Affairs* and later a *Minister of Housing & Public Utilities-Khartoum State* until he left office in mid 2001. During his mandate he achieved a lot of works that changed the face of Khartoum Capital; the first successful project was the re-planning & restructuring of the Greater Khartoum urban structure and reallocation of urban functions which included slums upgrading and villages organization for absorption in the urban fabric as well as restructuring of the transportation network. In 1994 he was granted the *Star of Achievement*, the highest medal of the state offered to officials as a reward for his outstanding performance. He executed the giant Housing Plan of Greater Khartoum which paved the way for all of the metropolis citizens to settle. He was able to renew and expand the urban networking to cope with the burgeoning population which surpassed over five million at the time. One of Dr. Bannaga's most known achievements in Khartoum is the construction of the *Salvation and Menshia bridges* that link the tri-capital cities, Khartoum, Khartoum North and Omdurman and upon this he was granted the *medal of Sudan's Loyal Son* in 2000, the highest medal granted to the Sudanese by the state and he ranks number seven in the list comprising those granted since Independence Day (1/1/1956).

It is worth mentioning that Dr. Bannaga has been rewarded by international and regional institutions - he was granted the *Prize of The British Institution of Water Engineers & Scientists* in 1979, the *Arab Environmental Shield* from *Arabian Union for Youth and Environment*, Arab League in 1996, the *Honorary Doctorate* from the *University of Juba, South Sudan* in 1999, and the *Honorary Doctorate* from the *University of Khartoum* in 2001.

Dr. Bannaga is a recognized professional engineer. He is a Fellow of the *British Chartered Institution of Water and Environmental Management- CIWEM*, Fellow of the *Sudan Engineering Society* and *Chairman of its cultural committee*. He is a member of the *International Society of City and Regional Planners- ISOCARP*, the *World Society of Sustainable Energy Technology- WSSET* and was member of the *British Institution of Water Engineers and Scientists- IWES*, the *British Institution of Public Health Engineers*, and the *American Society of Civil Engineers – ASCE* and

He published too many papers and articles in reputable scientific journals and was rewarded by IWES in 1979. The majority of the papers provides knowledge on water, urbanization and the physical environment. He edited eight books on urbanization, lands and human settlements covering primarily Greater Khartoum and the IGAD Sub-African region and five of them have been published by *Zurich University (ETH: Swiss Federal Institute)*. These include: *Treatment of Squatter Settlements, Reorganization of Villages and Reallocation of Urban Functions, Khartoum – a Profile of Urban Housing, the Displaced and Peace in Sudan, the Homeless Masses at Home, IGAD Region*. Other books include *Management of Islamic Cities between the Visions of Today and the Islamic Doctrine, Land Right of Use and Management Paradigm and the Salvation Bridge*. He chaired a committee that edited several books on similar subjects for the Sudanese Council of Ministers.

Dr. Bannaga is currently the President of the *Organizing Council for Consultancy Firms - OCCF, Sudan*, and the Chairman & Executive Director of the consultancy firm - *"Bannaga Consult"*. He is an associated professor, at

the *Sudan University of Science and Technology*, member of the *Council of Ministers' Consulting Group*, Chairman of two NGOs (*Child Development Foundation, Sudan + The International Family Organisation, Sudan*) and *Deputy Chairman of Alsogya Charity Organization, Sudan*.

#### Authors' contributions

The paper is written by one author and no contribution made by another person.

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#### References

1. Intergovernmental Panel on Climate Change, IPCC WGI AR5 website [www.climatechange2013.org](http://www.climatechange2013.org) and website [www.ipcc.ch](http://www.ipcc.ch) and [ipcc.ch/report/ar5](http://ipcc.ch/report/ar5), 2014 and IPCC website (2015)
2. Met Office, Hadley Centre and Climatic Research Unit, 2015. "Global Average Temperature Anomaly (1850 September 2015). Sourced at Internet: [www.metoffice.gov.uk/hadobs/hadcrut4/](http://www.metoffice.gov.uk/hadobs/hadcrut4/)
3. Earth System Research Laboratory. Trends in Atmospheric Carbon Dioxide, 2015. "Annual trend of Carbon Dioxide (CO<sub>2</sub>) concentrations". Global Monitoring Division, Earth System Research Laboratory, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce, The data is sourced at Internet: <http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html>
4. Anna T (2006) UN-HABITAT Address at the High Level Plenary. COP13, Bali
5. Daniel H, Lorraine S, Clauddia Lorena Trejos G (2011) Cities and greenhouse gas emissions: moving forward. Environment & Urbanization, International Institute for Environment and Development (IIED) XX(X):1–21, April 2011 Downloaded from [eau.sagepub.com](http://eau.sagepub.com)
6. European Institute for Energy Research EIFER (EIFER), 2011. Overview – Energy Cities and Territories, 2001. EIFER Website <https://www.eifer.kit.edu/-energy-cities-and-territories>
7. The International Energy Agency (IEA), 2009. Cities, Towns and Renewable Energy, OECD/IEA, 2009
8. UN-HABITAT (2011) The Economic Role of Cities, the Global Economic Dialogue Series. United Nations Human Settlements Programme 2011, Nairobi
9. Richard Dobbs and Others, 2011. "Urban world: Mapping the economic power of cities". McKisey Global Institute, March 2011
10. UN Department of Economic and Social Affairs, Population Division). "World Urbanisation Prospects 2014". The 2014 Revision, Highlights (ST/ESA/SER/A/352) and "World Population Growth 1950 – 2020" World Urbanization Prospects, the 2001 Revision
11. Statista Website (2015): Databases Available online at [www.Statista.com](http://www.Statista.com)
12. IEA Annual Reports, 2012-2014. "Key World Energy Statistics, 2012-2013 and 2014"
13. COPs: The 18th, 19th and 20th Sessions of the Conference of the Parties to the UNFCCC and in particular the 18th session of the Conference of the Parties, held in Qatar National Convention Centre, Doha, Qatar on 26 November to 8 December, 2012.
14. UN-HABITAT (2007-14). Global Urban Observatory.
15. World Bank Report (2001-2015) available online at <http://www.worldbank.org>
16. Buermann, W., Y. Wang, 2002. "How Plants Can Change Our Climate". NASA Earth Observatory, 6 May 2002. Available at NASA's Earth Science Data Centers.