

# From Economies of Scale to Emissions Economy

## Eco-regional Notes on Climate Change and Urban Areas



Indian Network on Ethics and Climate Change (INECC)  
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A Climate Education Booklet



**From Economies of Scale to Emissions Economy**

Eco-regional Notes on Climate Change  
And Urban Areas

a Climate Education Booklet

by

Centre for Education & Documentation

in collaboration with

Indian Network for Ethics in Climate Change (INECC)

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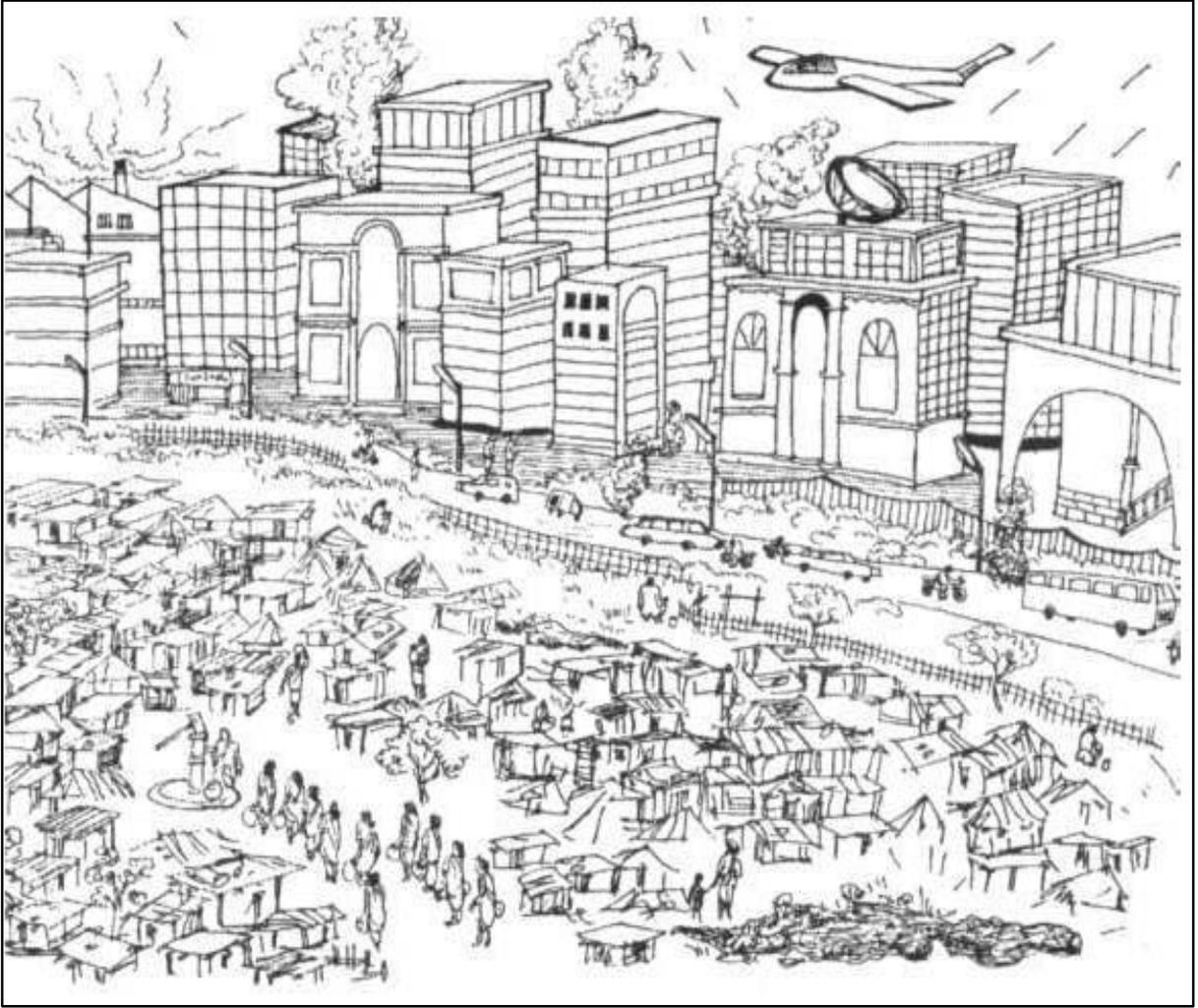
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*Eco-ethic, Dec 2002*

## Urban World: An Introduction

The world has experienced unprecedented urban growth in recent decades. In 2008, the world's population was evenly split between urban and rural areas. At that time there were more than 400 cities with populations over 1 million and 19 mega-cities with over 10 million people. The more developed nations had larger urban populations – about 74 percent urban, while less developed countries had only 44 percent. However now, urbanization is occurring rapidly in many less developed countries. It is expected that 70 percent of the world population will be urban by 2050. (Population Reference Bureau)

## Urban Population

India too is urbanizing rapidly. 12.8 per cent of the world's urban population growth between 2010 and 2025 will be in India. (Glaeser, Indian Express, 05 Jul 2012)

## Urban India

Currently 31.2% of India's population lives in urban centres (according to the 2011 census) compared with 27.8% in 2001 and 25.5% in 1991. For the first time since Independence that the absolute increase in population in urban areas is more than the increase in rural areas. Between 2001 & 2011, the increase in urban areas was 91 million compared to 90.4 million in rural areas. The biggest trend towards urbanization is in southern India, where all states except Andhra Pradesh have more than 35% of the population in urban centres. (Deccan Herald, 2011)

## More people, More slums

Besides having a large urban population, India has the world's largest population living in slums. 49.4 per cent of them are non-notified, as per the National Sample Survey 58<sup>th</sup> Round (2002). The figures do not include unrecognized informal settlements and people residing in poor quality housing in inner-city areas, on construction sites, in urban fringe areas and on pavements. (Agarwal, 2011)

In Delhi, the 2001 census estimated an urban slum population of 1.85 million, which was 18.7 per cent of Delhi's urban population (Poverty Estimates for 2004-05, PIB, 2007). But unauthorized settlements, including *jhuggi jhodpi* clusters (squatter settlements), slum-designated areas (slums recognized by the government, many of which are in the walled city) and unauthorized colonies and *jhuggi jhodpi* resettlement colonies (squatter resettlement colonies), are estimated to have a population of 9.84 million in 2001. Thus those with inadequate housing represent more than half of Delhi's total population, which is estimated to be 19 million in, 2001 (Government of National Capital Territory of Delhi, 2006); also (Bhan G, 2009). A further 100,000 people are homeless and reside on pavements, under bridges and by the roadside; many are rickshaw pullers and casual workers.

In 2004-2005, 80.8 million urban dwellers (25.6 per cent) were below the poverty line and the largest concentrations of urban poor populations were in Maharashtra (14.6 million), Uttar Pradesh (11.7 million) and Madhya Pradesh (7.4 million), and Tamil Nadu, Karnataka and Andhra Pradesh (each between 6-6.9 million).

Among the poorest quartile of India's urban population in 2005-2006, 81.5 per cent did not have access to piped water at home and 52.8 per cent did not use a sanitary flush or pit toilet; among the rest of the urban population, 62 per cent had access to piped water at home and 96 per cent used a sanitary toilet.

A large proportion of slums are located adjacent to large open drains, dumping grounds, or railway lines and they have to live amidst heaps of garbage, faeces strewn in the lanes or around the slum, clogged drains with stagnant slushy water. Such adversities in the physical environment lead to contamination of water, proliferation of flies, rodents and mosquitoes - that carry various diseases. Consequently slum families are prone to risks of excreta such as diarrhea, typhoid, jaundice and vector-related diseases such as dengue, chikungunya and leptospirosis. (Agarwal, 2011)

It is these poor populations who are the most vulnerable to the impacts of Climate Change. Any climate related incident will have devastating impact on their lives, making it that much more difficult to recover. Measures to enable adaptation to the effects of Climate Change like improved land use planning, housing, infrastructure and services which are essential, will save the city from repeated disaster expenditure. It also has the co-benefit of providing better development and city management. It is also expected to reduce air and water pollution, restore water bodies and promote effective waste management etc. (Sharma D, 2010). It is in this context that programmes like the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) which targets urban development and urban renewal, need to have a sub-component for climate adaptation, risk mitigation or vulnerability assessment for urban areas. (Revi A, 2008)



## Understanding Climate Change

Climate change is about long term global change in average weather patterns

Climate Change refers to long term changes in global and regional climates. It is about changes in the climate system as a whole which affect the average pattern and intensity of climate phenomenon. It does not refer to day to day changes in the weather.

These days however whenever we talk about climate change, we are referring to one type of climate change namely Global Warming.

Global Warming is about global average temperature increase due to increase in GHGs

Global Warming refers to climate change where there is an increase in temperature, over and above the normal temperature cycles. It specifically refers to increases in earth temperature caused by the increase in Green House Gases(GHGs) in the atmosphere. This increase is largely due to human activities, particularly after the industrial revolution.

## Why Global Warming?

Green House Gases (GHGs) like CO<sub>2</sub> act like a giant net around the earth, which allows short wave energy from the sun to pass through it, but traps the returning long wave energy. If the amount of these gases in the atmosphere increases, the net is thicker – It allows less heat to escape the earth compared to that which enters the earth. Therefore the earth becomes hotter. Actually, in proper proportions these gases enable the earth to maintain a temperature which supports life, as we know it. If these gases were totally absent in the atmosphere, the earth would have been around 30°C colder (which means ice like temperatures).

The most abundant greenhouse gas is water vapour (making up for about 60% of the greenhouse effect). We assume that global water vapour content did not change a lot during the last few centuries. And therefore even though largest in quantity, water vapour is not considered responsible for the additional warming (radiative forcing) that we experience today. The concentration of carbon dioxide, the second important greenhouse gas, however, has increased about 30 percent, from a pre-industrial level of about 270 parts per million to a current (June 2012) level of 395.77 parts per million. ([www.co2now.org](http://www.co2now.org))

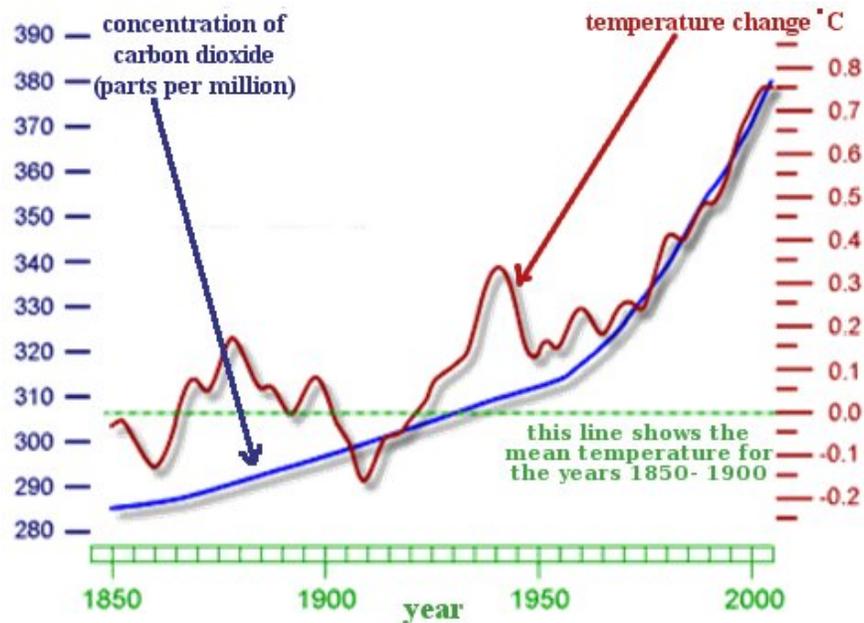
Burning of oil & coal produces CO<sub>2</sub> which is released into the atmosphere. This takes place in all our factories, cars, planes etc. When we use electricity, we don't see the emission of CO<sub>2</sub>, but CO<sub>2</sub> is produced in the power plants creating this electricity. Global emissions of CO<sub>2</sub> hit a record high of 31.6 gigatonnes in 2011, according to the IEA's preliminary estimates, an increase of 1 Gt, or 3.2 percent from 2010. The burning of coal accounted for 45 percent of total energy-related CO<sub>2</sub> emissions in 2011, followed by oil (35 percent) and natural gas (20 percent). ([PHYS.ORG](http://PHYS.ORG))

## Global Temperature increase

The net impact is that since 1901, the Earth has warmed over 0.7°C. An average temperature increase of 0.1°C per decade is already underway. This increase in temperature will start a vicious circle of less availability of water, increased water salinity, more soil salination, less cultivable land and less crop productivity, resulting in increase in concentration of atmospheric CO<sub>2</sub>, and in turn further increase in atmospheric temperature. If the consumption of fossil fuels such as coal and oil continues into the next century at projected rates, the carbon dioxide concentrations in the

atmosphere would reach the 600-700 parts per million by 2100 and the average temperatures could increase by as high as 6.4°C by 2100.

### Global Temperature increase since 1890(oC)



The latest high resolution modeling of the scenarios (see note of scenarios & models) of and projections for climate change in India shows that there will be an annual mean surface temperature rise by the end of century, ranging from 3 to 5°C to 2.5 to 4°C, with warming more pronounced in the northern parts of India.

## Impacts of Climate Change

Climate Change has a chain of impacts on this planet. Jeffrey Sachs of the Earth Institute speaks of four types of geographies that will

share the largest burden of climate change crisis. They are

- the low-lying coastal settlements,
- farm regions dependent on river water from glacier and snow melt,
- sub-humid and arid regions that suffer from drought, and
- regions of Southeast Asia facing changes in monsoon patterns.

India is considered more vulnerable to climate change as most parts of India falls into one of these four zones:

- We have a coastline of over 8118 km and touches eight states and two island territories. It is about 5700 kms on mainland and about 1800 kms in the two groups of islands which are most vulnerable
- We have the entire Indo-Gangetic plains, which rely of the river-waters fed by the Himalayan glaciers,
- We have large arid regions in the Deccan plateau and Rajasthan and finally
- Most of peninsular India is covered by either the south-west or the north east monsoon, and therefore vulnerable to changes in the monsoon patterns.

A 20% rise in all India summer monsoon rainfall and further rise in rainfall is projected over all states except Punjab, Rajasthan and Tamil Nadu, which show a slight decrease.

### **Extreme weather**

Most of the potentially damaging consequences relating to climate change are being associated with extremes - heat waves, floods, or severe storms. Extremes in maximum and minimum temperatures are also expected to increase and similarly extreme precipitation also shows substantial increases, particularly over the west coast of India and west central India.

As a result of global warming; oceans have become warmer, and humidity and water vapor have increased 4% since 1970. This has increased tropical storm activity.

As the planet gets warmer, more evaporation could take place leading to heavy rain and increase in frequency and intensity of floods.

However evaporation and precipitation occur at different places, and if the planet warms, while wet regions could receive even more rainfall, evaporation may be accelerated in drier regions and they could face acute water shortages. This, in turn, will accelerate desertification and give rise to acute water supply shortages.

### **Rise in sea-level**

The average sea level rose by 10 to 20 cm during the 20th century, and an additional increase of 18 to 59 cm is expected by the year 2100. Higher temperatures can cause the ocean volume to expand and glaciers to melt thereby causing the water to overflow onto the heavily populated coastlines of countries like Bangladesh and drown islands like Maldives. In Bangladesh more than 17 million people live at an elevation of less than 3 ft. above sea level. In India too, millions inhabit the flat banks of the Ganges and Brahmaputra Rivers.

Simulation models show an increase in frequencies of tropical cyclones in the Bay of Bengal; particularly intense events are projected during the post-monsoon period.



Thus, sea level rise is projected to displace populations at least 300 million people living in low-lying coastal areas and deltas in coastal zones due to increased flooding. It would also result in loss of crop yields from inundation and salination. It could accelerate coastal erosion and force the relocation of communities and infrastructures.

### **Shrinking water resources**

Warming accelerates the rate of land surface drying, leaving less water moving in near-surface layers of soil. Less soil moisture leads to reduced downward movement of water and so, less replenishment of groundwater supplies. Areas in mid-latitudes and mountainous regions depend upon glacial runoff to replenish river systems and groundwater supplies. These areas will become increasingly susceptible to water shortages with time, because increased temperatures will initially result in a rapid rise in glacial melt water during the summer months that will be followed by a decrease in melt as the size of the glacier continues to shrink.

This reduction in glacial runoff water is projected to affect approximately 1/6 of the world's population by the IPCC.

Water quality degradation will be a major cause of water scarcity. Sea-level rise will not only extend areas of salinity, but will also decrease freshwater availability in coastal areas. Many islands are gradually facing the loss of their fresh water supply due to salt-water intrusion.

### **Ecosystem Changes**

Ecosystems provide fundamental life-support services. Human civilisation depends directly or indirectly on the products of the eco-system such as livestock, fish, wood, clean water as well as ecosystem services like pollination, erosion prevention, re-cycling of nutrients, climate moderation and detoxification of natural substances.



Climate change has the potential to alter ecosystems so as to impact the resources and services they provide to each other and to society. It could benefit certain plant or insect species by increasing their ranges. The resulting impacts on ecosystems and humans, however, could be positive or negative depending on whether these species were invasive (e.g. weeds or mosquitoes) or if they were valuable to humans (e.g. food crops or pollinating insects). Most of the world's endangered

species (some 25 per cent of mammals and 12 per cent of birds) may become extinct over the next few decades.

**Forests:-** Climate impact assessments for the year 2085 show 77% and 68% of the forested grids in India are likely to experience shift in forest types under A2 and B2 scenario. (see Notes)

Indications show a shift towards wetter forest types in the north-eastern region and drier forest types in the northwestern region in the absence of human influence. Increasing atmospheric CO<sub>2</sub> concentration and climate warming could also result in a doubling of net primary productivity under the A2 scenario and nearly 70% increase under the B2 scenario.

### Health

Climate change can have both direct and indirect human health impacts. WHO has estimated that the increase of temperature by 10F in the quarter of the 20th century, was responsible for the annual loss of about 160,000 lives and the loss of 5.5 million years of healthy life by 2000. The toll is expected to double to about 300,000 lives and 11 million years of healthy life by 2020. The exacerbated air pollution levels, and heat waves directly contribute to deaths from cardiovascular and respiratory diseases, especially among the elderly people.

Vector-borne diseases such as Schistosomiasis, Chagas disease, Sleeping sickness, River blindness, and various strains of encephalitis all could change their ranges and patterns of infection in the course of climate change. Malaria is likely to persist in many Indian states and new regions may become malaria-prone and the duration of the malaria transmission windows is likely to widen in northern and western states and shorten in southern states.

The impact of climate change on water availability is likely to be one of the most significant for the health of populations.



Other indirect health impacts arise from changes in temperature patterns, which may disturb natural ecosystems and cause large-scale reorganisation of plant and animal communities. Rising temperatures, changing patterns of rainfall, and more frequent droughts and floods are projected to decrease crop yields in many developing countries causing shortages of food supplies. This could

result in severe malnutrition, especially among children, in countries where large populations depend on rain-fed farming at subsistence level.

### *Agriculture and food security*

Temperature-induced range changes may push populations into new areas for which they are otherwise poorly adapted. It may render local cultures, economies, and infrastructure (that had been uniquely shaped around specific food resources), obsolete. The range, migration habits, and life cycles of pollinators and plants, pests and their prey, and wild food stocks and their predators, will all be affected.

In general agricultural producers will face less stress from extreme cold events and freezes but higher stress from more frequent and more intense heat waves. Such events can damage crops, kill or stress livestock, and disrupt or destroy both natural resources and necessary infrastructure. Parasites, diseases, fungi and other pests will thrive and spread faster in warmer and more humid climates. Due to sea level rise, agricultural areas, such as low-lying river deltas and brackish estuaries will be increasingly susceptible to saltwater intrusion.

The oceans are absorbing excess amounts of carbon dioxide making the environment acidic which is unsuitable for sea life. Higher concentrations of atmospheric carbon dioxide allow plants to grow faster and larger. Farmers may have to use more herbicides. Due to CO<sub>2</sub>, sometimes plants may speed through the growth phase in which they generate their harvestable grains, fruits or vegetable matter. As a result the harvest may be diminished and less nutritious.

The simulation studies based on experimental work, which predict that increase in CO<sub>2</sub> concentration to 550 ppm would increase the yield of rice, wheat, legumes and oil seeds by 10-20 per cent. While 10°C increase in temperature may reduce the yield of wheat, soybean, mustard, groundnut and potato by 3-10 per cent. Initially, the productivity of most crops will decrease marginally by 2010.



However, if the trend of climatic changes continued at the same pace, the losses will be 10-40 per cent by 2100. (Dr H Pathak, Environmental Scientist at the 98th Indian Science Congress)

## *Shelter*

Human-induced climate change threatens to create an unmanageable environmental refugee crisis during this century. Most in danger are people in the developing world who have the least ability to adapt to climatic variability. Many scholars and activists working on this issue are pushing for international legal recognition of environmental refugees.

The Intergovernmental Panel on Climate Change (IPCC) estimates that there will be 150 million environmental refugees by 2050. The Institute for Environment and Human Security, affiliated with United Nations University, estimated the number of environmental refugees at 20 million in 2005 and predicted the number could be 50 million as early as 2010.



*One Road, Many Cities, The Hindu, 2012*

## Climate Change & the City

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## Impact of Climate Change on Cities

Due to the concentrations of large populations and centralised infrastructure in cities, the impact of climate can be more dramatic in the form of terms of human lives, loss to personal property, critical infrastructure, environmental quality and future prosperity. The poorer cities, some of which belong to the developing world, are highly vulnerable to climate change-related extreme events. (Dossou K, 2007), also (Muller, 2007). Within each city it is the poorer areas, which are not the big emitters of GHGs, that are most affected. (Huq S, 2007)

### General Impacts of Climate Change in Urban area

While the physical changes in climate in most land areas, are similar namely

- Warmer, more frequent and longer spells of hot days, including heat waves;
- Increased frequency in warm spells/heat waves over most land areas;
- Increased frequency of high rainfall events

These changes impact cities in accentuated ways. The warmer spells exacerbates the general heat island effects in large parts of urban areas. The higher frequency of heavy precipitation means more frequent inundation of large tracts of low lying areas on which poorer communities have been forced to settle. It also signals significant disruption of economy and loss of wages for the poorer informal services and wage earners.

These changes may also affect city services like water supply, transport, electricity distribution etc.

### Indirect Impact on cities

This increase in temperature and consequently change in precipitation will effect drinking water shortage and increase in food and biomass fuel prices in urban India (as well as rural India). This will further depress demand of urban sectors goods and services and also accelerate migration towards cities. The increase in temperature and consequently increase in precipitation with addition of high peak monsoon will increase river line and inland flooding.

**Table – Climate Change Projections for India based in an ensemble of four GCM**

Year	Temperature change (°C)			Precipitation change (%)			Sea-level rise in cm.
	Annual	Winter	Monsoon	Annual	Winter	Monsoon	
2020s	1.36±0.19	1.61±0.16	1.13±0.43	2.9±3.7	2.7±17.7	2.9±3.7	4–8
2050s	2.69±0.41	3.25±0.36	2.19±0.88	6.7±8.9	2.9±26.3	6.7±8.9	15–38
2080s	3.84±0.76	4.52±0.49	3.19±1.42	11.0±12.3	5.3±34.4	11.0±12.3	46–59

Source: Aggarwal and Lal, 2000

## Impact on Cities

Changing patterns of rainfall have affected inland cities. In some cases, overall total rainfall has decreased. In other places, the rain has become more concentrated into fewer and heavier storms. In many of these cities, minor floods that affect people's lives and livelihoods occur more frequently. In higher gradient areas there is erosion and landslides which flatten agricultural and urban lands below. Often as rivers overflow, large areas remain inundated for several days and urban habitats and agricultural lands are destroyed with deposits of debris and mud. Floods also directly damage urban infrastructure and impacts services, damage to roads can disrupt supplies, livelihoods and incomes. Damage to drainage and sewage in turn impact health.



Dryland cities are prone to desertification and sandstorms, which have severe effects on health and infrastructure as well as provoke erosion. Climate change will increase water scarcity and accentuate drought. The effects of drought are widespread but are focused in particular on drinking water shortages and increased food prices. Droughts also result in increased dust pollution which can cause respiratory illness and eye infections. Children born in drought years in poor countries are more likely to be malnourished or stunted. Water contamination increases as water needs to be stored for longer periods. Reduced water flow into lakes increase concentration of pollutants in the lakes leading to an increase in illness.

One of the key factors which affect all these cities is the lack of sufficient drainage, which leaves people vulnerable to flooding after heavy rains. Where there is insufficient drainage, stagnant floodwater provides an ideal breeding ground for parasites, particularly mosquitoes, which may lead to an increase in malaria and other vector-transmitted diseases. The threat of water-borne diseases also increases as drinking water becomes polluted due to stagnant water remaining in settlements. Furthermore, floods can carry contaminated water containing wastes and toxic chemicals into living spaces. Storm water flowing into temporary

### Sea Level Rise

In Asia, the highest net sea level rise has been recorded at Kochi (1.75 mm per year) followed by Aden in the Persian Gulf (1.37 mm), then Mumbai (1.2 mm) and finally Karachi (1.06 mm). The gauge at the Harbour located in the delta of the Ganga, indicated a huge 5.74 mm per year rise in sea level; but that's primarily because land here is sinking at a fast rate. (TOI, 2007)

toilets, and inadequacies in the capacity of solid waste management systems in cities also contribute to blockages. The increased use of plastic, and other non biodegradable material for packaging or sanitary wear, clogs drains further.

The coastal cities take a bigger hit. Flooding and coastal erosion caused by a rise in sea level is already affecting beaches, monuments, industries, ports and human settlements. They are also vulnerable to tropical storms. The Intergovernmental Panel on Climate Change (IPCC) – the global scientific body that assesses climate change – estimates that global sea levels rose by about 2mm per year during the 20th century, with the fastest average rates (4mm per year) recorded in the 1990s. 60% of the ten percent of people living in Low Elevation Coastal Zones are in urban areas. Large areas of cities may become uninhabitable due to flooding or water-logging or damage to infrastructure. These areas are also rendered unsuitable for agriculture due to salt ingress. Many areas have been inundated. All these impacts would ultimately lead to migration. (IIED, 2007)

**Table - Net Sea Level Rise trends from past tide-gauge data**

Station	No of Years of data	Trends in mm/yr	GIA (glacial isostatic adjustment corrections)	Net sea level rise in mm/yr
Mumbai	113	0.77	-0.43	1.20
Kochi	54	1.31	-0.44	1.75
Vishakhapatnam	53	0.70	-0.39	1.09
Diamond Harbour (Calcutta)	55	5.22	-0.52	5.74 sinking of delta

## Risk-indian-cities

The most vulnerable stretches along the western Indian coast are Khambhat and Kuchhi in Gujarat, parts of the Konkan coast and south Kerala. A significant amount of settlement area is expected to be lost in the Ganga, Krishna, Godavari, Cauvery and Mahanadi deltas on the east coast (Aggarwal, D 2001). Return level estimates using storm surge model driven by RCM indicate higher flood risks associated with storm surges along the southern part of the east coast of India, where tidal ranges are low - Sea level changes along the Indian Coast - A.S. Unnikrishnan, M.Manimurali and M.R. Ramesh Kumar, National Institute of Oceanography, Goa: <http://moef.nic.in/downloads/others/Unni%20-%20Coastal%20India.pdf>



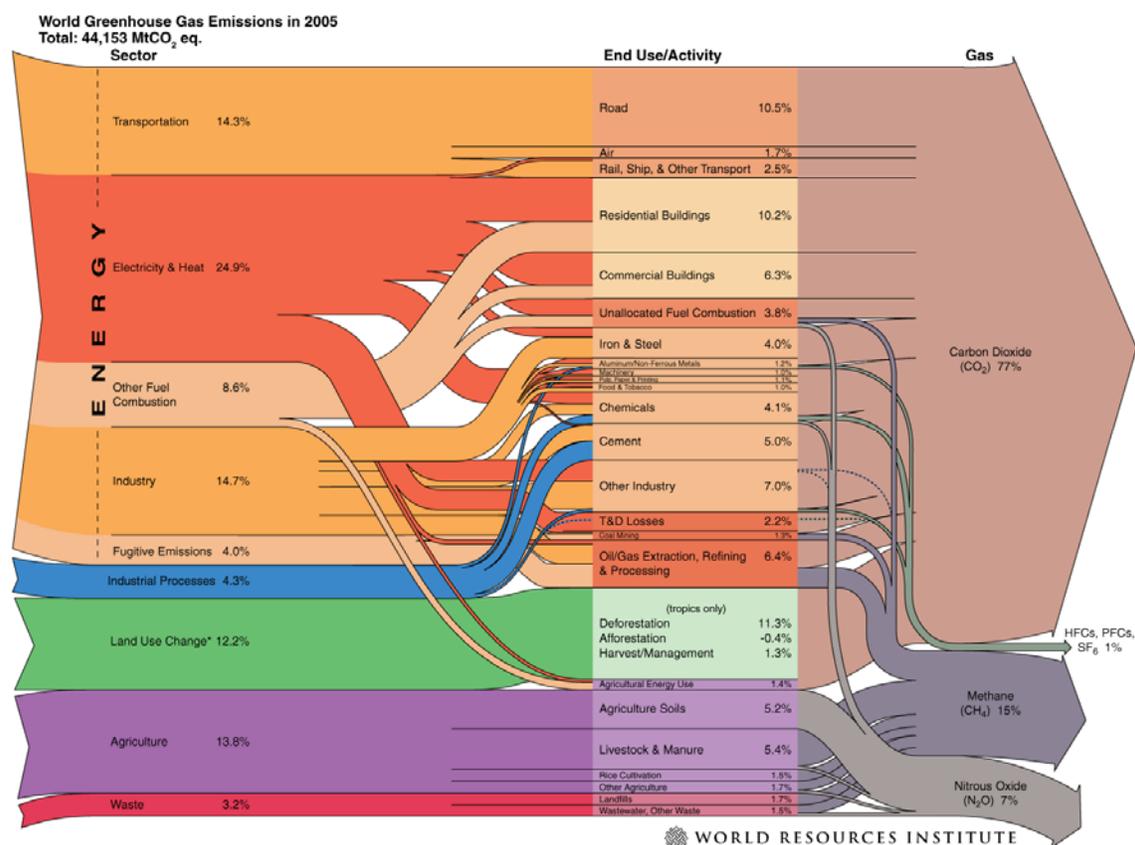
*Mumbai Floods 2005, mdmu.maharashtra.gov.in*

Extreme precipitation events like the one in Mumbai in 2005 are expected to increase substantially over the west coast and in central India (Rupa Kumar and others, 2006). On 22 August 2009, Delhi

witnessed a heavy downpour that brought about 74 millimeters of rainfall in just two hours. This caused the national capital to grind to a virtual halt, as the roads were flooded, the sewers clogged up and the traffic slowed down for hours (Hindustan Times, 2009). Gujarat has faced three floods since 2004 as a result of extreme weather events, resulting in great economic losses in its cities (GSDMA/TARU, 2005). Cyclones and storm surges could have a devastating impact on large coastal urban centres, including the mega cities of Mumbai and Chennai, the million-plus cities of Vishakhapatnam, Surat, Bharuch, Bhavnagar and Jamnagar, besides affecting important ports such as Kandla. In 1999, Orissa was hit by a super-cyclone that killed more than 10,000 people and devastated buildings, essential services and infrastructure and economic assets across 10 coastal and six inland districts, which included a number of towns and cities. (TARU/BMTPC, 2000)

## Relative contributions of GHG emissions

While none of the impacts of climate change can be attributed exclusively to global warming, the extent, intensity and high incidence of extreme weather events does point to global warming.



Indicative flow chart of relative GHG emissions

Since it is human activity, - particularly the burning of fossil fuels that is responsible for global warming, the situation can be mitigated only by a global human effort.

And for this all of us need to be aware about which sector, uses and activities contribute to global warming and in which sectors we can reduce emissions. This chart shows the relative contributions of different sectors and sub-sectors to GHG emissions in the year 2005. It also correlates each sub-sector to the end use activity on the right side.

The sector contributing the maximum emissions 66%, is the energy sector, with

- Transportation contributing 14.3%, of which
  - Electricity & Heat (24.9%)
  - Residential buildings 10.2%
  - Commercial building 6.3%

Industry 14.7%

Land Use Change: is 12.2% out of which Deforestation is the biggest culprit - 11.3 %.

Agriculture contributes 13.8%. And the bulk of it is methane emission 9% and nitrous oxide a little over 6%.

Barring Agriculture, almost all the other emissions are mainly produced in urban setting.

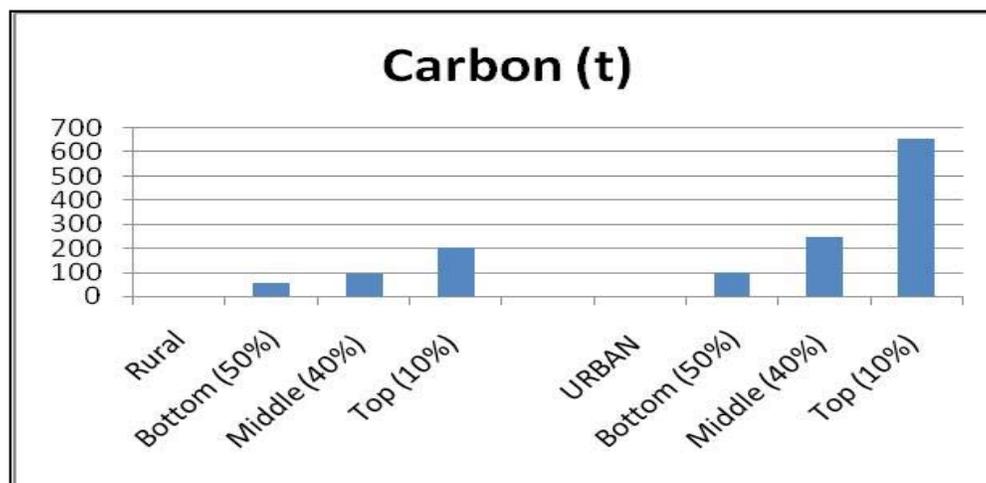
### Energy Use Differentiation by Class

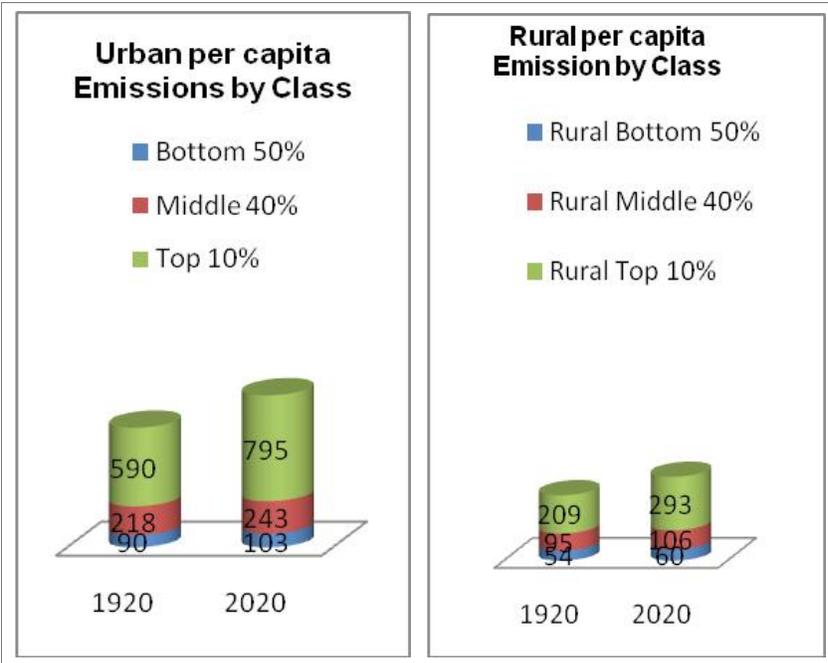
Within the city, the biggest cause of CO2 emissions is energy. This includes energy supply for electricity generation (mainly from coal, gas and oil); transportation; energy use in commercial and residential buildings for lighting, cooking, space heating, and cooling; industrial production; and waste.

**Table: Per capita Annual Energy Use (Direct and Indirect) 1989-90\***

Income Group	Coal (kg)	Oil (kg)	Elec(kWh)	Carbon(t)
<i>RURAL</i>				
Bottom (50%)	74	22.5	95	054
Middle (40%)	127	39.7	152	093
Top (10%)	262	89.8	284	204
<i>URBAN</i>				
Bottom (50%)	130	45.6	164	101
Middle (40%)	302	118.6	366	246
Top (10%)	765	332.3	858	656
Extreme Disparity Ratio <sup>@</sup>	10.3	14.8	9.0	12.0

\*Excluding energy used directly and indirectly to make deliveries to others demand for private consumption  
 @ EDR= Urban top/ Rural bottom





Urban areas consume disproportionately high amounts of energy, and within the city it is the top 10% who contribute the maximum. Thus the major contributor to global warming is the high consumption of energy by the higher income groups in the urban areas.

In terms of carbon emissions, it can be seen in the chart below that the bottom 50% of rural people emitted in 1990 a mere 54 kg of carbon per person per year. The richest 10% of urban people emitted 12

times as much at 656 kgC per person per year, which is still way below the world average of 1.1 t and much below the average emission in developed countries.

Even the projected emission for 2020 show that the bottom 50% of urban population would emit a mere 103 kgC per person per year whereas the top 10% in urban areas 795 kgC.

### Estimating Urban Emission

Cities are responsible for anything between 40 and 70 per cent of CO2 equivalent emissions. This is based on production-based activities which are adding up GHG emissions from activities located within cities. This goes up to 60 to 70 per cent if a consumption-based method is used (i.e. figures calculated by adding up GHG emissions resulting from the production of all goods consumed by urban residents, irrespective of the geographic location of the production. (UN Habitat, 2011)

### Emissions

The two approaches represent two different views as to whether emissions are the "responsibility" of those who directly produce them or those whose consumption drives their production. In the urban rural context, it is argued that cities are the hub of innovation, culture and economies which generate ideas, money and modern products. In exchange they depend on basic resources: primary food, timber, minerals on the country-side. If the exchange was fair and equitable in terms of co-benefits, it could have been a different story. But the benefits of many high-emitting industries located outside cities, such as electricity generation from fossil fuels, are disproportionately annexed by the city at the cost of the countryside. In fact the technologies generated mainly through urban activity privilege higher densities of consumption in the cities. Further these projects have adversely affected the bio-mass based energy and material and environmental resources of the country-side.

This is not just a contradiction between the urban and the rural. China for example is accused of high emissions today, as it produces a large number of goods using its low production costs, mainly low cost of labour and more organised pockets of infrastructure. They are able to do it, because of high consumption in the west and affluent sections of other developing countries, but has to be

complemented by low carbon per capita footprints of the Chinese workers, for such exports to be viable.

Similarly, many rural activities serve urban customers with their higher purchasing power, e.g. agriculture and forestry products and primary resource extraction such as minerals and hydrocarbons. These are generally at the cost of low wages in the countryside, and the appropriation of land, mines, forest resources, water etc. Each such appropriation has been found to have higher carbon footprints, than the activities they replaced. The emissions do not only represent individual and urban lifestyles choices but also the nature of the infrastructure, the burden that places of the environment and the structure of the economy in the urban system.

There are also interesting correlations between per capita GHG emissions, urban form and service access. The neighborhood with the lowest emissions per capita is a high-density apartment complex within walking distance of a shopping centre and public transit. The average emissions per capita neighbourhood consists of high-density single family homes close to the downtown core and with access to public transit. The highest emissions per capita neighbourhood is located in the suburbs, consisting of large, low-density single family homes, distant from commercial activity.

## Big City, Small City

While discussing urban centres in the context of climate change, we are normally talking about large complex cities whose economies serve local, regional, national as well as global markets. They would also have large and complex transport systems where a high proportion of the workforce may live outside the city.

However a growing number of cities are actually simple small market towns, mining centres or tourist resorts. Such simple towns especially in low income countries have very low carbon footprints. They use very low levels of non-renewable resources. Incomes and consumption levels are low, demand for energy-intensive capital goods is also low and there is little or no industry. These urban centres draw most of their material needs (food, other natural resources, water) from close by. Thus, from a perspective of ecological sustainability, these small urban centres perform extremely well.

In fact even in some larger urban centres in low-income nations, GHG emissions that are around 0.1 tonnes CO<sub>2</sub>e per person per year. For example many cities in India have below 1 tonne even though India is not classified as a least developed country. This compares with many wealthy cities in the West who have GHG emissions of 10–25 tonnes of CO<sub>2</sub>e per person per year, about 100–250 times the former. (Satterthwaite, D 2011)

These are clearly unacceptable levels of consumption because if this is extended to a larger section of the world's urban population as is suggested by most current development models, it would be unsustainable.



Large parts of cities in places like Mumbai, Delhi boast of such high emissions, high material consumptions etc. It is the same section which generates the highest amounts of waste, uses the maximum amount of water, travel in bigger and more polluting cars, yet the general misconception in the urban mind that it is the poor areas which are polluting. In the Indian urban population, households with an income of 30,000 plus rupees a month contribute five or more times the GHG emissions than a household with less than 3,000 rupees a month. (Satterthwaite D, 2009)

## Population and climate change

Another misconception is that it is the increasing migration to and over-crowding of the city that is responsible for higher per capita emissions. Today, many of the nations with the most rapidly growing national and urban populations have very low levels of CO<sub>2</sub> emissions per person and have experienced slow growth in their emissions; on the other hand many of the nations with the slowest growing national and urban populations have the highest levels of GHG emissions per person and have had rapid growth in CO<sub>2</sub> emissions per person.

## The City as Commons

The adverse impact of climate change in the cities is highest on poor communities. And any major incident like the Mumbai Floods, is generally blamed on such communities. While one section feels that the carrying capacity of the city is being exceeded largely due to populations marginalised from the rural areas, the other feels that they have no option but to seek a livelihood in the city. A fair number of the latter are actually development refugees and the next few waves of migration, would certainly be climate refugees.

The former however believes that they have paid their dues and that the land and environment is for them to consume as and when they pay for it. They therefore easily support systems where the resources of the city: water, transport, sanitation, health, leisure spots are barricaded, and handover to professional managers in a corporate setup.

Amita Bavishkar quotes the example of how the trans Yamuna region which was home to around 125000 people, besides migrating birds, was taken over for the hosting the Commonwealth games, and then got converted into real estate with manicured parks, housing rich people, shopping mall, metro station and commercial area, where the so called public spaces now exclude the city's working people who earlier enjoyed the quiet of the area, or used it as a public toilet, or the farmers who grew crops and vegetables.

In September 2010 the heavy downpour, characteristic of a climate changing world, raised the water levels to such a height that the protection offered by the embankments and dams seemed suddenly shaky; real estate values fell. Once again the ecological value of the Yamuna wetlands, both in terms of ground water recharge and as an adaptation of the city to flooding, reasserted itself. Amita Baviskar regretted that the discovery of ecological value occurred only after nature re-asserted itself after the riverbed was commodified but saw it as a sign of hope for renegotiating space and value attached to it. She concluded saying that Ecological and social limits to capital exist. Commodity Fictions must contend with counter movements to reclaim "social lives" of nature. - Commodity Fictions: The Lives of Nature in Liberalised India by Amita Bavishkar. Nature Inc. ISS, The Hague, 2011.

In the climate changing context, particularly in the city, where the resources are cornered by the very few who have the highest carbon footprint, solutions to climate change which perpetuate commodity fictions like CDMs, Cap and Trade, Nuclear Power would have to give way for the needs of the excluded. UN-Habitat's World Urban Forum in 2010 spoke of "the Right to the City

" as the collective right of present and future generations to a sustainable city free from discrimination..., as well as to preserve their identity and cultural memory”.

The declaration said

1. all people, whether permanent, temporary or recent, must enjoy all of their fundamental human rights and freedoms and well-being based on dignity, equality and social justice. This is particularly important in the context of neoliberal globalization, where large groups are being alienated from their dwelling and livelihood, and their resistance to such alienation is being increasingly criminalised.

2. all inhabitants have a right to participate in decisions on the distribution & use of goods and services that the city offers. This requires public policies and specific instruments to halt speculation, urban segregation, exclusion, evictions and displacement, and urban and rural land grabbing.

3. all inhabitants participate in decision-making on public policies, planning, public budgeting and control over urban processes. This means strengthened institutional spaces for not just public consultations, but also participation in managing, monitoring, and evaluating public policies.

The declaration envisages

- A city that rescues and strengthens the productive capacity of its inhabitants, supports the social production of habitat and economic activities, including urban agriculture that supports food sovereignty. This involves strengthening the people’s economy, not only the quasi-monopoly gains of a few.
- A city where inhabitants and authorities implement public policies which ensure a responsible relation of common goods like water and the environment – without privatization, and without affecting natural ecological reserves, for present and future generations.
- A city that recognizes the right to accessibility and to equal opportunities. A city that facilitates the mobility of all inhabitants, with clean and sustainable technology and incentives for public transportation and alternative means of transport, such as bicycles.
- A city that includes the right to a sustainable city – as well as the right to horizontal communication and information – in all levels of educational training and for public authorities who are responsible for local public policies. - A paradigm shift for just, democratic and sustainable territories: Call to convergence for Rio+20 and beyond. (The World Charter for the Right to the City, common platform to demand our rights and defend common goods, 2012)



*Eco-ethic, Nov 2012*

## Politics of Climate Change

## What is the world doing about climate change?

Since the 1960s and 70s, climatologists and environmentalist had warned about increases in concentrations of carbon dioxide in the atmosphere. However it took years before the international community responded to their call for action. In 1988, an Intergovernmental Panel on Climate Change (IPCC) was created by the Organisation and the United Nations (UNEP).

IPCC's first assessment report in 1990 was a real risk for humanity - "The message was clear. This spurred the creation of the United Nations Framework Convention on Climate Change (UNFCCC) at the Rio Earth Summit in June 1992. It was agreed to have a world that would aim at stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous human induced interference with the climate system. The conference of parties to the framework (COP) was to meet every year to evolve strategies to combat Climate Change.

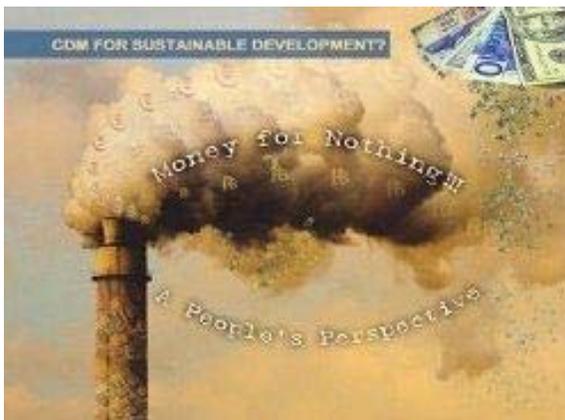


World Meteorological  
Environment Programme

1990, pointed out that there earth's future is in danger" international community to Convention on Climate Summit of UNCED in June framework under which the greenhouse gas concentrations

## Kyoto is born

However, it was not until 1997 at the 3rd COP in Kyoto, that a protocol (The Kyoto Protocol) was established with legally binding commitments for the reduction of greenhouse gases by industrialised countries. To enable the developed countries meet its commitment, it established three "flexible mechanisms", which allow developed countries to adjust its emissions activities. The most important of these is the Clean Development Mechanism (CDM).



CDM was supposed to provide an opportunity for developing countries to access modern technology for reducing emissions and receive financial incentives to overcome the barriers. The logic was that developing countries who did not have legally binding emission reductions, would have financial incentives to develop GHG emission reduction projects. This was supposed to be the sustainable development.

In reality it dis-incentivised highly polluting industry or luxury consumption, from finding climate friendly solutions (alternative paths to fossil fuel based growth), by providing a cheaper route to continue "business as usual" as it capitalised on the low hanging fruit in the developing countries.

The main achievement of the Kyoto Protocol was to establish the principle of "common but differentiated" responsibility. By January 2009,



183 countries had ratified the Kyoto Protocol. The notable non-signers were US and Australia. Besides, in the protocol, there were several details that were not fully agreed to.

***A BRIEF HISTORY OF THE UNFCCC AND THE KYOTO PROTOCOL (taken from IISD reporting services)***

The international political response to climate change began with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, which sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases (GHGs) to avoid “dangerous anthropogenic interference” with the climate system. The Convention, which entered into force on 21 March 1994, now has 195 parties.

In December 1997, delegates to COP 3 in Kyoto, Japan, agreed to a Protocol to the UNFCCC that commits industrialised countries and countries in transition to a market economy (EITs) to achieve emission reduction targets. These countries, known as Annex I parties under the UNFCCC, agreed to reduce their overall emissions of six greenhouse gases by an average of 5% below 1990 levels between 2008-2012 (first commitment period), with specific targets varying from country to country. The Kyoto Protocol entered into force on 16 February 2005 and now has 192 parties.

**LONG-TERM NEGOTIATIONS IN 2005-2009:** Convening in Montreal, Canada, at the end of 2005, the first session of the CMP decided to establish the AWG-KP under Protocol Article 3.9, which mandates consideration of Annex I parties’ further commitments at least seven years before the end of the first commitment period. COP 11 created a process to consider long-term cooperation under the Convention through a series of four workshops known as “the Convention Dialogue.”

In December 2007, COP 13 and CMP 3 in Bali, Indonesia, resulted in agreement on the Bali Roadmap on long-term issues. COP 13 adopted the Bali Action Plan and established the AWG-LCA with a mandate to focus on mitigation, adaptation, finance, technology and a shared vision for long-term cooperative action. Negotiations on Annex I parties’ further commitments continued under the AWG-KP. The deadline for concluding the two-track negotiations was in Copenhagen in 2009. In preparation, both AWGs held several negotiating sessions in 2008-2009.

**COPENHAGEN:** The UN Climate Change Conference in Copenhagen, Denmark, took place in December 2009. The high-profile event was marked by disputes over transparency and process. During the high-level segment, informal negotiations took place in a group consisting of major economies and representatives of regional and other negotiating groups. Late in the evening of 18 December these talks resulted in a political agreement: the “Copenhagen Accord,” which was then presented to the COP plenary for adoption. After 13 hours of debate, delegates ultimately agreed to “take note” of the Copenhagen Accord. In 2010, over 140 countries indicated support for the Accord. More than 80 countries also provided information on their national mitigation targets or actions. Parties also agreed to extend the mandates of the AWG-LCA and AWG-KP until COP 16 and CMP 6.

**CANCUN:** The UN Climate Change Conference in Cancun, Mexico, took place in December 2010, where parties finalised the Cancun Agreements. Under the Convention track, Decision 1/CP.16 recognised the need for deep cuts in global emissions in order to limit global average temperature rise to 2°C. Parties agreed to keep the global long-term goal under regular review and consider strengthening it during a review by 2015, including in relation to a proposed 1.5°C target. They took note of emission reduction targets and nationally appropriate mitigation actions (NAMAs) communicated by developed and developing countries, respectively (FCCC/SB/2011/INF.1/Rev.1 and FCCC/AWGLCA/2011/INF.1, both issued after Cancun). Decision 1/CP.16 also addressed other aspects of mitigation, such as: measuring, reporting and verification (MRV); and reducing emissions from deforestation and degradation in developing countries, including conservation (REDD+).

The Cancun Agreements also established several new institutions and processes, including the Cancun Adaptation Framework and the Adaptation Committee, and the Technology Mechanism, which includes the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN). The Green Climate Fund (GCF) was created and designated as a new operating entity of the Convention’s financial mechanism governed by a 24-member board. Parties agreed to set up a Transitional Committee tasked with the Fund’s design and a Standing Committee to assist the COP with respect to the financial mechanism. Parties also recognised the commitment by developed countries to provide US\$30 billion of fast-start finance in 2010-2012, and to jointly mobilize US\$100 billion per year by 2020.

Under the Protocol track, the CMP urged Annex I parties to raise the level of ambition towards achieving aggregate emission reductions consistent with the range identified in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), and adopted Decision 2/CMP.6 on land use, land-use change and forestry (LULUCF). The mandates of the two AWGs were extended for another year.

**DURBAN:** The UN Climate Change Conference in Durban, South Africa, took place from 28 November to 11 December 2011. The Durban outcomes cover a wide range of topics, notably the establishment of a second commitment period under the Kyoto Protocol, a decision on long-term cooperative action under the Convention and agreement on the operationalisation of the GCF. Parties also agreed to launch the new ADP with a mandate “to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties.” The ADP is scheduled to complete negotiations by 2015. The outcome should enter into effect from 2020 onwards.

**BONN CLIMATE CHANGE CONFERENCE 2012:** This meeting took place from 14-25 May 2012 in Bonn, Germany. The conference comprised the 36th sessions of the SBI and SBSTA. It also included AWG-LCA 15, AWG-KP 17 and the first session of the ADP. Under the AWG-KP, the focus was on issues to be finalised for adopting a second commitment period under the Kyoto Protocol and for the AWG-KP to conclude its work at CMP 8. Many outstanding questions remained, including the length of the second commitment period under the Kyoto Protocol and carry-over of surplus units.

Under the AWG-LCA, debates continued on which issues require consideration so that the AWG-LCA can finalize its work at COP 18. Developed countries stressed “significant progress” and the various new institutions established in Cancun and Durban. Some developing countries identified the need to continue discussing issues required to fulfill the Bali Action Plan mandate.

Under the ADP, discussions centered on the agenda and the election of officers. After nearly two weeks of discussions, the ADP plenary agreed on the Bureau arrangements and adopted the agenda, initiating two work streams: one addressing matters related to paragraphs 2-6 of Decision 1/CP.17 (post-2020 regime) and the other addressing paragraphs 7-8 (enhancing the level of ambition during the pre-2020 period), and agreed on the election of officers.

**BANGKOK CLIMATE CHANGE TALKS 2012:** This informal session took place from 30 August - 5 September 2012 in Bangkok, Thailand. Under the ADP, parties convened in roundtable sessions to discuss their vision and aspirations for the ADP, the desired results and how these results can be achieved. Parties also discussed how to enhance ambition, the role of means of implementation and how to strengthen international cooperative initiatives, as well as the elements that could frame the ADP’s work.

The AWG-KP focused on resolving outstanding issues to ensure successful completion of the group’s work in Doha by recommending an amendment to the CMP for adoption. This would allow a second commitment period under the Protocol to start immediately from 1 January 2013. The AWG-KP produced informal papers outlining the elements for a Doha decision adopting amendments to the Kyoto Protocol.

The AWG-LCA continued working on practical solutions to fulfill specific mandates from COP 17. The focus was on outcomes needed to conclude the group’s work in Doha, how to reflect the elements in the final outcome of the AWG-LCA and whether additional work might be required beyond COP 18.

## **DOHA**

Negotiations in Doha focused on ensuring the implementation of agreements reached at previous conferences. The package of “Doha Climate Gateway” decisions adopted on the evening of Saturday, 8 December, included amendments to the Kyoto Protocol to establish its second commitment period. Having been launched at CMP 1 in 2005, the AWG-KP terminated its work in Doha. The parties also agreed to terminate the AWG-LCA and negotiations under the Bali Action Plan. Key elements of the outcome also included agreement to consider loss and damage, “such as” institutional mechanism to address loss and damage in developing countries that are particularly vulnerable to the adverse effects of climate change. While developing countries and observers expressed disappointment with the lack of ambition in outcomes on Annex I countries’ mitigation and finance, most agreed that the conference had paved the way for a new phase, focusing on the implementation of the outcomes from negotiations under the AWG-KP and AWG-LCA, and advancing negotiations under the ADP.

## Climate Change and Equity

### Equity in International Climate Negotiations

About 100 nations comprising Small Island Developing States (SIDS), Africa and least Developed Countries, of more than a billion people account for 4.67 of the global emissions ( It is 3.2 per cent if we exclude south Africa) This is compared to 23.3 per cent for the US, 24.7 per cent for the EU, 15.3 per cent for China and 4.5 per cent for India (see table below).

	CO2 emissions, 2002		
	Total in 000 tonnes	Percentage	Per capita
LDC, SIDS and Africa	1,155,363	4.67	2.3
India	1,105,595	4.50	1.1
China	3,783,231	15.30	2.9
US	5,773,401	23.30	19.9
EU	6,117,989	24.70	8.4
Global	24,756,694	100	4.0

These 100 odd nations are the most vulnerable to climate change. Besides the location and low lying status, the low level of development and the higher dependence on nature (which is the reason for their low emissions in the first place), in these countries make them vulnerable to other stresses not least of them climate variability, extremes events. The low level of development further constrains their adaptive capacity. (Haq S, 2007)-

In the climate negotiations, developed countries want to start from current status of emissions, and legislate a percentage reduction from there, as that would maintain its relative position of economic strength. It is with similar intentions that the US energy secretary has argued for a tariff on imports from countries, like India who did not have mandatory cuts prescribed in the Kyoto Protocol. They say that such measures were necessary to “level the playing field”, especially given the recessionary conditions there. Further, French President Sarkozy favours a carbon tax on imports from nations that have lower environmental standards than France. China counters this by emphasizing consumption, and says that its emissions because of exports should be the responsibility of the receiving country. Thus the arguments are all based on the need to preserve the economic dominance of the developed countries rather than an equitable sharing of sharing emission responsibility.

Developed countries are also reluctant to accept emission based taxation, as proceeds from a tax would legitimately belong to the commons, and that too a commons which knows no state borders. Thus the proceeds were to be used for developing new technology, it would be common property.

A similar divide operates inside each country. For example in India, the top 50 million people (which is the population of many European countries, like France, UK, Italy) have emissions on par with the European average.

### Twin-track process

In its Fourth Assessment Report (AR4), the IPCC had said that if the world had to have a reasonable chance to keep warming to 2°C over pre-industrial levels, Annexe 1 countries would have to reduce GHG emissions ranging from 25% to 40% below 1990 levels by 2020, Further,

world emissions should peak by 2015, and GHG emissions should be reduced to 50% below 1990 levels by 2050. For this, the developed countries need to reduce emissions by 80% or more below their 1990 levels.

Since no meaningful commitments to this end were forthcoming, negotiators at Bali (COP13) in 2007 evolved a two-track process:

- **The Convention (UNFCCC) Track (known more as the Long term Cooperation Track(LCA))**, which would focus on four building blocks: adaptation, mitigation, technology transfer & deployment, and financing, and
- **The Kyoto Protocol Track**, which would deal with the agreed emission reduction targets that was to be set in 2009, and the means including market mechanisms, to achieve these targets.

## Copenhagen Accord

The two track process set up of Bali was the compromise, which negotiators hoped would enable progress on some fronts like reducing emissions from deforestation and forest degradation (REDD); mitigation action from developing countries even when mitigation commitments from developed countries were pending. With less pressure on Kyoto commitments, there was not much headway on the protocol, and in December 2009 at Copenhagen (COP 15) the Kyoto track reached a dead end as the biggest emitter, the US was unwilling, along with other major developed countries to take the deep emission cuts needed. There was an impasse.

At this juncture, President Obama put this back door proposal before the BRIC (Brazil, Russia, India, China – emerging countries) countries. He proposed that 1) Industrialised countries put on the table what emission reduction targets they are willing or ‘able’ to do and that 2) Developing countries on their part must list their specific mitigation action and subject these to verification. Thus emerged the **Copenhagen Accord**.

It was not accepted by many countries and therefore only “taken note of” by the COP. However, by March 2010, more than 110 nations including India, China and the US submitted their commitments indicating their acceptance of the Copenhagen Accord. Recent Wikileaks of cables indicated that many countries were coaxed with incentives to join in.

## From Copenhagen to Cancun

**The Cancun conference in December 2010** then more or less laid the basis for the burial of the Kyoto Protocol. The per-capita based as well as historic emission based equity principle seems to have been blunted. What emerged is a set of commitments, which are subject to verification, but fall much short of required commitments. Funding was the carrot used particularly to get the small island states in line. Even so, no clear commitment or modalities for any financial incentives were disclosed. The powers that be seem to expect further negotiations and incentives to get developing countries to raise their commitments, to make up the gap between current commitments and to desired levels. One of the measures that emerged was a set of proposals called the Reducing Emissions from Deforestation and Forest Degradation (REDD).

Paragraph 6 of the accord recognised...”

*“the crucial role of reducing emission from deforestation and forest degradation and the need to enhance removals of greenhouse gas emission by forests”*

*and agreed*

*“on the need to provide positive incentives to such actions through the immediate establishment of a mechanism including REDD plus, to enable the mobilisation of financial resources from developed countries.”*

As per its earlier submissions, the government of India wants to make it possible to earn “carbon credits” (i.e. tradable permits certifying that emissions of greenhouse gases have been reduced somewhere else) on the basis of carbon supposedly stored in forests.

This development has important implications for forests in general and forest communities in particular.

Basically the Cancun decision and outcomes (about 20 odd) has given more prominence to the “Long Term Cooperative Action track”. The attempt seems to be that the elements of climate mitigation and adaptation in the Kyoto track is made redundant by getting both Annexe 1 and non Annexe 1 countries to commit to emission cuts (through NAMAS - Nationally Appropriate Mitigation Actions), and have them externally verified. The only difference would be that non-Annexe 1 countries would get international financial and technological support for their efforts. Corporates in India especially seem to welcome this as they see in it an opportunity to broaden the scope of CDM like mechanisms.

It is likely that individual polluters in developing countries would press for them to purchase CERs from within their countries, as well as from other lesser developed countries. Corporates in the developed countries would however try to retain their comparative advantage using finance capital and technology. Thus while there is the carrot of 100 billion dollars, there is no indication of the sources of such money and the conditions that would be attached to such finance.

## Durban

The 17th Conference of Parties (COP 17) at Durban in December 2011, after several days of protracted negotiations, pushed the world to yet another round of torturous and messy negotiations for a new treaty, protocol or legal instrument.

Under “**the Durban Platform for Enhanced Action**”, the world agreed to negotiate “a protocol, another legal instrument or an agreed outcome with legal force” by 2012, to be implemented from 2020. Thus sounding the death knell of the basic principle of climate negotiations - ‘Common but Differentiated Responsibilities (CBDR).’

## Bonn Conference May 2012

The climate change conference in Bonn in May 2012, which was supposed to create a work-plan for a new global climate treaty by 2020 only managed to draw up a partial agenda. Rapidly growing economies such as India and China apparently don’t want a treaty that will restrict their growth, while more developed countries are unwilling to make any changes by themselves.

There is however some hope as many countries have agreed that the Kyoto protocol be extended beyond 2012 at the Doha COP in November 2012. (Singh T, 2012)

### C40

In the midst of all the wranglings between countries, C40, a group of around 59 cities, mainly represented by their mayors, asserted at Rio (June 2012) that cities are proving to be the most effective government entities in addressing global climate change. In addition to announcing goals to reduce 1.3 billion metric tons of carbon emissions by 2030, leaders cited already-taken actions that will cut 248 million tons of greenhouse gases by 2020. The cities’

achievements contrast with international negotiations (and some national governments), which have been unable to agree to binding CO2 reduction targets.

They feel that Mayors are more directly accountable to their constituents than national leaders on quality-of-life issues. Cities also directly control the majority of the big, greenhouse gas-emitting urban systems— such as transportation, waste, electricity, and building regulations. And whereas cities have been rightfully criticised as the source of many global climate challenges— they account for 75 percent of global CO2 emissions, for example— they're also proving to be engines of innovative solutions to address those problems. (Cities Take the Lead on Tackling Climate Change. Clayton Lane, June 22, 2012, WRIInsights)

C40 Cities have undertaken nearly 5,000 climate-related actions since the network first formed in 2005. In many cases, these actions were taken without national government support.

Additionally, and helping to build on cities' significant accomplishments, C40 is launching a new solid waste peer-to-peer learning network today. With support from the World Bank and the Climate and Clean Air Initiative of the U.S. State Department, C40 will establish a new network that will assist local governments in reducing methane emissions through solid waste management (<http://www.mikebloomberg.com/index.cfm?objectid=053FFAE1-C29C-7CA2-F07FC901633A565A>)

Speaking at the opening session of the C40 Rio+20 meet, mayor Bloomberg of New York said "Give cities the authority, tools, and technology that will enable us to enlarge our achievements, and quicken our progress. Give city leaders our rightful role in helping to set the policies that will make just, equitable, and sustainable development a global reality, and take those steps now."

"The world is rapidly urbanizing. Cities are becoming bigger and bigger. Our problems are sometimes harder and harder to tackle. Yet we continue to make major progress, even in times of tough budget cuts. ([C40 Cities on Track to Cut Annual Emissions by 250 Million Tons](#) Jun 19, 2012 For more information you can check the official website of C40: [www.c40.org](http://www.c40.org))

## 20 Years of Negotiations

Will the governments of the world manage to reach a workable consensus? Two decades of intensive intergovernmental bargaining has shown that they the major stumbling block has been the economic interests of the countries concerned. The same factors have come into play at other international fora. Twenty years after Rio, the Rio summit saw a linking of the Sustainable development goal to the Green Economy. Civil Society saw this as a move to monetise nature, and raised red flags about how various programmes under Climate Change, Bio-diversity and Sustainability have been used to privatise natural resources and implant technologies which will give those corporates having patents on them a competitive edge.

## It's Corporate, Not Western

We as Indian NGOs have been asked to buy into criticizing a CDM agenda, which we do but with a different view.

One example of this is the Carbon credits for destruction of waste gases emitted during the manufacture of coolant gases. The New York Times ran a series of articles on the issue. ([Chilling Effect: Rosenthal 2012](#)) It tells us two things: a. that any corporate Indian or Foreign will try to capitalize on any market tradable instruments even if it is unethical. b. that the much touted technology assistance and the pledges for aid at the COPs or Rios, are merely instruments of ensuring profitability of the corporates in the host country.

One of the articles does mention that all the acceptable substitutes under development for air-conditioners are either under patent, demand new equipment or require extensive new regulation

and testing procedures. But it doesn't say who controls these patents and what price would they extract for change-over, if any.

But the most important conclusion to my mind, is the admission the recent article that China is genuinely looking to substitute this practice. “That is because China has a more centrally controlled economy and because it is developing an industry based on newer coolants. “It’s easier for them to put the national interest before the interest of one manufacturing sector,”.

Coming as it is when increasing monetisation and privatisation even of public goods is the only solution to economic, social and environmental problems.. it speaks volumes...

## **The Indian Response**

India is one of the key players in the Climate negotiations. It is part of the BRIC (Brazil, Russia, India & China) bloc. Though they represent poor countries, they have large economies, and more importantly rising economies. As rising economies, their total emissions are rising as they are attempting to grow in the current market. In each of these countries a sizeable section of the people are poor and have low carbon footprints, and therefore they feel they have the right to development even if it means more emissions.

India’s fast growth rate Gross Domestic Product (GDP) about 8, and human capital are the potential for fast future development. India’s rank is 4th in producing greenhouse gas, however per capita emission is much below to the global per capita emission average.

India emphasizes that it has a limited role in contributing to climate change [4.6% cumulative; 1.2 metric tons per capita], and that it has a large number of people living below the poverty line, for whom the economy needs to grow. Thus it does not want to take on commitments on GHG mitigation targets.

India’s perspective on burden-sharing is equal per capita rights to global environmental resources, and convergence of per capita emissions over time. India wants to take voluntary actions for decarbonisation. (India, 2008).

At the international level, India has stood firm on the per-capita-based equity principle. At the time of Kyoto (1997), India had a low per capita emission rate barely 0.8 tce (tonnes of coal equivalent). Being an emerging country, by 2005, the total emissions took it to 5th highest in the world, though per capita emissions remained low – 1.2 tce. Thus it was labeled by the international media as “dangerous emitter”, likely to become even more dangerous in the future. The Northern countries started putting pressure on countries like India to consider mitigation actions to ‘build trust’ with Annexe 1 countries.

Perhaps, as a counter to all these pressures, in June 2008, India pulled out the proverbial rabbit out of the hat in the form of the **National Action Plan on Climate Change**.

## NAPCC

The NAPCC laid down principles, approaches and institutional arrangements for managing the climate change agenda through eight national missions:

- Protecting the poor and vulnerable sections of society through an inclusive and sustainable development strategy, sensitive to climate change.
- National growth objectives through a qualitative change in direction

- Efficient and cost-effective strategies for end-use demand side management.
- Deploying appropriate technologies for adaptation & mitigation
- Engineering new forms of market, regulatory and voluntary mechanisms to promote sustainable development.
- Creating unique linkages, including with civil society and local government institutions and through public-private-partnership.
- Welcoming international cooperation for research, development, sharing and transfer of technologies, global IPR regime

The salient features of eight missions are:

*a) National Solar Mission*

It is planned to increase the share of solar energy in the total energy mix and decentralised distribution of energy. It aims to create affordable, convenient solar power systems and storage. **The Jawaharlal Nehru National Solar Mission** envisages implementation in three stages leading up to an installed capacity of 20,000 MW by the end of the 13th Five Year Plan in 2022, with 1,100 MW of solar power through the electricity grid and 200 MW off the grid, in its first phase; and a 'focussed R&D programme.' At the launch of the mission, the PM called for creation of 'solar valleys' on the lines of the Silicon Valley!

*b) National Mission for Enhanced Energy Efficiency*

This mission wants to enhance cost effectiveness and improvements in energy efficiency in energy intensive large industries and facilities. Energy efficiency will also be promoted through mechanisms for financing demand side management programmes and fiscal instruments. To shift to energy efficient appliances, Standards and Labelling have been launched in 2006 by Bureau of Energy Efficiency for household refrigerators (frost-free), florescent tube lights, air conditioners, transformers and other equipment. General purpose electric motors, ceiling fans and geysers etc. will also be brought under standards regulation. **The National Mission for Enhanced Energy Efficiency** is expected to save 23 million tonne oil equivalent of fuel and avoid the need to build additional capacity of over 19,000MW, leading to greenhouse gas emissions reduction of 98.55 million tonnes per year, and will add towards the country's target of reducing its emission intensity by 20-25% below 2005 levels.

*c) National Water Mission*

National water mission focuses on conservation of water, minimizing wastage and ensuring equitable distribution of water.

**The National Water Mission** has five goals:

- Comprehensive water database in public domain by 2011 and assessment of impact of climate change on water resources by 2012.
- Promote citizen and state action for water conservation, augmentation and preservation – includes expeditious implementation of irrigation projects, minor irrigation schemes, groundwater development, mapping flood-affected areas, capacity-building and awareness
- Focused attention on over-exploited areas – intensive rainwater harvesting and groundwater recharge programmes, pursuing enactment of groundwater regulation and management bill
- Increasing water use efficiency by 20 percent – both on the demand side and the supply side, particularly in the agriculture and commercial sectors. Guidelines for incentivizing recycled water, water neutral and water-positive technologies, improving efficiency of urban water supply systems, benchmark studies for urban water use, water efficiency indices for urban

- areas, manuals for mandatory water audits in drinking water, irrigation and urban systems , promoting water-efficient techniques including sprinkler and drip irrigation systems
- Promote basin-level integrated water resources management – basin-level management strategies, review of National Water Policy in order to ensure integrated water resources management, appropriate entitlement and appropriate pricing.

d) *National Mission for Sustaining the Himalayan Ecosystem*

This mission will sustain and safeguard the Himalayan glacier and mountain eco-system. It would help in understanding whether and the extent to which the Himalayan glaciers are in recession. It also seeks for observational and monitoring network for the Himalayan environment: to assess fresh water resources and health of ecosystem. This mission will also explore protection and enhancement of forest lands in the Himalayan region.

e) *National Mission for a Green India*

**The Green India Mission** seeks to enhance carbon sinks in sustainably managed forests and other ecosystems, adaptation of vulnerable species & ecosystems to the changing climate, and adaptation of forest-dependant local communities in the face of climatic variability. Its goals include the afforestation of 6 million hectares of degraded forest lands and expanding our forest cover from 23% to 33% of the country's geographic area. This mission will look forward to involve communities in forest protection and afforestation.

f) *National Mission for Sustainable Agriculture*

This mission is of adaptive in nature, seeking for sustainable agriculture by developing new varieties of crops capable of withstanding extreme weather, thermal resistant crops, and alternative cropping patterns. It also emphasizes for orientation of agricultural research systems to monitor and evaluate climate change and recommend changes. Further, it seeks for convergence and integration of traditional knowledge and practice systems, information technologies and biotechnology.

It also focuses on improving productivity of rain fed agriculture.

h) *National Mission on Strategic Knowledge for Climate Change*

Last mission in the series is on building strategic knowledge for climate change. It focuses on funding of high quality research into climate change. This mission will study impact on health, demography, mitigation patterns and livelihoods due to climate change. It will establish network of dedicated climate change related units in academic and scientific institutions. A Climate change research fund will be setup. Private sector initiatives through venture capital funds will be launched. And finally research to support policy and implementation through identified centres will be done.

g) *National Mission on Sustainable Habitat*

This mission will work in three broad sector of sustainable development viz., Energy conservation in habitat, urban waste management and transportation sector. It extends application of Energy Conservation Building Code, incentives for re-tooling existing building stock and emphasizes recycling of materials and urban waste management and technology development for power from waste. This mission is seeking for better urban planning and modal shift to Public Transport to reduce GHG emission. (Ahmed S, 2007)

## Sustainable habitat in NAPCC

Little effort has been made to redesign our cities to adapt to climate change. The Sustainable Habitat Mission under the National Action Plan for Climate Change is poorly conceived and omits large components (for example, residential housing) from its scope, focussing narrowly on matters like “green buildings” – mainly high-rise commercial structures that use huge amounts of energy-intensive concrete, steel and glass, but seek a measure of economy and efficiency in demand management by tinkering at the margins while leaving the ecological burden of construction unresolved. (**Our dying cities**, Praful Bidwai, Frontline, Jul 14, 2012)

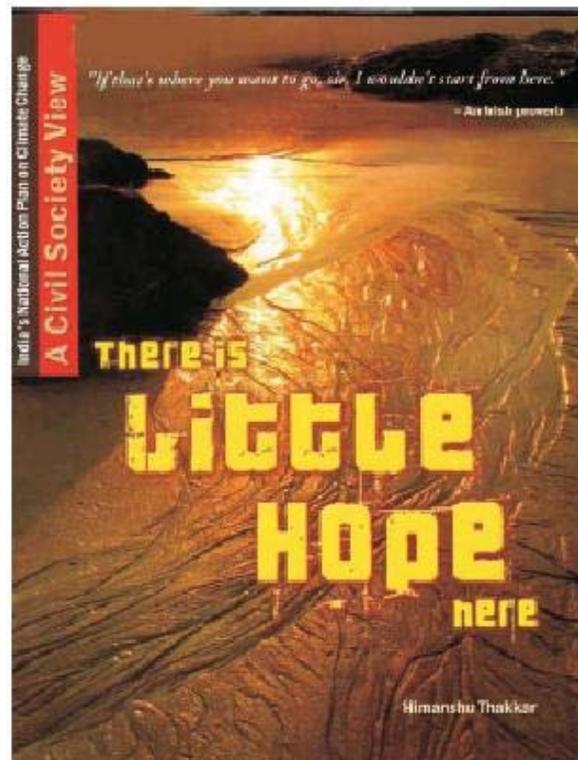
## Civil Society critique of NAPCC

Civil Society has criticised the secretive process that excluded the majority of the country from having a voice in its conception, process and planning. NGOs feel that whilst the NAPCC preamble has lofty principles, its proposals are mostly business as usual. Further the NAPCC ignores the key issues of equity within India, and resorts to the market mechanisms such as the CDM, which only increases inequity. Much of what the government claims as adaptation is merely a repackaging of existing programmes.

There is a dangerous advocacy of large dams as part of the National Water Mission. Whilst the Water Mission makes the necessary obeisance to localised water harvesting, it still focuses on large storage and major hydro projects, and capital intensive technologies for centralised water distribution. Groundwater, the mainstay of the harvesting system for domestic and irrigation use, receives very little attention. There is very little radical thinking on urban and industrial use.

The National Solar Mission is an ambitious mission. There are some issues relating to the regime of incentives and subsidies. The plan however seems to ignore the potential of Solar and other renewable as a means of decentralised generation and use of energy, particularly in villages that have no electricity. India’s persistent moves to go in for nuclear power, as ‘clean power’ has come in for universal criticism from civil society across the country.

By making sustainable agriculture mission, more adaptive in objective, the mission is missing out on the opportunity to reduce nitrous oxide emissions, through reducing use of chemical fertilizers and methane emissions by adopting SRI. Further adaptation of non pesticidal management and encouraging so called low value crops of millets, and non grain foods like tubers, would bring in co-benefits of resilience to the growing erraticism of rain and temperature in a climate changing world. Lip-service is paid to small farmers and their dry-land farming technology. The focus seems to be on bio-technology; with little or no learning from the green revolution that has led India up the unsustainable fossil-fueled based path to agricultural ‘development’.



Civil society maintains that the decades of involvement at the grassroots on issues relating to food production and distribution, watershed management and forest development and protection is finally being validated by the need for a low carbon path to equitable and sustainable development. The models and results are there for all to see; there is very little evidence of such awareness, understanding and acceptance in any of the missions.

The NAPCC focuses largely on mitigation, and leaves very little space for adaptation to changes that are already taking place, and affecting small farmers, traditional fisher folk, and forest-based communities. Its economic focus belies the basis in equity and 'inclusive and sustainable development strategy, sensitive to climate change' that is amongst the first statements of principles of the Plan: By putting the economy ahead of the environment, the NAPCC inevitably is full of prescriptions, lacks scientific rigour, and the proposed actions are incoherent and at times paradoxical, considering the government's ideas of economic development. The various positive suggestions in the report are not accompanied by identifying any current economic policies and actions that may need to be done away with, which may be harmful to climate.

We need to democratize the debate and action on climate change – in intent, process and implementation. A national action plan needs a debate on the larger vision of a low-carbon path to development, development that is inclusive, and provides for inter-generational ecological equilibrium and balance.

Ashish Kothari, commenting on the Green India Mission says that one of the biggest weaknesses is the complete absence of a strategy to prevent the loss of standing forests. While the MoEF formulates greening programmes, the Government of India is busy de-greening India. Between 1999 and 2007, about 50,000 ha of forest land, some of it with good standing forests was diverted annually to non-forest use. If the ultimate objective of any green India mission is to help counteract climate change and its impact, surely it is important to conserve what still exists while also regenerating what has been degraded. The GIM's second major weakness could be governance, given the fact that mostly JFM is dominated by bureaucracy and particularly the lack of coherence between the different departments of forests, tribal/social welfare, and rural development.

### India's approach

The Prime Minister's at 11th Sustainable Development Summit in New Delhi in 2011 sums up the Indian Governmental position. He says India will continue to play a constructive and responsible role in the on-going negotiations and will work with the international community to find practical, pragmatic and equitable solutions. Most commentators feel that India is in a position to take the lead in ushering in a low carbon development paradigm, as a majority of its people live very low carbon lifestyles, and would very easily adopt new carbon friendly technologies. Further being a large economy with a large market, it would be the ideal ground for scaling decentralised technologies. Further India has a large tradition of social entrepreneurship and Non-government Activity.

Instead the Prime Minister clearly indicated that India would tail the industrialised countries.. He said, "even as we wait for meaningful agreements on global mitigation action, we in India have committed ourselves to keeping our per capita consumption below the average for the industrial countries."

After speaking about the eight missions, the PM spoke about the Twelfth Five Year Plan which will "focus on specific initiatives needed to put our development on a path consistent with low carbon growth. Energy efficiency and exploitation of renewable energy sources will receive a special emphasis."

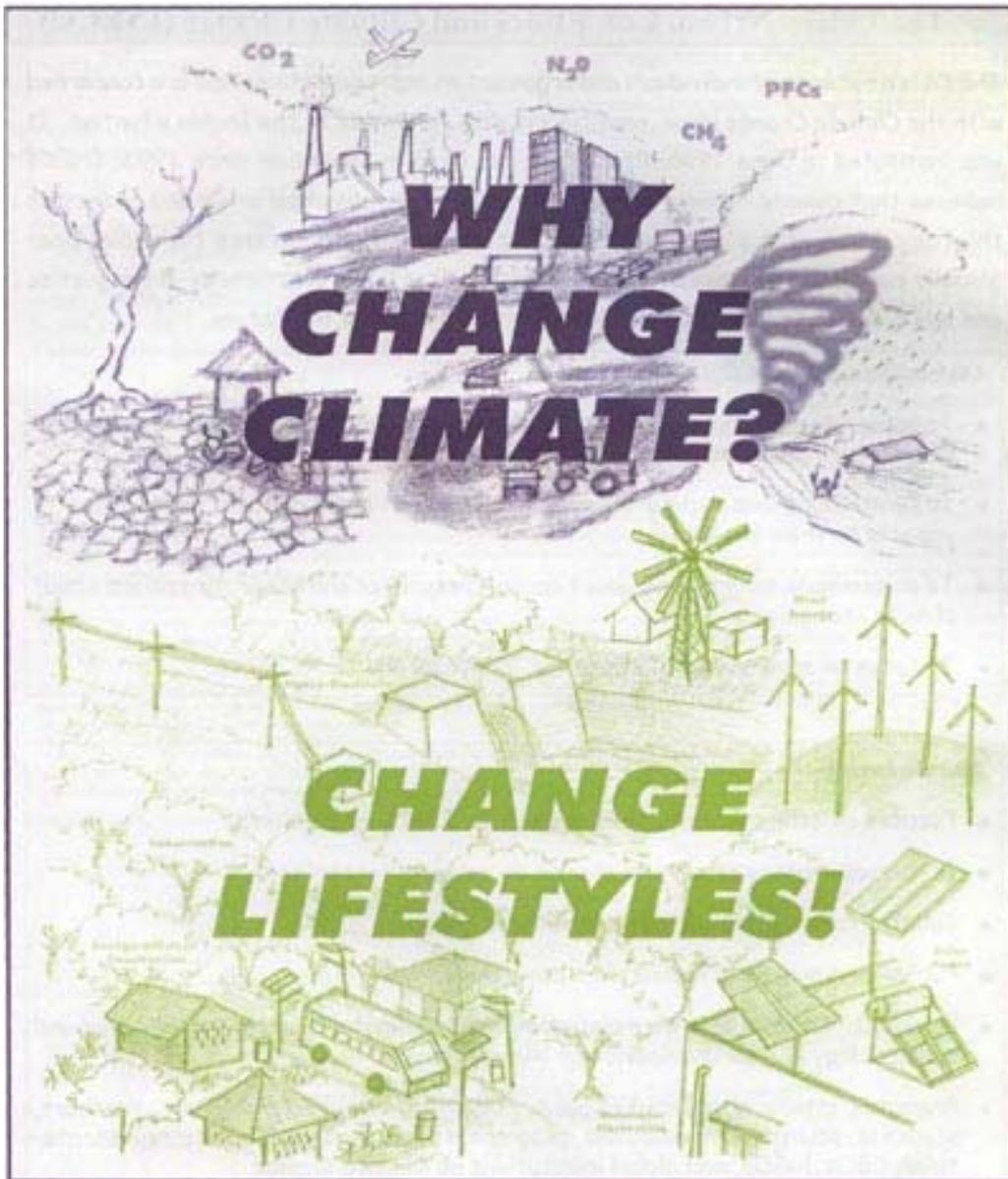
## Approach Policy

While determining who should take responsibility for reducing emissions, it should be kept in mind that only 55 percent of Indian households have access to electricity which means that a large part of the emissions of the poor is actually inefficient non-modern energy for lighting and cooking, and so increasing access to electricity and cooking gas to the poorer persons would actually reduce per capita emissions.

India's growing transport sector, which relies on fossil fuels, is also a key contributor to carbon dioxide emissions. The number of motor vehicles is growing due to opening up of the country's economy that led to a spurt in private car owners. At the same time, there is nothing explicitly stated in the National Policy, the NAPCC or any development plans that this consumption has to be reduced to sustainable levels, or that they should be carbon taxed appropriately. There is also nothing in the policy which would give a comparative advantage on the supply side to development of those production systems which have been outside of the fossil fuel or mainstream economy in transport like the development of non-motorised transport. In the non-transport sectors, the emphasis seems to be on some notions of energy efficiency, all of which work only on a higher scale, where there would be a higher absolute consumption of fossil fuel, and therefore a higher net emission. The fact remains that the vast, huge majority of people is totally out of the fossil fuel economy, and the efforts to develop these economies in the low carbon path is more or less absent. The fact is also that the development activities as well as plans, while aiming to increase growth and therefore emissions, are actually further marginalizing the poor and whatever livelihood they may have had.

But a majority of these people need to increase their energy consumption if they have to get out of the vicious cycle of poverty/survival. While it is unfair to ask poor people to do something about the CO<sub>2</sub> emissions, the dominant choices of development seem to be forcing them into higher emission development pathways. What is more tragic is that more and more people are losing control of their livelihood, as these high carbon development pathways are increasingly centralizing, and moving control to corporate hands, rather than public bodies.

Most Civil Society critics feel that emphasis in energy efficiency and renewable energy is not enough. The entire economy needs to be re-shaped around these principles, and since a large population on India is still within this paradigm, India needs to take a lead in this.



*Eco-ethic, Oct 2006*

Sustainable Development, Climate Change &  
Inclusion

## **What is Sustainable Development?**

Sustainable development has become a buzzword ever since the UNCED meet at Rio in 1992. It has become part of all climate change policy discussions at the global level, particularly due to adoption of Agenda 21 and the various Conventions resulting from the UNCED-1992. And like all such concepts, it means different things to different people, and each uses a conception compatible with their vision of development.

The Brundtland Commission defines sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. Economic well being, social equity and environmental sustainability are integral to this process. Despite the agreement that such a concept needs to go beyond economic well being and consider environmental sustainability, after 20 years we are still struggling to ensure that the environment is not reduced to money value. Why? Because the current dispensation feels that the moral fibre and good sense of the world's people cannot give us a better system of interaction, and sharing the world's resources than the money based market and trade. It also believes that those who can convert mineral sources into products or distribute nature's resources like water at a most economic rate should be given access to these resources and give them at a fee or rent to the others.

### Sustainable forests

The REDD scheme is a clear example of how the current dispensation works out a system of monetising forests, in order to preserve it. Besides the real and present danger of forests, and forest lands going further into the control of commercial interests, the scheme does not take into account that any genuine interest in protection of forests, lies with the forest dwellers whose very survival is dependent on the forest. They do not need carbon credits to support their work. In fact, a money oriented economy only increases the prospect of non-sustainable lifestyles being encouraged in the forests areas, the next proximate reason to commercialization of forest.

The National Federation of Forest People and Forest Workers (NFFPFW) have in a petition to the government delegation at Copenhagen warned that "a carbon-trading model involving private companies will create a huge financial incentive for wholesale takeovers of forests. With such funds, there will be a rush by private companies seeking access to public forestland for plantations as well as control over official forest protection programs. Reliance, ITC and other companies have been demanding access to 'degraded' forests for commercial afforestation for many years, and this scheme could legitimize their demand. The lack of legal rights combined with such pressure will make land grabbing very likely." Post Cancun however Jairam Ramesh has delinked the development of forests from the REDD funding process, and connected it to the Green India Mission.

Tribal communities living in close proximity with biodiversely rich landscapes, having evolved location specific and innovative livelihood strategies based on their traditional knowledge. If livelihoods based on forest based produce are maintained and improved or improved, it will incentivize forestation as well as ensure better and more resilient eco-system services. Given the current economic dispensation, we need to value these produce (NTFP) at higher levels, rather than seek to determine the economic value through commercialization or scale.

### Sustainable Agriculture

In the Sustainable Agriculture Mission lip service is paid to traditional agricultural methods, which do not use external inputs. Since the emphasis of the public distribution system and the food policy is on rice and wheat, the conventional dependence on green revolution technology and

mechanization, the options receiving the financial and institutional support are bio-technology and corporate farming.

Meanwhile, several farmers practicing sustainable agriculture have found that traditional crop varieties, and even local animal breeds, are more resilient to the changing climatic impacts than 'imported' crop varieties and animal breeds or cash crops grown as a single, stand alone crops.

A lot more institutional support need to be given to strengthen non-chemical inputs systems. These are mainly prevalent small farms in rain fed areas. On the contrary, the Deputy Chairman of the Planning Commission has gone on record to say that small so called unviable farmers should be moved to other more non-farm based occupations.

Sustainable practices such as organic farming, natural farming can help farmers adapt to the changing climate. Integrated farming systems based on locally available resources by including trees, livestock, water management can help mitigate climate change to a large extent and improve the quality of life of the farmers.

According to the FAO study of 2007, organic farms use on an average 33 to 56 per cent less energy per hectare. Organic farming reduces its fossil fuel dependence in many ways.

Crop rotation and usage of biological fertilisers(organic compost) can increase the soil carbon content and thus help in sequestering carbon. Integrating trees in farms helps in feeding the livestock, as well as improving soil organic content, they also help in minimizing water run-off during rains. Livestock, specially the local breed improve the soil organic content with manure, they can be fed with fodder (crop residues) without burning. Used as recycled biomass, crop residues potentially translates into organic carbon. Thus, by implementing soil conservation schemes, changing from mono-cropping to multi-cropping by including legumes, rotating crops, planting trees and harvesting water, we can reduce the carbon footprint of agriculture to a large extent.

### Sustainable Fisheries

A study of CO<sub>2</sub> emissions per ton of fish catch should that mechanized boats emit more than double per ton of fish catch.

Mechanized boats: trawlers- 1.67 tce, gillnetters: 1.79 tce, dolnetters: 1.45 tce, and compared to 0.48 of motorized boats, and almost negligible for traditional catamarans. (ICAR Annual Report 2008-09)

Yet, in the field of fisheries and coastal livelihoods too, we find that the emphasis of developmental efforts is on development of large aquaculture farms, and mechanized fishing by setting of fishing harbours, rather than promoting local beach landing sites and small marketing yards.

### Sustainable Energy

According to an expert committee of the Planning Commission on Integrated Energy Policy (August 2006), 'India needs to sustain an 8% to 10% economic growth rate, over the next 25 years, if it is to eradicate poverty and meet its human development goals. While it is true that the development of marginalized populations living in rural areas would require exponential increase in energy, what needs to be questioned is which parts of the 8 to 10% economic growth will actually benefit these populations, and which parts will only increase CO<sub>2</sub> emissions, that ultimately impact and worsen the situation of the 60%. These populations are *Adivasis*, *Dalits*, fisher-folk, small-scale

farm families, livestock who largely depend upon local natural resources and eco system services. Their energy needs are largely fulfilled by these decentralized energy resources.

The share of decentralized energy (energy which is locally managed and controlled) is hardly recognized. Further small scale projects serving the energy needs of remote habitations, especially *Adivasi* communities, are left isolated. Technological development and upgrading of these systems have at best been museumised. In fact, most of the renewable resources have been usurped by the centralized energy in manners and proportions that make these resources non-renewable.

An important example of these are the large wind farms which have been put up in hilly terrains. These farms have cordoned off high forest tracts which local populations accessed for their fuel, and food needs. Shabbily done roads to these mills, cut through verdant forests, and dump debris all along the slopes destroying natural vegetation and disturbing habitats. Trees are not allowed to regenerate as they interfere with the so called wind flow. Worst of all the electricity generated goes over the heads of the local populations.

Civil Society groups have played a pro-active role in demonstrating the potential and in influencing policies based on grassroots realities - working a on wide range of DEOs: solar, micro hydro, smokeless 'chulha', bio fuels, etc. The results of such experiments and innovation are lessons in sustainable living; and need to be included in any 'planning' for a low carbon alternative.

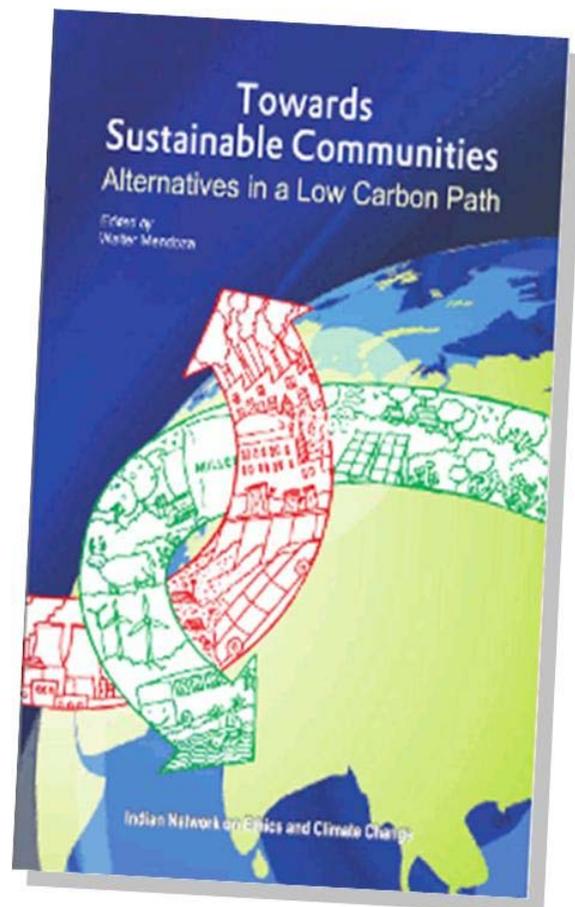
### Emissions & Poverty

Climate change is linked to emissions, and in turn, to economic growth. Limiting emissions is then about limiting growth. The global budget is extremely tight. The question is how to share it; developing countries cannot forsake the right of their current and future generations to grow economically by accepting undue constraints on the use of energy. If developing countries have to accept certain constraints to save the world from global warming, then it is obvious that all nations and peoples on Earth should share those constraints equitably (Sunita Narain, Centre for Science and Environment, India).

However in reality we see that all the developmental activities aim to increase growth (and therefore emissions), yet they are actually further marginalising the poor and their livelihoods.

### People's Choices

In a declaration at the National Workshop of the Indian Network for Ethics on Climate Change (INECC) titled "Peoples' Voices in the Domestic and International Climate Change Agenda" on November 7, 2008 at Visakhapatnam, these voices said...



The traditionally-rooted communities, usually the marginalized rural communities, have preserved the environment for centuries and they continue to do so... The country needs to find ways of responding to the issues of the ecosystem communities because they are the first to suffer the ill-effects of Climate Change.... Thus Climate Change is an issue of inequity which leads to food insecurity among the poor...

The communities and many more civil society groups have therefore to be involved in the search for alternatives, with a focus on the poor and vulnerable groups. Adaptation to and mitigation of Climate Change is possible by preserving/ protecting bio-diversity, forests, using agricultural waste for bio-fuels and through livestock improvement, organic farming better governance of electric power production and distribution, undertaking renewable decentralized energy options such as micro or 'nano' hydro, photovoltaic solar based home lighting systems and biomass based initiatives...

### from Growth to Decentralization

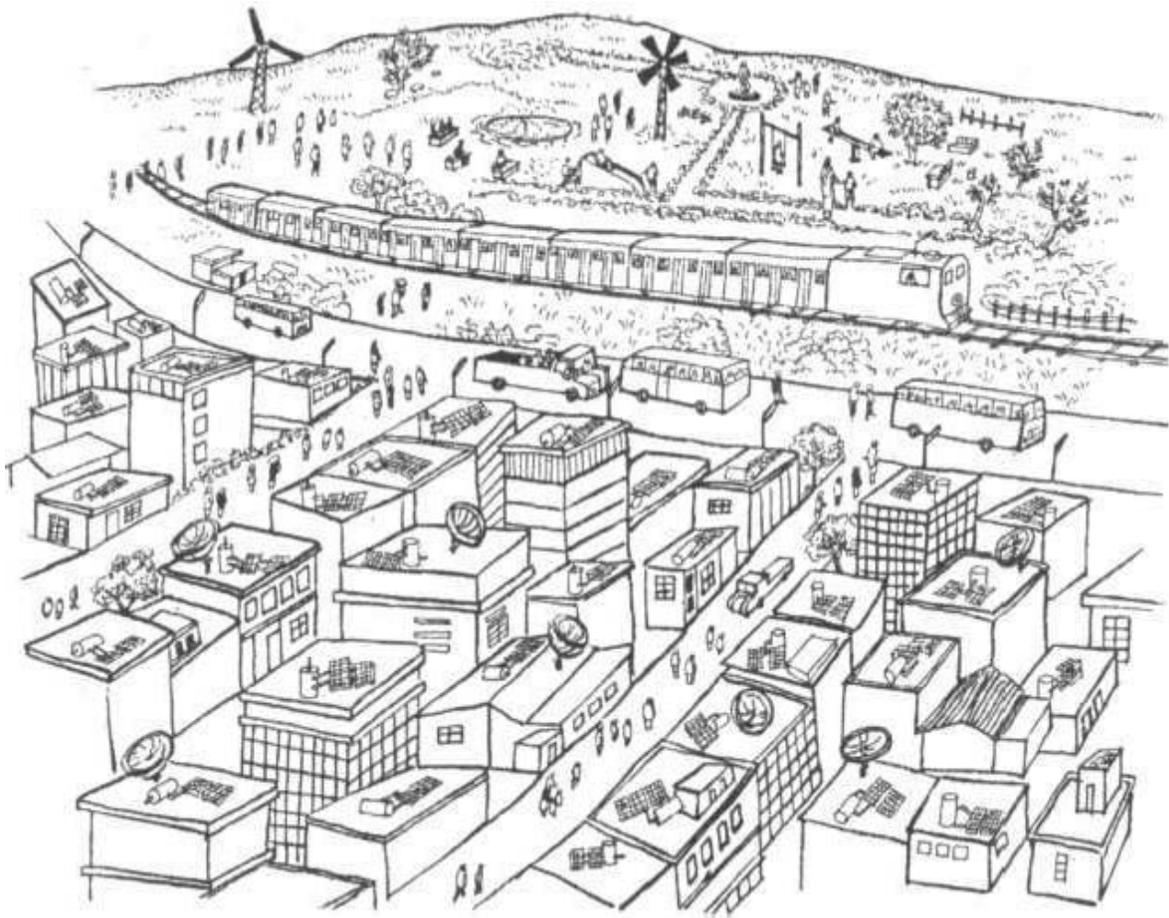
The challenge today is that no country has been able to delink growth from a rise in CO<sub>2</sub> emissions, or show how to build a low carbon economy or re-invent the growth path. Countries like India and China are still building their energy, transport and industrial infrastructure and therefore give the world the opportunity to "avoid" additional emissions. We can build our cities on public transport; our energy security on local and distributed systems - from biofuels to renewable; our industries using the most energy-efficient and pollution-efficient technologies. Our leaders can be key players at this critical juncture. They can provide leadership to the rich and the poor world by showing a different pathway to growth.

The Climate Action Network, South Asia (CAN-SA) has recommended in its national level consultation, that both mitigation as well as adaptation measure must be taken. They have strongly suggested that the solutions lie in shifting the emphasis from centralized production systems to decentralized, bioregional production and that any alternative should essentially protect the lives and livelihoods of people. That should be the precautionary principle observed in planning and decision-making.

#### **Low Carbon Development Path**

LCDP is a part of sustainable development. It

- i. restrains energy demand growth,
- ii. drives production towards low carbon sources,
- iii. promotes an economic growth which works with secure energy
- iv. Uses low carbon and renewable substitutes to fossil fuels



*Eco-ethic, Jul-Dec 2002*

What is to be done!

## **What is to be done!**

Action on Climate Change has been classified under two basic heads - mitigation and adaptation. Mitigation refers to an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases, while adaptation refers to the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damage, to take advantage of opportunities, or to cope with the consequences both responses are equally important for example, mitigation will have global long-term benefit whereas the benefits of adaptation are on a local to regional scale.

Those of us working with marginalised communities, insist on adding the equity and decentralisation dimensions to mitigation and adaptation programmes, as we feel that without equity and decentralisation, such efforts are bound to end in failure. We also oppose models of development where growth is measured in terms of money where the additional value is generally created at the expense of the environment, where the commons are disproportionately used up by one section of people. In the case of climate change it is the "carbon space".

Cities in this regime should be architected, not as fountainheads of emissions, but as centres of emissions economy based on principles of sharing carbon space and awareness and concerted efforts of mitigation and adaptation. What is to be done therefore highlights those approaches and policies which would make such an economy possible.

### The Urban as alternative

#### Can a City be sustainable?

In a fast-approaching world with 9 billion people, 70 per cent of whom are expected to live in urban areas by 2050, there seems to be no option but for cities to become sustainable. In a global warming world this means that its per capita emissions must be within limits of the available carbon space.. not only for the current generation, but also for future. Within the city we have seen that a large part of the population, mostly the ones considered illegitimate as they stay in informal dwellings or slums are the only ones who are living within the average per capita carbon space. And all other activities like industry, commercial buildings, malls, transport are considered as essential for economic growth, are actually high emitters and therefore not ecologically sustainable. This therefore is the challenge of equity and sustainable development.

Concentrations of people and economic activity generate knowledge, social transformation, innovations and new technologies. Thus cities can be credible laboratories of social change, with sufficient scale to bring about meaningful changes.

First, Cities have the unique ability to respond to a global issue such as climate change at a local, more visceral level; they usually offer more immediate and effective communication between the public and the decision makers. Being concentrated and tightly organised, mitigation actions can be carried to scale and thereby make a substantial contribution to reducing the absolute levels of emissions.

Similarly, Adaptation actions become more viable and cost effective as they serve a larger population, and assets. This in turn has a cascading effect on co-benefits of mitigation and adaptation actions on the quality of life and livelihoods.

Therefore, national governments who have had to deal with intractable geo-political issues, would do well to hand over planning and implementation to local bodies while keeping the responsibility

of oversight and facilitation. These cities some of which have populations more than many countries are in a position to take effective action, and well as cooperate with each other. In fact today 75 "global cities" because of their economic deft and trend-setting nature, determine much of the current global collective civilization.

**Earth Policy Institute recommendations**

**Mitigation**

The Earth Policy Institute has estimated that the following measures would cut global net CO2 emissions 80% by 2020.

- a) Raise the energy efficiency of buildings & appliances, through better insulation, efficient lighting, and nano-technology controls for appliances.
- b) Substitute fossil fuels with renewables: Wind, Solar, Geothermal, Bio-mass and small scale Hydro, Tidal and Wave Power projects.
- c) Improve manufacturing efficiency for carbon emissions heavyweights (chemicals, petrochemicals, steel, and cement) offers major opportunities to curb energy demand
- d) Restructuring transport to emphasize rail, light rail, and bus rapid transit.
- e) Ending net deforestation and planting trees to sequester carbon

All these measures rely for their success on the generation of a new economy around energy efficient products, grid connected power generation from renewable source, like wind farms, solar farms, charging points and systems including batteries for plug in hybrid electric vehicles etc. If there is a free market, such a new economy will not work unless fossil fuels are disincentivised through a tax on carbon emissions. The suggestion is to raise tax on carbon emissions by \$20 per ton each year, so that the tax will exceed \$200 per ton of carbon by 2020.

**Box: Urban GHG emissions**

<b>Mitigation measures according to drivers of GHGs in a city</b>			
<b>Sector</b>	<b>Drivers based on production</b>	<b>Drivers based on consumption</b>	<b>What can be done</b>
Energy Supply	Distribution losses	Increased use of grid based electricity, Privatisation of distribution has incentivized higher scale of consumption. Higher demand driven plans	Energy saving devices Grid integration of renewable source of electricity: solar, wind, Less GHG intensive sources/consumption Reducing consumption among high consumption households, Curbing distribution losses
Industry	Growing levels of production Higher energy intensity of production Production of emission producing goods like motor vehicles	Raw material, mineral based development Transport of ancillary inputs and minerals	A shift away from heavy industries and from industry to services; increasing energy efficiency within enterprises; capture of particular GHGs from waste streams Reduce consumption of high GHG embedded goods. Encourage consumption of local goods, materials Increasing small scale processing of raw

			material for local needs Costing of GHGs increases in products
Transport	Growing use of private automobiles; increases in average fuel consumption of private automobiles; Urban sprawl increase in tier II cities	increased air travel Increased private car travel outside urban area. GHG emission for manufacture of automobiles, steel, fuel transport outside urban area. Material for transport infrastructure	Walkways, pedestrian plazas, Increase bicycle travel, bicycle lanes Reduced private automobiles: more efficient vehicles, auto using alternative fuels Augment Public transport, mass transit Planning/zoning for reducing travel: Mixed used areas, City expansion as per transit need Reduce air travel, reduce private car travel outside urban area.
Residential /Commercial Buildings	High energy construction methods Urban Design	High fossil fuel based High energy intensive construction material Increased use of electricity for lighting, cooling, heating	Cutting fossil fuel/electricity use, thus cutting GHG emissions from space heating (usually the largest user of fossil fuels in temperate climates) and lighting; PASSIVE DESIGN Fixtures & fittings/utilities
Waste and waste-water	Growing volumes of solid and liquid wastes and of more energy intensive waste	Emissions on dumping of waste in non-urban area Effluents into sea, into rivers, Water from outlying areas,	Reducing volumes of wastes, and waste management that captures GHGs Recycling waste Recycling water, Rain water harvesting,
Forestry and agriculture	From encompassed forest and agricultural areas  High energy food products, cold foods, pre-prepared foods	GHGs generated by deforestation and agriculture Emission from food agriculture, meat production, High consumption and wastage higher income groups	Convert household waste to fertilizer Use water effluent for urban agriculture Diet shift to low emission foods, Reduction of food miles, Shift back to seasonal food Encouraging less fossil fuel intensive production and supply chains for food and forestry products
Public sector and governance	Urban governance preference for heavy investment, bigger infrastructure expenditure to boost economy support corporate big industries, urban sprawl,		Governance that support Lower GHG options above, low intensity, high human/renewable inputs  better management of government-owned buildings  reducing GHG emissions generated in the building of infrastructure and the delivery of services

## **Adaptation**

Climate change is already impacting existing vulnerable individuals, households and cities in a variety of different ways. In

many low-income cities, urban infrastructure is insufficient for dealing with current climate variability. Addressing this ‘infrastructure deficit’ is an important component of climate change adaptation’. New strategies and financing for adaptation will be necessary to respond to this. They need to take broader issues of development into account such that households, communities and cities are able to meet the challenges of today, as well as those that will arise in the future.

Adaptation of infrastructure can involve planned retreat, accommodating the changes, or constructing various protective measures

Adaptation can also involve “soft” or ecosystem infrastructure, including the use of mangroves or other vegetation to protect coastline. Cities need to reforest degraded coastal areas, enforce coastal zone management policy to regulate developments along the coastline and provide for appropriate management of coastal resources.

Adaptation also requires building resilience to a wider range of shocks and stresses, which can be achieved through the improvement of health and education systems, as well as through the provision of adequate shelter, sanitation and drainage. However, currently most municipal authorities do not see climate change adaptation as a priority or as their responsibility.

## **Adaptation Action at the Municipal level**

There is a need for a consolidated and coordinated approach to adaptation to projected climate impacts on a municipal scale because it is at this level that people are directly affected by climate-induced impacts and it is at this level that institutional solutions that target wide numbers of people can be introduced.

Key municipal sectors involved in adapting to incremental climate change include health, water and sanitation, solid waste, infrastructure (i.e. electricity and transportation). Besides these, other sectors (which come in the purview of the state government) which build resilience to climate change impacts are food security and agriculture, bio-diversity, coastal zone development/conservation, as also strategic planning, economic development and disaster risk reduction and management. In most municipal sector like water, sanitation, electricity and transportation, design and planning, service delivery can easily be planned so as to provide co-benefits in terms of climate change adaptation. Thus climate awareness and prioritization of climate issues need to be made an integral part of poverty reduction, development plans. Further, the health and water municipal adaptation plans should also take into account larger thresholds levels of disaster.

Disaster management is generally regarded as a responsive (i.e. a relief and welfare) rather than a proactive function. Given the increased frequency and intensity of disasters following extreme climate events, there is need to prioritize proactive and strategic interventions to prevent disasters, and these go beyond the early warning system range of solutions.

For example, resilience needs to be built into construction processes, relocation of existing key infrastructure and people away from flood prone/landslide areas, design and to reduce the probability of infrastructure failure and enhance the chances of recovery after an extreme weather event etc.

## **What Urban Authorities can do**

Elements of an effective programme of adaptation at the city level would therefore include -

a. Knowledge & Awareness where local authorities should gather local information of impacts of storms, floods, heat waves etc by collating experiences of local people, as well as external studies and projections. It needs to study the existing measures of coping with these impacts. It should share these knowledges, as well as forecasts, emergency plans, and evacuation routines with the local people, which themselves should have been drawn up in consultation with them. The communities must also be involved in the early stages of adaptation plans and implementation of disaster preparedness.

b. Better Design & Planning: The local authorities should allocate safe locations for low income housing to reduce possibilities of flooding, landslides, and encourage zoning practices that will reduce distance to livelihood and employment.

They need to build resilient and effective infrastructure particularly in low income housing, and slum and squatter settlements, and improve drainage systems to reduce possibilities of flooding, dampness, stagnant water pools etc.

Providing low cost housing would involve upgrading of slums, squatters colonies and informal housing. The local authorities would also need to make building standards for formal housing such that it privileges lower carbon footprints through tax break and incentives for water harvesting, energy saving designs, low energy embedded building materials, urban agriculture, waste segregation and local composting, zero garbage schemes etc.

An important task is to privilege sustainability enhancing livelihoods by promoting Waste recyclers, incentivising ragpickers, urban agriculture in conjunction with decentralised composting, Upgrading eco-system jobs, through facilities, and incentives.. (IIED, 2009)

### **People led Adaptation**

In Urban areas, responses of individuals, households and communities are key to adaptation. A wide variety of coping strategies is already in evidence among many low-income groups: moving valuable items; sending children to stay with friends or relatives elsewhere during disaster events; or constructing flood barriers around their homes.

Innovative urban policies include community based initiatives led by organizations formed by the urban poor, and local governments working in partnership with their low-income populations. (IIED, 2009)

### **Governance & Urban Adaptation**

State Governments are responsible for Urban Development which is a key component as well as co-benefit of adaptation. But for Adaptation to be effective, urban planning and development needs to be devolved to the local governments. The nodal agencies for providing policy guidelines and financial support in the areas of Housing and Urban Poverty Alleviation, two key elements of an effective adaptation programme are at the central ministries. Thus in practice despite the 74th amendment, devolution of decision making to the local level is varied. (Sharma D, 2010)

Further, there are parallel but isolated institutional structures for disaster management and environment at the national level in India. These diverse sectors, including health, planning,

resource management and agriculture, coordinated effectively with each other in terms of responding to disasters, supported by a coherent legal framework and resources from above. However these same actors did not coordinate well when it came to the emerging, and more fragmented fields of climate change research and planning. This has led to stunted adaptation efforts at the sectoral level, even within institutions that are active in the areas of both disaster management and climate change science. (Patwardhan A, 2007)

### **Mumbai Disaster Plan**

The government of Maharashtra developed India's first urban disaster management plan for Mumbai in the late 1990s, identifying flooding as a significant risk and pinpointing bottleneck locations in each ward, as well as vulnerable slums and settlements. (Mumbai Disaster Management Plan, 1999); (Vatsa, K S, 2003). It was only after the July 2005 deluge, that the city started looking at the development aspects. It realised that the Mithi River which was the critical storm drainage of the city has been choked and interfered by inappropriate planning, of the airport, housing, and development schemes along the river. Also the storm water drainages in critical parts of the city has been narrowed, thanks to the expansion of the roads and highways.

### **Mumbai Not Prepared for Climate Change**

Meanwhile, nations, worldwide are preparing detailed maps of the effects of climate change on their cities. They are also developing back-up systems in case of emergencies caused by rising ocean levels. Mumbai is yet to initiate any such moves.

The Centre had formed a cell on global warming. At the local level, efforts were initiated to enforce the coastal regulation zone (CRZ), which prevents development within 500 metres from the high tide line. Tetrapods and retention walls are being laid along the coast to stem sea erosion. Also, government has ordered protection for coastal wetlands and mangroves, which act as a buffer against the sea.

However, wide-ranging studies on the impact of a rise in sea-level are yet to be carried out. Numerous CRZ violations too are being reported on a regular basis and there is a strong lobby campaigning for it to be done away with altogether. (TOI, 2006)

### **Flexibility and innovation in adaptation systems**

More effective adaptation planning in cities will require greater awareness of the existing knowledge of impacts of climate change and impacts of local climate and environmental degradation, more knowledge also needs to be generated and made known. This would require the involvement of a range of stakeholders including citizen groups, the private sector, city and national governments and financing institutions. It cannot be left to the outside experts alone.

One approach is to foster positive relationships with the academic community, ensuring that there is an ongoing discussion and continually updated information between the realms of science and policy.

Another approach would be to work with local technical and municipal staff, including engineers as they have encountered impacts and would be in a position to interface between paper design plans and local situations, and therefore bring in flexibility in the system as well as on the ground responses. (IIED briefings. Nov 2011)

## Towns in poor countries, and poor areas in Towns

Towns and cities in poor countries, as also poor areas in the big cities, have habitats particularly vulnerable to climate change. Thus any action for adaptation must address the issues of habitat which are inadequate infrastructure and environmental degradation and inappropriate location like low lying areas. Low-income urban residents have little choice about which land they live on: to live near opportunities for making a living, they are forced to make trade-offs in security of tenure, land prices and land safety.

In many low-income cities, houses are poorly constructed using wood, mud or old iron sheets – materials which cannot withstand heavy wind, let alone floods.

The people most vulnerable to climate change are low-income residents of slums and squatter settlements. Because of their systematic exclusion from the formal economy of the city, their lack of basic services and entitlements and the impossibly high costs of entry into legal land and housing markets, most of the urban poor live in hazardous sites and are particularly vulnerable to the consequences of climate change. (IIED, 2009)



*Khader Shariff Garden, Bangalore*

### **Community Composting**

A part of the Urban mind-set is scale. Small inconveniences like garbage disposal, carrying carry bags is replaced by apparently cheap alternatives. So, waste is packed into small plastic bags, dumped into stinking bins, or just strewn down the wayside. The garbage is transported to dump

sites, which besides leaving a large carbon footprint in terms of transport, also emit large amounts of methane. Besides productive land is lost.

A small group of middle class residents in Bandra and surrounding places decided to compost their waste. They use a simple low cost method for composting food waste. Developed by Christopher Pereira, the compost tumbler is designed to reduce smell, and generation of methane, as well as provide a cleaner and easy way of handling the composting. (For details of Compost tumbler check [pcdfire.co.in](http://pcdfire.co.in))



Since the waste is decomposed aerobically, it generates free fertilizer for gardens. More importantly it could be part of an urban food generating system, which reduces import of food to that extent. (Vasudeva, 2011)

In areas without toilet facilities, human excrement is a source of environmental pollution and diseases; this is especially a problem in dense urban areas. However, this excrement can be recycled through composting toilets, which do not require expensive sewer systems; this might very well prove to be a viable solution for slum areas.

If composting toilets were to be installed in slum areas it would not only improve sanitation in these areas but would also be a way of providing fertilisation. And if land were then to be allocated for farming, through which the primary skills of many slum dwellers, i.e. their knowledge and experience of farming, are put into use, this would come

to represent a holistic and ecologically sustainable solution. And perhaps it could even serve as a model for the rest of the city? (Valeur and Kaur, 2012)

In Bangalore, the work of Waste Wise, led by Anselm Rosario and Agriculture Man Ecology (in consort with ETC Netherlands) are examples of civil society organisations active in waste management in general and composting in particular. Swabhimana and Civic are other prominent examples of community-based organisations working to promote urban sustainability through effective waste management. Exnora (an acronym of Excellent, NOvel and RADical Ideas) in Chennai was founded in 1989. The organisation has been extensively involved in promoting effective solid waste management at the community level. All their schemes revolve around extensive public participation in community-ownership. There are now more than 3000 community-based Exnora "chapters", known as Civic Exnoras, which promote integrated SWM involving rag pickers (scavengers), separation at source and extensive composting of organic waste.

### It's time to reduce the water footprints

Water requirements for the urban eco-system will be under severe stress. As it is, urban water supply systems are inadequate despite several water projects displacing several rural habitats by virtue of big dams, water canals and pipelines.

For example the water systems of the Vasai Virar Regions outlying Mumbai have been destroyed by rapid urbanisation in the natural drainage areas. This region is now being supplied water from river systems further away, which is affecting farmer communities in the Thane region.



Urban eco-systems can easily reduce their water footprints due to densities of population and structures. It calls for an Integrated Urban Water Management (IUWM) system which manage the surface water, groundwater and rainwater as a whole. It also calls for recycling water and treating waste-water as a whole. Thus an integrated system will close the hydrological loop at the city scale itself as far as possible.

The City of Chennai has solved a lot of its fresh water problems by legislating water harvesting into the building rules.

Privately, a residential layout on Sarjapur Road in Bangalore which harvests almost every drop of rainwater falling on site, prices water to control demand and recovers the monies spent on supplying it. The area has a waste-water treatment plant which treats and reuses all the domestic sewage generated and depends only on groundwater for its requirement from an aquifer which they themselves have recharged.

A city like Bangalore has approximately 3000 million litres per day of water falling on it in 60 rainy days. The demand for water is about 1800 million litres per day. Today, despite three stages of

Cauvery water projects at high costs, and furious pumping up of ground water by middle class residents, large areas of the city are water starved and depend on tanker water supply, thus increasing carbon footprint. By taking responsibility for harvesting rainwater on roof tops, and recharging groundwater through well managed percolation systems, Bangalore can take care of its water requirements easily. Further, its urban water bodies which currently receive waste-water, could be rejuvenated through treatment of waste water and wetland systems. (Vishwanath.S., 2012)

## Transportation

Since the invention of motorised transport, towns and cities have been structured around these machines and, to an extent, dominated by them. A study of London in 1999 indicated that while motor vehicle-related air pollution was concentrated in the centre of the city, car ownership was concentrated in the outer areas. Economically disadvantaged urban citizens often live by busy polluted roads in the city areas because housing there is less expensive. The wealthier urban families live along highways in sprawls

In Mumbai and Calcutta however because of the local trains, the poor do live in cramped apartment blocks in the distant suburbs and have to commute several hours in over-crowded trains. The only poor people in the city centre were the mills workers who have since been displaced after the textile strike, and closure of the mills. Otherwise, the inner areas of the city have residential enclaves for the rich, who then find it convenient to use private transport, due to the shorter commutes. There is however a growing middle class which commutes long distances by private transport which is incentivised by the overcrowded conditions in the trains and very inconvenient public transport by road. The recent JNNURM programme has however seen a rise in airconditioned swifter bus transport which has managed to attract some middle class travel to premium commercial zones of Bandra Kurla Complex and Worli, which are not conveniently located at terminal train stations. The metro services in places like Delhi have also had a similar impact. Thus the Indian City is now seeing a newer version of the sprawl, which is now being discouraged in the West.



*Anna Salai, Chennai*  
*Source: Frontline*

LOOK, WE ARE POLLUTING ALRIGHT, BUT WE ARE ALREADY LATE FOR OUR BUSINESS... WHY DON'T YOU CATCH HOLD OF THE GUYS COMING BEHIND CYCLING?...THEY'LL GET SCARED AND SIMPLY PAY UP.



*Eco-ethic, Mar 2005*

### Cycles but No space for them

Every car that is off the road saves 5.1 metric tonnes of CO<sub>2</sub> a year and a five per cent increase in cycle trips across the world would cumulatively save 100 million tonnes of CO<sub>2</sub> emissions annually. Realising the urgent need to promote non-motorised transport, many Asian cities are actively promoting them — Changwon in South Korea offers financial incentives to bolster cycle use; Hangzhou in China has a vast network integrated with the bus system; and Yogyakarta in Indonesia has introduced an accident insurance

scheme to encourage cycle users.

Despite a high user base, Indian cities have no plans for cycles. For example, Delhiites make 2.8 million trips a day by cycling, which is almost equal to the number of trips made by car. But the city hardly has any safe cycle-lanes. Chennai, which has about 1.4 million cycles, is no better.

Given the fact that the average trip length in Indian cities is within 5 km, bicycles are the best suited for such commutes. It is disheartening to see urban planners overlook this advantage. Worse, their policies have literally pushed cycles off the road, forcing the poor who use them the most to spend more and more on transportation. The larger benefit from promoting cycling lies in reducing energy consumption and pollution levels. (The Hindu, 2012)

### **Travelling in the opposite direction**

There is an actual decline of Non-motorised Transport especially cycling. Congestion, increase in trip lengths due to urban sprawl, increase in purchase power of people and totally inadequate facilities for cycling have all contributed to reducing cycling to less than 11% of the mode share which is down from nearly 30% in 1994. And for pedestrians our city roads have simply forgotten they exist. The percentage of roads with pedestrian footpaths runs to hardly 30% in most cities.

Public transport has generally dwindled. Some public transport services have been even pushed out of business. Consequently street congestion has dramatically increased and overall speeds on major corridors have dropped. Operating bus services in congested streets have become increasingly difficult in congested networks with turnaround times increasing by the day. Fleet sizes in nearly all public undertakings have declined rather than grow to meet the demand. Meanwhile, the share of personalized modes especially of two wheelers have gone up leaps and bounds clocking 12% per annum in the past two decades. (Ministry for Urban Affairs, 2002)

### **Highways and Transport**

Cities need better road access, but they also need congestion pricing that will charge drivers for the social costs of their driving. India can't just build its way out of traffic congestion, because new roads just attract more drivers. The Fundamental Law of Highway Congestion, documented by economists Gilles Duranton and Matthew Turner, shows that vehicle miles travelled increase roughly one-for-one with highway miles built. Singapore pioneered congestion pricing 37 years ago. (It takes a city by Edward Glaeser, Indian Express, 05 Jul 2012)

### **Transportation Policy**

**Transport in urban areas is major contributor to Carbon emissions, as well as other urban ills like pollution of Black carbon, public safety, congestion and infrastructure. The irony is that two of the main policy suggestions for better urban development by the ministry itself are also climate mitigation strategies. They are:**

**Prioritise Mass transport** will be the only way forward. However many cities in India have no public transport. and important recommendation has been that before embarking on larger mass transport systems, bus systems must be in place.

**Support Non Motorised Transport (NMT):** and the declining trend reverse. However even today 40% of today's trips in cities are by NMT, 25% of all fatal accidents involve NMT. Thus infrastructure must be developed to encourage NMT as well as improve safety.

In fact the National Urban Transport Policy 2006 has another climate friendly suggestion that is encouraging integrated land use and transport planning in all cities so that travel distances are minimized and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved.

### Policy Goals & Plans

Policy tools for local-level action on climate change

#### Goal: Reduce trip lengths

Tools:

Regulatory: Mixed use zoning to shorten trip distances, restructure land value tax in mixed zones, privilege use of NMT/Discourage vehicle use, Toll in cross-node travel for private transport

Service: Improve Infrastructure for Non-Motorised Transport

#### Goal: Increase Mass Transit use

Tools: Regulatory: Mass-Transit oriented development zones, tax incentives to developers close to mass transit,

Service: Expand mass transit service, improve quality of transit service, public hub and spoke multiple modes of travel.

Facilitative: employee transport plans in MTS

#### Goal: Discourage Vehicle use

Regulatory: Driving restrictions in certain zones, preference for NMT, parking restrictions in certain zones.

Facilitative: Traffic calming  
(adapted from Kamal-Chaoui, 2009)

### Grow your own food!

#### **The potential for small-scale urban farming in India**

The implementation of urban farming is, however, facing multiple challenges, the most critical of which may be land scarcity/high value of land in cities. However, land for urban farming could be provided in the same way as parking spaces are being provided; by reserving a certain percentage of a building plot for “food space”.

This is not the only challenge, though. Other challenges include contaminated soil, lack of sunlight due to cramped conditions, water scarcity and low quality of water. Solutions to these challenges can be devised where needed.

Furthermore, urban farming may be instrumental in promoting the recycling of both non-organic material, like plastic containers and construction elements, and organic material, like kitchen garbage, which may be composted and used for fertilisation. Other means of organic fertilisation include plant extracts, composted excrement from animals like chickens and cows (manure) and, perhaps more



controversially, composted excrement from humans (humanure).

In areas without toilet facilities, human excrement is a source of environmental pollution and diseases; this is especially a problem in dense urban areas. However, this excrement can be recycled through composting toilets, which do not require expensive sewer systems; this might very well prove to be a viable solution for slum areas.

If composting toilets were to be installed in slum areas it would not only improve sanitation in these areas but would also be a way of providing fertilisation. And if land were then to be allocated for farming, through which the primary skills of many slum dwellers, i.e. their knowledge and experience of farming, are put into use, this would come to represent a holistic and ecologically sustainable solution. And perhaps it could even serve as a model for the rest of the city? (Valeur and Kaur, 2012)

### Why Urban Agriculture

Urban agriculture can be an important coping strategy for households. Because women often have the responsibility for food procurement for the household, they are frequently involved in urban agricultural production and sales. Urban agriculture presents a number of challenges, including competition for scarce land, degradation of soils, and pollution. At the same time, urban agriculture offers new potential for recycling urban wastes, saving on marketing-transport costs and providing the poor with employment.

In terms of a comprehensive, citizen-driven approach to agriculture in an urban setting, the example of Mumbai stands out first and foremost in India. Perhaps due to the fact that it is the most highly urbanised "concrete jungle" of the sub-continent combined with a lack of space for waste disposal the right type of environment has emerged for the creative cultivation of plants and waste reduction through compost development in a dense urban environment. Some of the early actors in Mumbai were Dr. R.T. Doshi (See CED Film City Farming; [cityfarming.in](http://cityfarming.in)), Kisan Mehta of Prakruti and Preeti Patil who set-up the more resilient Urban Leaves([urbanleaves.org](http://urbanleaves.org))

According to Exnora: The households in this street have formed a Civic Exnora. Every house segregates their waste at source. The Civic Exnoras has distributed a green colour basket to every household, into which the residents store organic wastes. The street beautifier collects these wastes in one compartment of his tricycle, and the other inorganic recyclable waste in another. The organic wastes are converted to manure through aerobic composting, which is used in their own gardens. The street beautifier separates inorganic waste, sells it to waste buyers and earns an additional income. A small quantity of waste that cannot be recovered is transported to secondary collection points for collection by the Municipal authorities. (Quoted from <http://indiaa.com/exnora/swm.html>)



### Cuba, Havana

Many district level governments, across the world, are concerned about the growing competition for land and water and incompatible land use. They try to discourage food production in urban areas in the belief that, in addition to competing for scarce valuable land, it contributes to problems of public health. Raising animals is especially discouraged.

In stark contrast, the Cuban government has actively supported urban food production, especially in the capital, Havana. (Down to Earth, 2001)

Cuba had shown us that it can substantially do without fossil fuel, as well as ensure equity, and nurture nature. After the dissolution of the Soviet Union and the tightening of the U.S. Embargo in the nineties, Cuba was denied their former imports of petroleum products and pharmaceuticals, Cuba's 35,000 scientists, operating in 200 research institutes across the island, began to explore indigenous and sustainable ways to meet their food, medicine and energy needs. Innovations in organic agriculture and urban gardens earned Cuban agriculturists the Alternative Nobel Prize/Right Livelihood Award; advances in renewable energy including solar, wind, micro-hydro, biogas, and biomass, and island-wide energy efficiency campaigns earned the Cuban NGO Cuba Solar the UN Global 500 Award; and the development of alternative and traditional health care practices earned this Cuban program recognition by the UN Development Council, as one of the five most important projects in health care internationally.

Worsening food shortages motivated citizens to plant food crops in the yards, patios, balconies, rooftops and vacant land sites near their homes. Within two years, every neighbourhood in Havana had gardens and farms. By 1994 hundreds of residents were involved in food production. The majority of these urban growers had little or no access to much need agricultural inputs — seeds, tools and pest control devices.

In 1997, urban farms and gardens in Havana provided 30,000 tonnes of vegetables, tubers and fruit, 3,650 tonnes of meat, 7.5 million eggs, and 3.6 tonnes of medicinal plant materials. Residents of Havana are also growing rice today. This small-scale rice production is completely unprecedented because in Cuba rice production, historically, has been carried out on large farms using industrial methods. Nationwide, small-scale urban rice production now equals that produced by large-scale, state-owned, farms in rural areas. There has also been a revival of interest in herbal medicines which is one of Cuba's burgeoning economic sectors.



*Mumbai Port Trust Terrace Farm*

## Notes:

These refer to the different scenarios, for which climate models have been developed in order to study climate change in those scenarios. They include:

A1 scenario of very rapid economic growth, a peak in global population by the mid-21<sup>st</sup> century, rapid development of more efficient technology, with conversions between developed and developing regions. The A1 scenario is further subdivided into fossil-intensive (A1F1), non-fossil energy sources (A1T) or a balance across sources (A1B).

A2 scenario envisages a very heterogeneous world, with preservation of local identities. Economic development is locally focused, resulting in slower development but continuous population increases.

B1 scenario: A convergent world economy, similar to scenario A1, though with a heavy focus on clean and resources-efficient technologies, with an emphasis on global solutions to economic, social and environmental sustainability.

B2 scenario: Again a heterogeneous world similar to A2 though with an emphasis on local solutions to economic development social and environmental sustainability

# References:

## Introduction

Population Reference Bureau: <http://www.prb.org/educators/teachersguides/humanpopulation/urbanization.aspx>

It takes a city by Edward Glaeser, Indian Express, 05 Jul 2012 <http://www.indianexpress.com/news/it-takes-a-city/970507/0>

**State's rural population on decline, Deccan Herald, July 15, 2012**  
<http://www.deccanherald.com/content/176696/states-rural-population-decline.html>

**Press information Bureau, 2007, "Poverty estimates for 2004-2005", accessed 31 December 2010 at**  
<http://pib.nic.in/release/release.asp?relid=26316>.

**Government of National Capital Territory of Delhi (2006), Economic Survey of Delhi 2005-2006, Planning Department, page 364**

Siddharth Agarwal, 2011, "The state of urban health in India; comparing the poorest quartile to the rest of the urban population in selected states and cities", *Environment and Urbanization*, April; vol. 23, 1: pp. 13-28.

**Bhan, Gautam (2009), "This is no longer the city I once knew; evictions, the urban poor and the right to the city in Millennial Delhi", *Environment and Urbanization Vol 21, No 1, April, pages 127-142.***

**Government of India (2002), *National Sample Survey 58<sup>th</sup> Round (2002)*, Ministry of Statistics and Programme Implementation, Government of India, New Delhi, page 12.**

**Urban Health Resource Centre (2007), "Health of the urban poor in India; key results from the National Family Health Survey, 2005-2006", Urban Health Resource Centre, 6 pages. This is likely to be an underestimate as poverty lines in India are not adjusted sufficiently for the higher cost of non-food necessities evident in many cities.**

*Environment and Urbanization* October 2009 vol. 21 no. 2 545-567

Census 2011: Rapid urbanizations sees dip in since last head count: State's rural population on decline, Deccan Herald, 16 July 2011

Revi, Aramer (2008), "Climate change risk: an adaptation and mitigation agenda for Indian cities", *Environment and Urbanization Vol 20, No 1, April, pages 207-229.*

Sharma, D and Sanjay Tomar (2010), "**Mainstreaming climate change adaptation in Indian Cities**", *Environment and Urbanization* October 2010 vol. 22 no. 2 451-465. <http://eau.sagepub.com/content/22/2/451.full.pdf+html>

## Understanding Climate Change

Carbon dioxide emissions reach record high, Neela Banerjee May 29, 2012 <http://phys.org/news/2012-05-carbon-dioxide-emissions-high.html#jCp>

## Politics of Climate Change

**Bonn Climate Change Conference Fails to Make Any Progress Due to Lack of Political Will, Timon Singh, inhabitat.com. May 30, 2012** <http://inhabitat.com/bonn-climate-change-conference-fails-to-make-any-progress-due-to-lack-of-political-will/>

**Effort to Curb Coolant Falters, Sometimes at Home, Elisabeth Rosenthal, Nov 22, 2012**  
[http://www.nytimes.com/2012/11/23/science/earth/air-conditioner-repairs-undermine-coolant-restrictions.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2012/11/23/science/earth/air-conditioner-repairs-undermine-coolant-restrictions.html?pagewanted=all&_r=0)

Stephen O. Andersen, a former United States Environmental Protection Agency official who is now with the Institute for Governance and Sustainable Development in Washington in Rosenthal, 2012

Urban India and Climate Change: Mitigation Strategies towards Inclusive Growth by Sohail AHMAD and Mack Joong CHOI, Seoul, 2007 <http://um.ase.ro/no15/5.pdf>

## **Sustainable Development, Climate Change & Inclusion**

ICAR Network Project on Impact, Adaptation and Vulnerability of Indian Agriculture to Climate Change. Annual Report 2008-09. p.130 <http://www.crida.in/Climate%20change/npcc.pdf>

## **Climate Change and Cities**

**Cities & Climate Change: Policy Directions. A Global Report on Human Settlements 2011.** Abridged Edition. United Nations Human Settlements programme.

<http://www.unhabitat.org/downloads/docs/GRHS2011/GRHS.2011.Abridged.English.pdf> sited on 22nd April 2012

Satterthwaite, D (2011) How urban societies can adapt to resource shortage and climate change, Phil. Trans. R. Soc. A 2011 369, 1762-1783 <http://cat.org.in/files/reports/Mumbai-Marooned.pdf> (cited on June 7, 2012)

Cox, Wendell (2011) "Urbanizing India: The 2011 Census Shows Slowing Growth", New Geography, 11/21/2011. <http://www.newgeography.com/content/002537-urbanizing-india-the-2011-census-shows-slowing-growth>

Mumbai Marooned - An Enquiry into Mumbai Floods 2005 - Final Report. Conservation Action Trust, Powai, Mumbai. 84 pp. 2006. [R.Y01.14] <http://cat.org.in/files/reports/Mumbai-Marooned.pdf>

## **How Cities impact Climate Change**

UN-Habitat. 2003 Water and sanitation in the world's cities: local action for global goals. London, UK: Earthscan Publications.

Kovats, R. S. & Akhtar, R. 2008 Climate, climate change and human health in Asian cities. Environment and Urbanisation. Vol 20, No.2, 165–176. (doi:10.1177/0956247808089154)

Grimmond, S. 2007 Urbanization and global environmental change: local effects of urban warming. The Geographical Journal. Vol 173, Issue 1, 83–88. (doi:10.1111/j.1475-4959.2007.232\_3.x)

Kjellstrom, T. & Mercado, S. 2008 Towards action on social determinants for health equity in urban settings. Environment & Urbanisation. Vol 20, no. 2 551–574. (doi:10.1177/0956247808096128)

McGranahan, G. 2007 Urban transitions and the spatial displacement of environmental burdens. In Scaling urban environmental challenges: from local to global and back (eds P. J. Marcotullio & G. McGranahan), pp. 18–44. London, UK: Earthscan Publications.

Satterthwaite, D (2011) How urban societies can adapt to resource shortage and climate change, Phil. Trans. R. Soc. A 2011 369, 1762-1783 <http://rsta.royalsocietypublishing.org/content/369/1942/1762.full.pdf+html> (cited on June 7, 2012)

## **Impact of Climate Change on Cities**

Huq, S, S Kovats, H Reid and D Satterthwaite (2007), "Reducing risks to cities from climate change: an environmental or a development agenda", Environment and Urbanization, Vol 19, No 1, April, pages 3-15.

DOSSOU, Krystal M R and Bernadette Glehouenou-Dossou (2007), "The vulnerability of global cities to climate change In Cotonou (Benin): the rise in sea level", Environment and Urbanization Vol 19, No 1, April, pages 65-79;

Muller, Mike (2007), "Adapting to climate change: water management for urban resilience", Environment and Urbanization vol 19, No 1, April, pages 99-113;

Revi, A (2005), "Lessons from the deluge: priorities for multi-hazard risk mitigation in Mumbai", *Economic and Political Weekly* Vol XI, No. 36, September, pages 3-9.(12)

Kumar, R K, A K Sahai, K Krishna, S K Patwardhan, P K Mishra, J V Revadekar, K Kamala and G B Pant (2006). "High resolution climate change scenarios for India for the 21<sup>st</sup> Century", *Current Science* Vol. 90, No 3, 10 February, Pages 334-345.

Hard two-hour rain, and Delhi has another manic day, *Hindustan Times*, August 21, 2009  
<http://www.hindustantimes.com/India-news/NewDelhi/Hard-two-hour-rain-and-delhi-has-another-manic-day/Article1-445672.aspx>

GSDMA/TARU (2005), *Gujarat Vulnerability and Risk Atlas*, Gandhinagar, GUJARAT as quoted in

Sharma, D, 2010 (**Mainstreaming climate change adaptation in Indian Cities** by Divya Sharma and Sanjay Tomar, *Environment and Urbanization*, October 2010)

TARU/BMTPC(2000), "Rapid assessment of damage to buildings and lifeline infrastructure in districts of Orissa affected by cyclonic storm 05B-99", TARU, New Delhi. (in **Mainstreaming climate change adaptation in Indian Cities** by Divya Sharma and Sanjay Tomar, *Environment and Urbanization*, October 2010)

Aggarwal, D and M Lal(2001), "Vulnerability of Indian coastline to sea-level rise", *Centre for Atmospheric Sciences, Indian Institute of Technology, New Delhi*

Climate Change and the Urban Poor: Risk and Resilience in 15 of the World's most Vulnerable Cities. The International Institute for Environment and Development (IIED), London. 2008-2009. pp 22.  
<http://pubs.iied.org/pdfs/G02597.pdf> [CED Ref: R.E31d.76]. This report outlines lessons learnt regarding the principal effects of Climate Change on 15 cities in low-income countries, and what makes them vulnerable to these effects.

Kovats, S and Akhter, R (2008) "Climate, climate change and human health in Asian cities"

*Environment and Urbanization* April vol. 20 no. 1 165-175

Government of Maharashtra (1999), *Mumbai Disaster Management Plan*,  
<http://mdmu.maharashtra.gov.in/pages/Mumbai/mumbaiplanShow.php>

Vatsa, K S and J Joseph (2003), "Disaster management plan for the state of Maharashtra, India: revolutionary process", *Natural Hazards Review* Vol 4, No 4, November, pages 206–212.

City sea level rising 1.2 mm yearly, Sunil Nair, *Times of India*, Oct 26, 2007  
[http://articles.timesofindia.indiatimes.com/2007-10-26/mumbai/27977494\\_1\\_sea-level-nio-s-unnikrishnan](http://articles.timesofindia.indiatimes.com/2007-10-26/mumbai/27977494_1_sea-level-nio-s-unnikrishnan)

The World Charter for the Right to the City, common platform to demand our rights and defend common goods in 'Call to convergence for Rio+20 and beyond', *International Alliance of Inhabitants* (<http://rio20.net/en/iniciativas/a-paradigm-shift-for-just-democratic-and-sustainable-territories>)

### What is to be done?

Climate Change and the Urban Poor: Risk and Resilience in 15 of the World's Most Vulnerable Cities, International Institute for Environment and Development (IIED), London. 2008-2009. pp 22. <http://pubs.iied.org/pdfs/G02597.pdf> [R.E31d.76].

Urban adaptation planning: the use and limits of climate science: Lessons from adaptation in practice. IIED briefings. November 2011. <http://pubs.iied.org/pdfs/17108IIED.pdf> cited on 28th April 2012

*Mainstreaming climate change adaptation in Indian cities*, Divya Sharma & Sanjay Tomar, *Environment and Urbanization*, October 2010 vol. 22 no. 2 451-465

Anand Patwardhan and Mita Ajit, Disaster Prevention, Preparedness and. Management and Linkages with Climate Change. Adaptation. September 2007 <http://www.basic-project.net/data/final/PaperIndia%20Disaster%20Prevention%20%20Preparedness%20%20Linkages%20w%85.pdf>.

It's time to reduce the water footprints, Vishwanath.S, The Hindu, June 9, 2012. <http://www.thehindu.com/todays-paper/tp-features/tp-propertyplus/article3507182.ece>

Cycling Cities, The Hindu, July 9, 2012  
<http://www.thehindu.com/opinion/editorial/article3616915.ece>

Study on Traffic & Transportation Policies & Strategies in Urban Areas in India: Final Report. Wilbur Smith Associates. May 2002. Ministry of Urban Affairs [http://urbanindia.nic.in/programme/ut/final\\_Report.pdf](http://urbanindia.nic.in/programme/ut/final_Report.pdf)

Grow your own food!, Henrik Valeur and Arshinder Kaur, Economic & Political Weekly, Vol - XLVII No. 24, June 16, 2012, <http://www.epw.in/web-exclusives/grow-your-own-food.html>

Raquel Pinderhugues et al., "Going to Town with Agriculture", *Down to Earth*, 15 Jan 2001, [http://el.doccentre.info/eldoc1/k33\\_/k33\\_M1142.pdf](http://el.doccentre.info/eldoc1/k33_/k33_M1142.pdf)

### Further Reading:

Urban Development Ministry Website:<http://www.urbanindia.nic.in/>

Urbanizing India: The 2011 Census Shows Slowing Growth by Wendell Cox 11/21/2011  
<http://www.newgeography.com/content/002537-urbanizing-india-the-2011-census-shows-slowng-growth>

McGranahan, Gordon, Deborah Balk and Bridget Anderson (2007), "The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones", *Environment and Urbanization* Vol 19, No 1, April, pages 17-37.

Satterthwaite, D, 2009, "**The implications of population growth and urbanization for climate change**"  
<http://www.unfpa.org/webdav/site/global/users/schensul/public/CCPD/papers/Satterthwaite%20paper.pdf>

Urban India and Climate Change: Mitigation Strategies towards Inclusive Growth, Ahmad S and Choi M. J. Theoretical and Empirical Researches in Urban Management

Number 6(15) / May 2010. <http://um.ase.ro/no15/5.pdf> cited 30.4.2012. Findings reveal that yet the climate change is not taken seriously by policy makers, hence blue print for mitigation haven't placed. Findings suggest systematic mitigation measures for sustainable development which will lead to inclusive growth too. The need for collaborative planning among various stakeholders is emphasized.

Kamal-Chaoui, Lamia and Alexis Robert (eds.) (2009), "Competitive Cities and Climate Change", *Regional Development Working Papers* N° 2, 2009, OECD

Stephens, Carolyn, 2011, **Revisiting urban health and social inequalities: the devil is in the detail and the solution is in all of us**. *Environment and Urbanization* April 2011 vol. 23 no. 1 29-40

Deren, Sherry, Sung-Yeon Kang, Hector M Colon and Rafaela R Robles (2007), "The Puerto Rico-New York airbridge for drug users: description and relationship to HIV risk behaviours", *Journal of Urban Health* Vol 84, No 2, pages 243-254

**From Economies of Scale to Emissions Economy: Eco-regional Notes on Climate Change and Urban Areas** is a part of Eco-regional notes brought out by INECC. The booklets do not claim any exclusivity of research and has borrowed liberally from other sources liberally. Since the emphasis is on readability, we have removed academically required citations. While every attempt has been made to verify the data provided, the booklets do not claim any certitude. User discretion and judgment is an essential part of the education which these booklets seek to promote.

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About INECC

INECC is a loosely structured national network comprising of individuals and organisation representatives interested in the climate issue from a micro-macro perspective.

It connects the issues of climate change to larger sustainable development and social justice concerns. In this context INECC perceives policy changes in favour of communities who are most impacted by the climate crisis.

INECC, through its partners is involved in demonstrative models on grassroots mitigation and adaptation processes. Based on this experience INECC has been arguing for ensuring a link between development and energy access through relevant technologies for a low carbon pathway.



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About CED

**CED** is about information

- Information in the democratic process
- Information for awareness, analysis, critique
- Information as education and social change.

CED sees itself as part of the task to build intermediate alternative institutions. The information perspective is understanding of and resistance to dominant non-democratic, in-equitous development perspectives as well as engaging with pathways for alternative, sustainable, and equitable development & change.

CED's areas of focus are: Climate Change; New Economics, Knowledge in Civil Society & Just & Sustainable Urbanism.



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