

A brief report on the proceedings of the workshop



CONFRONTING CLIMATE CHANGE- TOWARDS CARBON NEUTRAL INDIAN CITIES

Organised by



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A Workshop on

CONFRONTING CLIMATE CHANGE: TOWARDS CARBON NEUTRAL INDIAN CITIES

29-30 OCT '09

MAGNOLIA INDIA HABITAT CENTRE, LODHI ROAD, NEW DELHI

09:30 AM-06:00 PM

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Ministry of Environment & Forests
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Moderated by

Dr. Sumana Bhattacharya

Consultant, CMS Environment

National Expert Consultant, NATCOM Project Management Cell

Ministry of Environment and Forests, Government of India

Executive Summary

Cities are the drivers of economies across the world and about 80% of the total GHG emissions globally are attributed to them. This is true, more so, for India, where development is largely concentrated in the cities. The GHG emission in the cities is mainly from energy consumption in commercial, residential and public sectors and from dumping of solid waste. By 2050s it is projected that about 60% of the population in Asia will reside in its cities. With growing population, the emissions are likely to increase manifold unless steps are taken to contain them. Other than the demands on energy and waste management, pressure is growing on water and food security of cities as well, which is likely to become scarcer with climate change.

Cities are the centers of innovation having well laid out governance structure. Hence mitigation measures can be easily implemented here along with a continued sustainable development that takes into account the climate change concerns and growing population.

A two day workshop was organized by CMS Environment on 29th and 30th October, 2009 in New Delhi to discuss the issues associated with sustainable development of cities in the future with focus on moving towards carbon neutrality. The discussions in the workshop were around the following themes in the context of climate change:

- Sustainable Energy Supply and Management in Cities
- Sustainable Transport System in Cities
- Urban Habitats
- Managing Water in Cities vis-a-vis Climate Change
- Urban Food Security
- Towards Development of Effective Climate Action Plan for Cities

Experts from different institutions working in relevant areas were resource persons in this workshop, who talked about their respective experiences and laid the path for forming a framework for developing measures that lead towards carbon neutrality. It emerged during the discussions that per capita CO₂ emissions in Indian cities are still far below the global average, and they range between 0.3 tons/ capita to 2.25 tons/ capita. However, since development is inevitable, emissions are likely to increase if the business as usual path is traversed. Hence, the experts concluded that the recently launched Climate Change Action Plan of the Indian government may be integrated at city level to achieve the desired carbon neutrality in the future. The missions in the Action Plan that are relevant to cities are the solar mission, energy efficiency mission, sustainable agriculture, water mission and urban habitats. Such an action plan has already been put in place by the Delhi government for the period upto 2012.

It evolved in the discussions during the workshop that the panacea for gravitating towards Carbon neutral cities obviously lies in a gamut of technologies that include energy efficient



lighting systems that constitutes of about 40% of the GHG emissions from cities globally; a sustainable transport system, with more focus on public transport and cleaner fuels (fossil fuel plus renewable); urban habitats that use material or are designed in such a way so that they rely on less energy for lighting, cooling, warming, water pumping, and other miscellaneous uses and can be built on our old climate friendly architectural traditions. Similarly, climate change is likely to stress the water resources, so integrated water management to capture and use the available water in an efficient manner is the key towards sustenance especially re-utilization of waste water in cities might be an appropriate approach to sustain in water stressed conditions in the future. The urban food security issue dependent on production of food, its transport and storage in urban centers requires technological impetus to overcome climate change impacts and collusion of the market forces is necessary for ensuring security of the same.

All this requires effective governance. The challenge of the hour is not only to put in place effective governance for retrofitting our cities that lie in 20,000 urban centers in India but also to develop self contained 400,000 villages in the next 20-30 years based on low carbon technologies. Though the five year plans as laid out by the Indian government can take care of the short term objectives, however, the climate change actions towards carbon neutrality need to be integrated over a period of time to confront the long term nature of climate change phenomenon with today's emissions impacting even beyond hundred years in the future. .

It was concluded in the workshop that for moving toward a Carbon neutral city the following need to be undertaken :

1. Develop a base line of GHG emissions from cities and scenarios that project the developmental path of the city in short, medium and long term time lines
2. Identify the high and fast growing GHG emitting categories
3. Identify opportunities whereby the relevant missions of the national action plan on climate change can be integrated such as increasing energy efficiency, water management etc
4. Trace the current institutional arrangement for implementing the measures
5. Identify the barriers for implementation under the current scenario and lay out actions for overcoming the same
6. Develop plans to mitigate greenhouse gas emission in the long term that include technology, institutional arrangements and policy directives and clear indications for financing action.



BACKGROUND: With increasing populations, cities are becoming huge sources of Green House Gases (GHG) emissions from anthropogenic activities. The emissions in the cities get embedded in the immediate living environment and stem from (i) electricity consumed in domestic, commercial and public sectors for lighting, cooling, water pumping and office management and (ii) fossil fuels consumed in sectors such as transport, cooking and in generators for generating electricity. The consumption levels are likely to be skewed further, when in 2050, 70 per cent of the world population will reside in cities (according to the UN projections).

In its National Climate Action Plan on Climate Change, launched in June 2008, the government of India has taken the initiative to mainstream climate friendly technologies through some key missions. However, these missions need to be effectively integrated in the city development plans as actionable items. The Intergovernmental Panel on Climate Change (IPCC) has stressed that action must be immediate.

WORKSHOP: A PLATFORM FOR ACTION AND INTEGRATION

As the theme of the CMS Environment Forum 2009 is on “Climate Change and Sustainable Technologies”, this workshop aimed at spotlighting how cities can cope with climate change in particular through the use of appropriate technology. The workshop provided a platform for city planners and officials, technology researchers, people from the public and the private sectors and other relevant stakeholders to develop a framework/action plan for environmentally sustainable cities in the context of climate change in India. This includes the identification of policy requirements, strategies and programmes, markets and employment opportunities.

Facilitator: Dr. Sumana Bhattacharya, National Expert Consultant, NATCOM Project Management Cell, Ministry of Environment and Forests, Gol and Consultant CMS Environment.





Day 1, October 29, 2009

Session-1: Inaugural (10:30am-11:45 am)



Inauguration of the workshop

The proceedings started with the lamp lighting ceremony by the esteemed dignitaries present in the inaugural session followed by the welcome address by Dr. N. Bhaskara Rao, Chairman, CMS, New Delhi, who introduced the topic to the participants and made enlightening remarks on the contemporary and futuristic relevance of the same, thereby setting stage for an engaging discussion over the next two days.



Mr. Emani Kumar

The first speaker to take the podium was **Mr. Emani Kumar**, Director of ICLEI South Asia. ICLEI, is a membership organization of local governments and their associations dedicated to a sustainable urban environment. ICLEI through its Urban climate project, for South Asian cities, is developing energy base lines, making projections of energy demand rates into the future, exploring the feasibility of measures for enhancing energy efficiency as well as exploring the opportunities for introducing renewable energy sources. It is also engaged in related policy advocacy for cities. Their estimates indicate that the per capita emissions in Indian cities vary from 0.3 to 2.6 t CO₂. As cities are part of the problem, they are also the units where solutions can be implemented effectively through energy efficiency measures in street lighting, water supply system, in buildings and through inclusion of energy from solid waste in the total energy mix of the cities. Dr. Emani Kumar mentioned that many of the Indian cities such as Delhi, Nagpur, and Bhubaneswar have set out their plans to achieve certain levels of energy efficiency by 2012 through these measures.



Prof. Joyashree Roy

The next speaker for the session was **Prof. Joyashree Roy**, Head of Economics Department, Jadavpur University who also co-ordinates the Jadavpur Global Change Programme. She touched upon the need to focus on Indian cities when it came to reduction in carbon emissions as the urban centres infamously had the highest energy consumption quotient. She spoke about her efforts in collaboration with the West Bengal government to fulfil the climate change mitigation objectives and how they had worked towards integrating these efforts with the eight missions of the National Action Plan for Climate Change. She also recounted how at the behest of the governor of West Bengal, the project of measuring the carbon footprint of Raj Bhawan, official residence of the governor was taken up and steps were taken towards its maximum possible reduction. This will serve as an example for similar civil projects elsewhere in the city but as the governor very correctly noted that



this project faced no budgetary constraints whatsoever but the others needed to be economically viable so as to be a success.

Her Excellency **Ms Anne Ollestad**, Ambassador of Norway to India, took the podium next. She remarked that India had been identified as one of the countries that will have huge challenges from global warming, as pointed out by the IPCC 4th assessment report and that the Norwegian embassy had been mandated by the Norwegian government to promote co-operation with India on environment, energy security and climate change. India had signed an MOU with Norway for getting sponsorship for several clean development projects, which would result in a straight 10% fall in the annual greenhouse emissions. A biodiversity project with assistance from the resourceful signatory and in collaboration with the Andhra Pradesh government would soon come into operation. Apart from this, several initiatives had already been taken like the Norwegian embassy had adopted thirty villages in north India and was taking care of their green energy needs. The ambassador added that her country was equally agile in combating climate change at domestic front. Norway has a very vibrant shipping industry and the government was taking full care of keeping a track of its potentially harmful carbon footprint.

Mr. Claes Leijon, counsellor for development co-operation, Swedish International Development Co-operation Agency (Sida), delivered the keynote address in which he touched upon the sustainable development works taken up by Sida in co-operation with Pune Municipal Corporation on a project centred around sustainable urban planning and non-motorised urban transport. He also showed how Swedish cities were pro-active in taking initiatives in mitigating climate change. Swedish local authorities are extremely independent, especially through the ownership of local energy companies. This reduces the chances of occurrence of impasse at policy level and helps in faster implementation at grass root level.

Mr. Gaurav Gupta, Senior Vice President, HSBC, North India, represented the theme partner of CMS VATAVARAN. He highlighted the steps towards sustainability taken by HSBC. It was the first major bank all over world to go green in 2005. Through the use of environment-friendly technologies and emission-offset trading, HSBC counteracts all carbon emissions generated by its building operations and corporate travel. Additionally, HSBC cares for its employees and customers by utilizing a green cleaning standard in its buildings that focuses on improving indoor air quality, recycling and minimizing the use of raw materials and toxic products. In 2007, HSBC announced a five-year, \$100 million program to help reduce the impacts of climate change on the world's rivers, forests and cities. This ground-breaking initiative partners HSBC with four world-class environmental organizations—Earthwatch Institute, World Wildlife Fund, Smithsonian Tropical Research Institute and The Climate Group—to inspire global action by individuals, businesses and governments worldwide.



Ms Anne Ollestad



Mr. Claes Leijon



Mr. Gaurav Gupta





Session-2: Sustainable energy supply and management in cities 12:00 pm-01:30 pm

The session focused on sustainable energy supply and management in cities and was chaired by Dr. Pramod Deo, Chairperson and Chief Executive Officer, Central Regulatory Electricity Commission (CERC), Delhi. He brought into public attention various energy initiatives taken by the commission, as a part of the National Action Plan on Climate Change, which comprised mainly supply side and demand side management and urged upon the need to have a market based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy intensive urban centers. Besides, various states in the country have their own potentially viable sources of renewable energy waiting to be tapped. A detailed tariff policy on non-conventional energy resources was in the process of being drafted which would include preferential tariffs for the latter to encourage investment and widespread usage and prescribe a percentage of consumption mandatory from renewables.



Dr. Pramod Deo

Dr. Murari Lal, Advisor, Chairman, CESDAC, took the podium next. He specifically mentioned a key finding of the IPCC 4th Assessment Report, which reflects on the Asian cities in particular that, the exploitation of natural resources associated with rapid industrialization and economic development in most developing countries of Asia has led to increasing air and water pollution, land degradation and other environmental problems that has placed enormous pressure on urban infrastructure. In his presentation, he proposed a plan towards a low carbon future for Indian cities, with a focus on Delhi. He underlined that though certain key measures such as the Metro rail and the CNG powered public transport system are in place in Delhi that in a way are helping to mitigate climate change, there still is an increase in private transport system and measures such as adequate feeder systems for the metro and sustainable management of energy utilization in residential and commercial complexes can bring about saving of energy. Climate change however, poses a threat to the availability of energy for the cities, and in this context he proposed a a nouveau concept of 'Bhartiya Climate Index' that will rank products and services according to their respective impacts on climate. The revenue thus generated will be used for funding climate savvy projects like awareness spreading campaigns etc.



Dr. Murari Lal



Ms. Aditi Dass, Programme manager, The Climate Group, dwelled primarily on the relative importance of LED lighting as compared to other instruments in popular usage. While doing so, Ms. Das, traced the evolutionary pattern of lighting instruments starting from incandescent bulbs to fluorescent lamps to CFL and now the changing trends to LED. She brought into the focus, the fact that 8% of the total GHG emissions in the world is from lighting and 40% of this lighting is still through incandescent lamp route. Incandescent lamps produce only 40-50 lumens per watt of electricity consumed, as compared to LEDs that are 3-4 times more efficient. She talked about a project taken up by The Climate Group in Canada to study the effectiveness of LED. Though the latter was 3-4 times as energy efficient as any CFL but the installation costs were high. But they could be offset in the long run usage. The Climate Group is in dialogue with few city municipalities in India to introduce in a pilot mode the LED street lighting and hopes, if costs are rationalized then it can be an important instrument towards reductions in GHG emissions from this sector in India. In addition, Ms. Das mentioned about the various measures that the Climate Group had undertaken to spread awareness in the public about the benefits of LED over conventional lighting instruments.

Dr. Chhemendra Sharma, Scientist, National Physical Laboratory, talked about the option of harnessing energy from municipal solid waste that is already forming one of the components in the energy mix of some cities in India as a part of the CDM initiative. Dr. Sharma mentioned that the waste sector in India emits 2% of the total GHG emissions which is about 24.56 million tons and this gas is available for energy purposes in cities. He went over the various technologies available for producing the energy from waste; however, pointed out the fact, that except for large cities, systematic collection of waste is not taking place, as a result we are losing out on a source that can easily be used for generating energy. Dr. Sharma presented the potential energy that can be generated from the three municipal solid waste dumping sites in Delhi, namely, Bhaleswa, Ghazipur and Okhla range between 1.8 to 3.7 MW each year for 10 years starting from 2010. In total the three dumping sites in Delhi can on average produce 6 MW of power each year in the next 10 years.



Ms. Aditi Dass



Dr. Chhemendra Sharma





Session-3: Climate change and sustainable transport system in the cities

02:30 pm-04:00 pm



Session III: Climate change and sustainable transport system in the cities



Dr. Dinesh Mohan



Dr. A. N. Goswami

This session invited discussion on sustainable transport system in cities. **Dr. Dinesh Mohan**, IIT Delhi chaired it. Prof Mohan is of the opinion that small city conglomerates within cities are solutions towards mitigating climate change where by each smaller city have offices and homes at walkable or cyclable distances. He mentioned that metro system by expanding the urban sprawl is in fact enhancing GHG emissions as it encourages long distance travel between home and office, which would have been limited otherwise. Further, he feels that building of flyovers and subterranean transport system would not limit the growth of private modes of transports and hence would not lead to reduction in emissions with respect to the current transport scenario in cities. Prof Mohan in fact, passionately endorses the Bus Rapid Transport (BRT) which is already operational in a certain part of Delhi. According to him this is the most efficient mode of transport that limits the passage of private cars and encourages more and more utilization of buses that rapidly ply in almost congestion free and signal free zones, leading to relatively less emissions of GHGs from this sector.

Dr. A. N. Goswami, Indian Institute of Petroleum, said that mitigation of Climate Change can happen through fuel switching in transport sector and sequestration in some of the high GHG emitting sectors such as the power plants. He provided various technical insights into the development of clean fuel production, which would further help in CO₂ mitigation. These world-class technologies are being used in refineries across the country in catalysis, refining, additives and related areas. Various environment friendly products include LPG stoves, low air pressure film burner, hurricane lantern, and multidirectional portable burner to name a few while the environment friendly processes include aromatic extraction of benzene and toluene and food grade hexane to name a few. Dr. Goswami mentioned that sequestration of Carbon emitted from power plants through absorption and adsorption techniques can be an effective way of mitigating Climate Change and IIP is working towards refining these technologies for its use in the power sector.

Mr. L.S. Murali, Senior Project Consultant, Transport Planning Section, L&T Ramboll Consulting Engineers Ltd. enlightened the participants with his suggestions on sustainable transport options in cities, with an ever increasing focus on the usage of public transport and walking to work at the expense of private modes of transport, that are the major culprits of urban pollution. Introduction of differential tariffs in parking and making roads safe for pedestrians were some of the prominent suggestions.

Mr. Magnus Carle, Transport Consultant, Ramboll Natura, Sweden, shared his experiences of coming up with options of sustainable transport and planning in cities. He mentioned that globally, 60% of the CO₂ from road transport sector can be reduced through advanced vehicle technologies, 10% through route advisory information, another 10% through taxation, 13% by car pooling, and 7% through improvement in transport infrastructure. He shared his experience in assessing the transport system of city of Pune that focused on mobility, urban transport and land use planning. The major threats to sustainability of the transport system in Pune, as enumerated by him, include steadily rising slum population leading to unplanned settlements along hillsides and water bodies, deteriorating traffic situation and dumping of untreated sewerage in the rivers. The Municipal Corporation of Pune has been advised to use an impact evaluation tool kit developed by Ramboll that acts as a safety valve keeping a track of social, economic and environmental developments on the existing transport system and how it should evolve.

Session-4: Climate change and urban habitats 04:15 pm-05:30 pm

The session was on climate change and urban habitats and was chaired by Mr. Chetan Vaidya, Director, National Institute of Urban Affairs.

Mr. Gaurav Shorey, Area Convenor, The Energy and Research Institute, dwelled upon the need of urban habitats built in harmony with Nature, only then they could aim to be sustainable. He remarked, “The best buildings are built around Nature, not against it!” He advocated the usage of the traditional architecture, indigenous to our country and customized to our needs and threw light on the futility and danger involved in borrowing architectural styles from the west, which are not conducive to our climate. He also discussed a new concept called GRIHA, which stands for Green Rating for Integrated Habitat Assessment. It is a green building design evaluation system, conceived by TERI and developed in collaboration with the Ministry of New and Renewable Energy, its USP being suitable for all kinds of buildings in different climatic zones of the country.



Mr. L.S. Murali



Mr. Magnus Carle



Mr. Gaurav Shorey





Mr. Chetan Vaidya



Ms. Varalakshmi Bhogale

Mr. Chetan Vaidya, Director, National Institute of Urban Affairs, touched upon a number of concerns and challenges regarding sustainable urbanisation and the current paradigms of planning, the efficacy of government programmes such as the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the viability of micro-economies within the city, and key drivers of urban growth. He shared his experience in working on the aforementioned aspects of many B-Class cities in the country, the sample taken being Rajkot in Gujrat. To begin with, he dealt with the topic of challenges in general and then came to the problem of energy inefficient residential complexes, occurring due to unplanned growth of the city. He showed various models on screen, which could be embraced in cities undergoing transition from small towns to cities.

Ms. Varalakshmi Bhogale, of CII presented the CII initiative on green buildings launched through its Green building Council. The initiative envisages India to be the fore runner in green building construction in the world by the year 2010. The concept has been caught on by real estate developers and architects operating in some of the mega as well as emerging mega cities in the country. Ms. Varalakshmi pointed out that the green building initiative in the country would lead towards 40-65% energy savings and better indoor ambience. She presented 9 examples of green buildings in India that have been able to achieve energy efficiency through their innovative designs and use of renewable energy and re-use of waste water. She mentioned that the challenges ahead are the market transformation and perception paradigms that need to be overcome in order to be the leaders in this area.

Day-2, October 30, 2009

Session-5: Managing water in cities vis-à-vis climate change (10:30 am-11:45 am)

The session focused on managing water in cities vis-à-vis climate change and was chaired by **Shri Rajendra Singh**, Chairperson, Tarun Bharat Sangh. He is a recipient of the prestigious Ramon Magasasay Award and has worked for the restoration and rejuvenation of water bodies in Rajasthan. In his talk, Mr. Singh mentioned that three factors have affected the well being of rivers since the British time, namely, encroachment, pollution and overexploitation leading to siltation of river beds and hence inundation in certain parts while drought in others. Villages since time immemorial had been water sufficient, but with development of cities that lacked technologies to tap their own water, sucked up water from the villages rendering the villages water deprived. To make matters worse, there exists a perpetual blame game played out by technocrats, bureaucrats and politicians. Now there is a compelling need of community driven decentralized water management that would circumscribe policy issues at global and national level and work for water sufficiency at local level even in cities.

Mr. Vijay Kumar, Head, Water Resources, DHI Group, highlighted the disparity in distribution of water resources in Asia and North America with respect to their populations. Asia has 36% of world's water but 60% of total population while North America has 16% of water and only 8% of world's population. Rapidly rising living standards and bio-fuel production have resulted in additional demand. There are two basic ways to confront the tricky situation, first is to supply more, which entails huge costs and the second is simpler, to live within the means. The working group II report of the Fourth Assessment of IPCC says that the sustenance of ecosystems, food security, and ensuring good health are all linked to water and climate change will impact the availability of water. The hard solutions for conserving water such as building dams, dikes, levees etc, eco-sanitation, decoupling of water and desalination have high socio-economic costs. The soft solutions such as watershed management, cultivation of salt resistant crops, ground water usage and Integrated Water Resource Management (IWRM), will on the other hand lead to economic efficiency, equity and environmental sustainability even under the full climate change commitment period. The way ahead is the Integrated Water Resources Management that will encompass harnessing water at the river basin level, to its utilization, disposal and regeneration for agriculture, industry, domestic and other uses.

Mr. R. K. Srinivas, Coordinator, Centre for Science and Environment, underlined the significance of wastewater management towards achieving the goal of water security. Recycle to meet demand is the



Shri Rajendra Singh



Mr. Vijay Kumar



Mr. R. K. Srinivas





futuristic solution for cities. According to a survey, there is a high inequity between the supply and demand of water in cities and this is further worsened by leakage loss since distance between the source of supply and urban centers is constantly on the rise owing to urban sprawl. E.g. Delhi gets its water from Tehri Dam located 500 km away. But Hyderabad poses a good example of management, gets water from the nearby Musi River. The treatment of sewerage is also a burning issue. In Delhi, only 15% of the wastewater undergoes treatment, rest is, as it is, flushed into Yamuna River. Many treatment plants in the area are under-utilized since collection of sewerage water is a costly affair. Various initiatives have been taken towards limiting the household water consumption by cities like Chennai, Chandigarh etc. Water rated appliances and flush systems are being popularized which penalize over-consumption. Besides, in places like Ladakh, which face a perennial water crunch, a novel concept of zero-water toilets has been developed. This also helps in generating manure for agriculture in Ladakh. So co benefits of utilizing recycled waste water should also be an added incentive to launch cities such facilities.



Prof. V. Geethalakshmi

Session-6: Climate change and urban food security

12:00 pm-01:30 pm

The session was on the issue of ensuring urban food security in the context of climate change and was chaired by Dr. Lakshman, TNAU.



Dr Lakshman

Prof. V. Geethalakshmi, Agro Climate Research Centre, TNAU, was the first to take the podium. The dimensions of food security, as described by her, include utilization, availability, access and stability of the food production and agriculture system. Since agriculture principally happens in rural areas, the rural population, which comprises 70% of the national head count, is responsible for feeding 100% of Indians, which, in itself, is a massive figure. The challenges include increasing meat consumption, which is equivalent to almost double the weight in terms of foodgrains, with rising income levels, and limited arable area put under non- food crop and industrial uses. The adverse effects of global warming will not only lead to submergence of land but also salinization of fertile coastal zones and the hitherto minor pests may turn into major menace for the food-crops. Besides, a two-degree rise in temperature will lead to 10% reduction in the yield of rice in India. One proposed solution from the agro-researchers is 'Climarice' that has been developed by three countries. Its yield will be mostly indifferent to moderate rises in temperature.

Dr Lakshman, Microbiologist, Soil and Crop Management Studies, TNAU, endorsed soil bio-technological intervention to sustain rice production and mitigate greenhouse gases' emission from agriculture. Amongst the various greenhouse gases, methane is generated in high amounts because of stagnated water in paddy fields, as a result of a microbiological



anaerobic process. The method proposed to bypass this situation is SRI (System of Rice Intensification) alternate drying and wetting of paddy fields, which will not only check methane emission but also save water! Other possible methods could be introduction of cyanobacteria (blue-green algae), which will aerate paddy field eco-system thus minimizing methane and methylootrophs, which consume methane in plants. Even azolla (water fern) could be used, which fixes nitrogen thereby obviating the use of urea in soil.

Dr. J. P. Kesari, Chairperson, Mahatma Gandhi Institute for Combating Climate Change, explained in great detail, the indigenously developed solar air heating system and application whose idea was conceived during his stay in France where the residential buildings use similar systems. Mechanisms had been built to store solar energy in the daytime and using the same for heating purposes at night. Besides, this was also used to warm poultry houses and make edibles like banana and potato chips.

Dr. Shiraz Wajih presented a project that is being undertaken by him in collaboration with the Rockefeller Foundation, and also being carried out parallelly in Indonesia, Vietnam and Thailand to develop climate resilient cities. In India, the sample city taken was Gorakhpur, which recurringly flooded every year with flood waters from Nepal. The risk management framework developed in this project comprises of measures for managing logging, solid waste and sewerage. The adversities that Gorakhpur faces is due to its physiography as it is a low lying areas, unplanned land use patterns, propagation of encephalitis and marginalization of poor and at the policy level improper implementation of master plan of the city.

Session-7: Towards development of effective climate action plan for cities 02:30 pm-04:10 pm

The session was chaired by **Dr. Noor Mohammad**, Chairman, NCR Planning Board.

The first speaker of the session was Dr. Sumana Bhattacharya, Expert Consultant, NATCOM who enumerated a few disturbing projections for the year 2050 for India such as the impending water crisis, diseases like malaria and depleted forest cover. Along with this is the ever increasing GHG emissions from cities, for example, Delhi already boasts of a per capita carbon emission, double the national average. The need of the hour is to retro fit our cities to face impending climate change. She mentioned that the barriers towards carbon neutral Indian cities include apathy of policy makers, lackluster public support, opacity on availability of funds and issues of green governance for managing new challenges. Coming to financing climate change programe in cities, she said this could be done via regular municipal financing and environmental fiscal instruments (EFIs) to reform the current urban taxation system.



Dr. J. P. Kesari



Dr. Noor Mohammad





Dr. Aromar Revi



Dr. S. P. Gautam



Dr. Noor Mohammad



Dr. Purnomeeta Dasgupta

As a part of the conclusive framework, she underlined the need to track greenhouse emissions by sector, identify key emitting sources and key sinks for sequestration, estimate projections of expected output targets and monitor/report/verify the actual output.

Dr. Aromar Revi, Director, Indian Institute for Human Settlement, described climate change as an issue of national security. Cities are growing in importance for India and in 20-30 years the country will be identified by the former despite the rhetoric that India lives in its villages. There is a compelling need to adjust the time frame of existing or future plans of combating climate change to longer durations like 100 years in order to accommodate changes. The sanity remains intact, as India is lucky to have the least rate of urbanization and urban migration in south Asia. Henceforth, the untapped potential to reform urban metabolism, lies with the 400,000 villages as opposed to an estimated 20,000 urban centers in 20-30 years. The focus should be on oil/gas centralized system of development as China did a la USA as well as integration of development agenda with the risk agenda.

Dr. S. P. Gautam, Chairman, Central Pollution Control Board, revisited the belief that any government is the public it takes care of and that the PPP model (for the people, of the people and by the people) needed to be strengthened. One also needs to track individual carbon footprint. Moreover, every kind of waste has some or the other use, provided it gets the right kind of innovation and R&D. A monitoring network also needs to be in place for pollution assessment and its impact on urban environment. One such example is National Ambient Air-quality Monitoring Programme (NAMP), which spreads awareness of the change in toto.

Dr. Noor Mohammad labeled the cities as the prime culprit for climate change as they had the highest share with respect to intra country distribution of per capita carbon emission. India is still in a nascent stage as opposed to the west in terms of GHG emissions. The western per capita carbon emissions are spiraling at around eight times of Indian average. Nevertheless, there is a need for early adoption of green technologies, that too at cost-effective rates otherwise we will follow the same learning curve as the western model, something that the mission of sustainability cannot afford.

Dr. Purnomeeta Dasgupta of Institute of Economic Growth, New Delhi presented her perspectives on Climate Change & Socio-Economic Development in an Urban Context. With reference to India, she mentioned that the immediate concerns were the impacts on water resources and agriculture, which provides subsistence livelihood to almost 70% of the rural population. In this context, she was of the opinion that the flash points in the future will be the areas where large changes in climate are to occur. In order to make the economics of food production viable she suggested that the production centers should align with the climatically

conducive regions. As respect to cities, it should have the economic wherewithal to procure agriculture produce from long distances, even import and store the same.

Session-8: Plenary 04:30 pm-06:00 pm

The plenary session started with the address of **Dr. N. Bhaskara Rao**, who was also chairing the session. At the outset, he acknowledged the efforts taken by Delhi climate change organizations owing to which the local forest cover had grown by two percent. He traced back these initiatives to the times of Indira Gandhi when a department of renewable energy was created and solar heaters were deployed in Pune, Baroda and Hyderabad. But our neighbouring country China, despite its starting late, leaped ahead of us by almost a decade, due to a lack of futuristic orientation towards these efforts on our part, the acumen to look beyond and plan for the future contingencies and the perspicacity to gauge things at a micro level. To prevent further damage, the focus should now be on a decentralized indigenous approach towards confronting these issues.

Shri Rakesh Mehta, Chief Secretary, Govt. of NCT of Delhi, categorized the Delhi Action Plan broadly into four subheads. On solar mission and energy efficiency, he said, a hundred energy efficient buildings had already been erected and several others were under construction, there was an increasing usage of CFL, the equipments were to be star rated according to their level of energy consumption, solar electricity to use 5% of its electricity from wind energy and there was an energy management center to be put in place. On sustainable habitat, there were provisions for penalizing diesel usage beyond a certain level and financial support for green technologies and proposals to coal fired power plants, convert waste to energy, make tiles from demolition waste, implement green building code and building facilities for bio-medical treatment of waste. On water mission, interceptor sewers are to be built, the focus would lie on a clean Yamuna and water recharging of 620 water bodies in and around Delhi. On strategic knowledge, there was a need of promoting bio-fuel, generated from waste oil from restaurants with the auto rickshaws as also battery operated vehicles. The government was also working in tandem with The Energy Research Institute (TERI) towards benchmarking energy consumption in buildings and conducting educational, training and other awareness programmes like 'Bhagidari'.

Dr. Sumana Bhattacharya, the facilitator, brought the two-day workshop to a close by summarizing what had been mentioned by the esteemed speakers and gave her concluding remarks, as quoted by Prof. Spencer of Harvard University, that the issues of lifestyle change define the needs of urban livelihood which in today's age, needs to be sustainable by all measures.



Dr. N. Bhaskara Rao



Shri Rakesh Mehta



Dr. Sumana Bhattacharya



PROGRAMME SCHEDULE

Day I: Thursday, 29 October 2009

09:30 am Registration

Session I: Inaugural

10.30 - 11.45 am

10:30 am	Welcome by Dr N. Bhaskara Rao, Chairman, CMS
10:35 am	Confronting Climate Change in Cities Mr. Emani Kumar, Regional Director, (South Asia), I.C.L.E.I Local Governments for Sustainability
10:45 am	India's National Action Plan on Climate Change and its Implication Towards Development of Carbon Neutral Indian Cities Prof. Joyashree Roy, Co-ordinator, Global Change Programme, Jadavpur University, Kolkata
10:55 am	Theme Partner Address Mr. Gaurav Gupta, Senior Vice President, Northern India - Corporate Banking, HSBC
11:05 am	Keynote Address Mr Claes Leijon, Counselor for Development Cooperation, Swedish International Development Cooperation Agency (Sida)
11:15 am	Guest of Honour H. E. Ms Ann Ollestad, Ambassador of Norway to India
11:30 am	Vote of Thanks
11:40 am	TEA BREAK

Session II: Sustainable Energy Supply and Management in Cities

12.00 - 01.30 pm

12.00 pm	Address by Session Chairperson Dr Pramod Deo, Chairperson and Chief Executive Officer, Central Electricity Regulatory Commission (CERC), Delhi
12:05 pm	Overview: Delhi Plan - Low Carbon Future: A Road Map to Low Carbon World Dr Murari Lal, Chairman, CESDAC
12:15 pm	LEDs and CO2 saving Ms. Aditi Dass, Programme Manager, The Climate Group
12:45 pm	Harnessing Energy from Municipal Waste Dr C. Sharma, Senior Scientist, National Physical Laboratory
01.00 pm	Open Discussion and Chairperson's Conclusion
01:30 pm	LUNCH BREAK

Session III: Climate Change and Sustainable Transport System in Cities

02.30 - 04.00 pm

02:30 pm	Address by Session Chairperson Dr Dinesh Mohan, Volvo Chair Professor for Biomechanics and Transportation Safety and Co-ordinator of the Transportation Research and Injury Prevention Programme, IIT, Delhi
02:35 pm	Technology Development for Clean Fuel Production and Co2 Mitigation Dr A. N. Goswami, HoA, Adsorption and Membranes, Indian Institute of Petroleum (IIP)
02:50 pm	Sustainable Transport Options for Cities: Global and Indian Perspective Mr L. S. Murali, Senior Project Consultant, Head - Transport Planning Section, L&T-RAMBØLL CONSULTING ENGINEERS LIMITED, India and Mr Magnus Carle, Transport Consultant Ramboll Natura, Sweden
03:15 pm	Planning for an Integrated Green Road Transport System for Indian Mega Cities - Policy Initiatives Dr Dinesh Mohan, Volvo Chair Professor for Biomechanics and Transportation Safety and Co-ordinator of the Transportation Research and Injury Prevention Programme, IIT, Delhi
03:45 pm	Open Discussion and Chairperson's Conclusion
04:00 pm	TEA BREAK



Session IV: Climate Change and Urban Habitats

04.15 - 05.30 pm

04:15 pm	Address by Session Chairperson Mr Chetan Vaidya, Director, National Institute of Urban Affairs
04:20 pm	The Challenges of Planning a Climate Friendly Built Environment Gaurav Shorey, Area Convenor, Green Rating for Integrated Habitat Assessment (GRIHA), The Energy and Resources Institute (TERI)
04.35 pm	Sustainable City Form for India Mr Chetan Vaidya, Director, National Institute of Urban Affairs
04.50 pm	Climate Change & Socio-Economic Development in an Urban Context Ms Purnamita Dasgupta, Ford Foundation Chair and Acting Head, Environmental Economics Unit, Institute of Economic Growth (IEG)
05:05 pm	Green Buildings in Indian Cities - Recent Initiatives Ms Varalakshmi Bhogale, Architect Counsellor, CII-Godrej GBC
05:20 pm	Open Discussion and Chairperson's Conclusion

Day II: Friday, 30 October 2009

Session V: Managing Water in Cities vis-a-vis Climate Change

10.30 - 11.45 am

10:30 am	Address by Session Chairperson Shri Rajendra Singh, Chairperson, Tarun Bharat Sangh
10:50 am	New Solutions for Water Supply and Demand Side Management in a Climate Change Context Mr Vijay Kumar, Head, Water Resources, DHI Group
11:05 am	Wastewater as a Solution for Meeting the Future Water Demands in Cities Mr. R K Srinivas, Coordinator, Centre for Science and Environment
11:20 am	Open Discussion and Chairperson's Conclusion
11:45 am	TEA BREAK



Session VI: Climate Change and Urban Food Security

12.00 - 01.30 pm

12:00 pm	Address by Session Chairperson
12.10 pm	Climate Change and Urban Food Security Issues in India Prof V. Geetha Lakshmi, Professor, Agro Climate Research Centre, TNAU
12.30 pm	Asian Cities Climate Change Resilience Network: A Case Study of Gorakhpur City Dr Shiraz Wajih, GEAC, Gorakhpur
12:35 pm	Tools for Ensuring Food Security in Cities: Soil biotechnological interventions to sustain rice production Dr Laxmanan, TNAU
12.40 pm	Open Discussion and Chairperson's Conclusion
01:30 pm	LUNCH BREAK

Session VII: Towards Development of Effective Climate Action Plan for Cities

02.30 - 04.10 pm

02:30 pm	Address by Session Chairperson Dr Noor Mohammad, IAS, Chairman, Association of Municipalities and Development Authorities and Member Secretary, NCR Planning Board
02:35 pm	Basic Tenets of a Carbon Neutral Action Plan for Cities Dr Sumana Bhattacharya, National Expert Consultant, NATCOM Project Management Cell, Ministry of Environment and Forests, Govt. of India
02:50 pm	Environmental Monitoring and Reporting in Cities - An Integral Part of Policy Decision Making Prof S P Gautam, Chairman, Central Pollution Control Board
03:05 pm	Integrating National and Local Level Institutions for Innovative Climate Change Policies Dr Aromar Revi, Director, Indian Institute for Human Settlement
03:20 pm	Open Discussion and Chairperson's Conclusion
04:10 pm	TEA BREAK



Session VIII: Plenary

04.30 - 06.00 pm

04:30 pm	Address by Session Chairperson Dr. N Bhaskara Rao, Chairman, CMS
04:40 pm	The Climate Change Action Plan for Delhi Shri Rakesh Mehta, Chief Secretary, Govt. Of NCT of Delhi
05:00 pm	Summarization and Concluding Remarks Dr Sumana Bhattacharya, National Expert Consultant, NATCOM Project Management Cell, Ministry of Environment and Forests, Govt. of India





**Every shade
of green
under the sun**



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