



**UNEP
RISØ
CENTRE**

ENERGY, CLIMATE
AND SUSTAINABLE
DEVELOPMENT

Promoting Low Carbon Transport in India

Workshop Report for

**Workshop on National Strategy for Promoting Low-Carbon
Transport in India, 18 October 2011, New Delhi**

&

**Workshop on Developing Low-Carbon Mobility Plans for Indian
Cities, 19 -20 October 2011, New Delhi**

Organized by

Indian Institute of Management, Ahmedabad



IIT Delhi



Workshops on Promoting Low-Carbon Transport in India

Supported by:



Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

based on a decision of the Parliament
of the Federal Republic of Germany

Summary

The Indian Institute of Management organized two successive workshops related to the project on Promoting Low Carbon Transport in India, at the India Habitat Centre, New Delhi from 18- 20 October, 2011. The first workshop held on October 18, 2011 focused on developing a “National Strategy for Promoting Low-Carbon Transport in India”. The second workshop held on October 19 and 20, 2011 focused on “Developing Low-Carbon Urban Mobility Plans for Indian Cities”.

These workshops were part of the UNEP project on “Promoting Low Carbon Transport in India”, a major initiative of Germany’s International Climate Initiative (ICI), and the United Nations Environment Programme (UNEP), and endorsed by the Ministry of Environment and Forests (MoEF), Government of India. The project is being jointly implemented by the UNEP Risoe Centre, Denmark (URC); Indian Institute of Technology, Delhi (IIT-D); Indian Institute of Management, Ahmedabad (IIM-A); and CEPT University, Ahmedabad

These workshops involved review and discussions on strategies for the development of Sustainable Low Carbon Transport for India (macro level) and for the Indian cities (micro level). They focused on development of sustainability indicators, providing a methodology for low carbon mobility plans, bringing about integrated assessment (energy and transport modeling) for development of a national transport action plan, and assessment of transport technology options and leading towards inclusiveness of the various transport systems in city mobility. They aimed at addressing transportation growth, development challenges and climate change issues in an integrated manner while demonstrating the requirements of a low carbon development path.

Workshops on Promoting Low-Carbon Transport in India
Workshop on National Strategy for
Promoting Low-Carbon Transport in India
Venue: Magnolia Hall, Habitat Center, Lodhi Road, New Delhi

18th October 2011

Workshop Programme

09:30 – 10:00 Registration

Session : Transport Scenarios at National Level

Chair : Dr. Subodh Sharma, Senior Advisor, Ministry of Environment & Forests, GoI

10:00 – 10:05 Welcome & Workshop Agenda, Prof P.R. Shukla, IIM, Ahmedabad

10:05 – 10:15 Project Overview, Dr. Subash Dhar, UNEP Risoe Centre

10:15 - 10:25 UNEP Transport Programme, Ms Kamala Ernest, UNEP

10:25 - 10:45 Germany's International Climate Initiative, Jürgen Frank, Counsellor, German Embassy New Delhi

10:45 – 11:00 Remarks by the Chair

11:00 - 11:30 **Tea Break**

11:30 – 12:10 Integrated Assessment of Low Carbon Transport at National Level: Approach and Framework, Prof. P R Shukla, IIM, Ahmedabad

12:10 – 12:20 Lead Discussant, Prof. Ambuj Sagar, IIT, Delhi

12:20 – 13:00 **Discussion**

13:00 – 14:00 **Lunch Break**

Session : Macro Indicators for Sustainable Low Carbon Transport

Chair : Dr. Prodipto Ghosh, Distinguished Fellow, TERI

14:00 – 14:20 Presentation of Outcomes from Public Consultation on Sustainability Indicators, Profs P R Shukla & Prem Pangotra, IIM, Ahmedabad

14:20 – 14:30 Lead Discussant, Dr. Jorge Rogat, UNEP Risoe Centre

14:30 -15:30 Discussion

15:30 – 16:00 **Tea Break**

Session : Infrastructure and Sustainable Low Carbon Transport

Chair : Sh. Prabhu N. Shukla, Director, Dedicated Freight Corridor Corp of India

16:00 – 16:20 Infrastructure and Low Carbon Transport : Case Study of Delhi Mumbai Freight Corridor, Prof. Prem Pangotra, IIM, Ahmedabad

16:20 – 16:45 **Panel Discussion: Panelists**

Dr. Manoj Singh, Advisor Transport, Planning Commission

Dr. Partho Mukhopadhyay, Centre for Policy Research

Mr. S A Verma, Dy. Chief Environment Officer, Delhi Metro Rail Corp Ltd.

16:45 – 17:10 Discussion

17:10 – 17:30 Conclusion & Summing Up

Workshop on “National Strategy for Promoting Low-Carbon Transport in India”

Day 1: 18th October, 2011

The Workshop on “National Strategy for Promoting Low-Carbon Transport in India” was held on 18 October, 2011. This workshop was inaugurated by Dr. Subodh Sharma, Senior Advisor, Ministry of Environment & Forests (MoEF), Government of India. Dr. Sharma also chaired the inaugural session. Mr. Jürgen Frank, Counselor, Embassy of the Federal Republic of Germany was an invited speaker during the inaugural session.

Session 1: Transport Scenarios at National Level

Key points from the Inaugural Speech by Dr. Subodh Sharma, Senior Advisor, Ministry of Environment & Forests, Government of India

In his speech, Dr. Subodh Sharma mentioned that India has adopted the mission mode approach to climate change, and that India’s National Action Plan on Climate Change (NAPCC) sets out 8 missions to promote the understanding on both climate change mitigation and adaptation. MoEF is a responsive partner in the global efforts in mitigation and adaptation to climate change and has been in the forefront of supporting research and practical work at the national and international level. On 14 October 2009, the Government announced formation of the ‘Indian Network of Climate Change Assessment (INCCA)’ which is a network comprising of 127 research institutions for assessing mitigation challenges and opportunities, and assessment of vulnerability and adaptation to climate change impacts for the different sectors of the economy across the various regions of India. INCCA has also launched a project on ‘Black Carbon’. In the eleventh five year plan, climate change is mentioned as a sub-sector of environment, but in the twelfth five-year plan, environment and climate change are considered as separate sectors.

Project Overview, Dr. Subash Dhar, UNEP Risoe Centre

This presentation provided a quick overview on the project. The three year project on “Promoting Low Carbon Transport in India” was initiated in November 2010, and shall run till 2013. The main implementing agency is UNEP and four implementing partners led by URC alongside IIMA, IITD and CEPT University, Ahmedabad. The project has been funded by ICI.

The project has two main objectives:

- Delineating an enabling environment for coordinating policies at national level to achieve a sustainable transport system; and
- Enhancing capacity of cities to improve mobility with lower CO₂ emissions.

Workshops on Promoting Low-Carbon Transport in India

This workshop emphasized the national level objective that focuses on the development of policies pertaining to sustainable transport in India. The institutional structure for implementing the project is to engage with the key stakeholders and key academic institutions within the country.

Therefore the Transport Action Plan which would be implemented at the National level is being worked out in close collaboration with MoEF, whereas city related interventions would be implemented through low-carbon mobility plans in collaboration with the Ministry of Urban Development (MoUD).

A high level Project Steering Committee (PSC) comprising of experts from relevant sectors and key institutions as well as participation from MoUD exists, and provides guidance and oversight to the project.

The key interventions at national level involve carrying analytical exercises and developing toolkits for producing a Transport Action Plan, which is in line with India's National Action Plan for Climate Change (NAPCC). The key analytical outputs consist of macro indicators, a national assessment of transport sector for various scenarios, case studies and a framework for climate adaptation.

The key interventions at city level similarly involve analytical exercises and toolkits which can result in Low Carbon Mobility Plans for up to 4 cities and concrete actions in the form of project proposals for funding.

UNEP Transport Programme, Ms Kamala Ernest, UNEP

Ms Kamala Ernest, Programme Officer, UNEP Transport Unit, based in Nairobi, Kenya, made a presentation on UNEP's transport programme. She began her presentation with an insight into the link between transport and environment. The major issue she noted was that energy use is the major flaw in the overall energy supply chain, and is related to fossil fuel usage. About 90% of energy is derived from fossil fuel which is also related to greenhouse gas emissions. Currently 23% of CO₂ emissions come from transport and in the future this will rise to 33% by the year 2050. Transport is the major source of urban air pollution.

She informed participants of major issues and challenges that modern economies face including deteriorating quality of systems in the developing world, declining transit modal shares in cities, lack of integration between land-use and transport planning, faulty policy actions and economic incentives that give rise to private vehicle ownership etc.

She also put forward certain sustainable transport pathways that could be adopted by various implementing agencies for the benefit of urban transport. These include the urgent need to re-think transportation trends and remove negative impacts, promoting non-motorized transport, moving towards green transport development which would eventually result in job creation, poverty eradication, carbon emission reductions, bringing about a participatory approach in the decision making process and integration within infrastructure, technology, services and policies that affect people.

Workshops on Promoting Low-Carbon Transport in India

UNEP has adopted an integrated approach for project development that covers fuel, vehicle, non-motorized transport and public transport systems, as is the case with the project on Promoting Low-Carbon Transport in India. It will be a learning process for UNEP to see how the project will impact on Indian cities. India is being viewed the model country that other developing countries can emulate.

Speech by Mr. Jürgen Frank, Counselor, Embassy of the Federal Republic of Germany, New Delhi

The Counselor of the Embassy of the Federal Republic of Germany in New Delhi, Mr. Jürgen Frank attended the inaugural session of the Workshop. Mr. Frank's address covered programmes of the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit), Federal Republic of Germany that are making key contributions to climate change and low carbon transitions.

He introduced the International Climate Initiative (ICI) under the Federal Republic of Germany that is financing climate protection projects in a number of developing countries since 2008. In cooperation with partner countries, ICI provides important momentum for negotiations on an international climate agreement for the post-2012 period. The funding under the initiative is also provided to the G5 states - Brazil, China, India, Russia and South Africa.

ICI also makes valuable contribution to international discussions on structuring climate financing architecture. The key focus areas of the ICI are:

- Promoting a climate-friendly economy;
- Promoting measures for adaptation to the impacts of climate change; and
- Promoting measures for preservation and sustainable use of carbon reservoirs/ Reducing Emissions from Deforestation and Degradation (REDD).

Since ICI's launch in 2008, Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU) has initiated 220 projects with funding totaling some 450 million Euros.

Referring to the Promoting Low Carbon Transport in India project, he said that the economic growth in India has been experiencing an increasing trend with significant increase in greenhouse gas emissions. The transport sector accounted for 13% of CO₂ emissions in 2005 and 92% of these emissions originate from the road sector. If the same trends continue, this would lead to rise in congestion and increase in air pollution.

He concluded by stating that the project aims at creating a Transport Action Plan at national level and Low Carbon Mobility Plans at municipal level. Sustainable development policies and measures at national and municipal level can not only reduce CO₂ emissions but also contribute to higher degree of choice for transport consumers, better local environment, health, economic growth and social development.

Workshops on Promoting Low-Carbon Transport in India

Presentation by Prof. P. R. Shukla, IIM, Ahmedabad

Prof P. R. Shukla made a presentation on Integrated Assessment of Low Carbon Transport at National Level: Approach and Framework. He introduced the concept of Low Carbon Transport. Low Carbon within the climate negotiation arena (e.g., Copenhagen Accord to which India is a signatory) is defined as a 2 degree stabilization scenario. Reduction of carbon from the transport sector could be achieved either by interventions from the demand or supply side.

The presentation provided information on the Low Carbon Transport Assessment Methodology based on an integrated modeling system and different scenarios. The short-term analysis included India's Copenhagen Commitments, i.e. 20 to 25% Emissions Intensity Reduction in 2020 with respect to 2005 levels. The long-term assessment for India covering the period till 2050 focused on the mitigation actions which are aligned to the 2°C global stabilization target under two policy paradigms - namely 'Conventional' and 'Sustainable'. The two paradigms were represented through two distinct scenarios. The 'Conventional' scenario follows the 'supply-side and climate-centric'-approach. The stabilization target, under two policy paradigms - namely 'Conventional' and 'Sustainable' scenario follows development-centric approach to align climate stabilization actions with national development goals. The presentation summarized the 'Key mitigation Options' under the two scenarios. The two scenarios showed that in the transport sector, energy efficiency, modal shift, urban design and behavioral changes were important in both scenarios, although these actions were used to a greater extent in the 'Sustainable' scenario. In the 'Conventional' scenario, on the other hand, nuclear energy and end of the pipe solution like Carbon Capture and Storage (CCS) had greater impact.

The overall conclusions from the presentation were: i) Low Carbon Transitions would significantly reshape the transport landscape compared to business-as-usual, ii) early actions in transport sector would be the key to avoiding lock-ins, gain co-benefits and reduce long-term costs of low carbon transitions, and iii) framing policies under a sustainability approach would deliver best results to align short-term and long-term actions and the national development and global climate mitigation goals.

Discussion by Prof. Ambuj Sagar, IIT, Delhi

Climate change is a serious issue. A series of transitions have been occurring in demographic, economic and technology areas. Transportation is undergoing transition even without climate change considerations at the policy level. Present policies for transportation are influenced by industrial policies and not by future climate change considerations. New technologies are emerging from developed regions like Europe, though it is pertinent to explore if in the Indian context these technologies are relevant. A key concern is how to reshape our policies to facilitate the transition to low carbon and sustainable transport. There is a serious global debate on electric vehicles versus hybrid vehicles. There is a high push for hybrid vehicles which currently have a 2% penetration rate of global sales whereas electric cars have a 0.1% penetration rate. Electric vehicles need deeper examination in the Indian context. It is important to determine how to balance the right type of co-benefits. Technology development and diffusion is a slow process because of cost, price and performance.

Workshops on Promoting Low-Carbon Transport in India

Some other points made by Dr. Sagar included:

- Infrastructure required for charging the electric vehicle batteries and carbon capture and storages are complex pathways to achieving benefits whereas Infrastructure required for public transport is less complicated;
- For technology transfer, it is important to map which technologies can make significant impact on emissions mitigation. Technological transfers are vital for low carbon transition; however the climate change agreements do not show specific pathways for technology transfer. Since Intellectual Property Rights (IPRs) are governed by the companies not by countries, the climate agreements can consider instituting the technological funds for purchasing the IPRs and thereby facilitating the technology transfer.

Session 2: Macro Indicators for Sustainable Low-Carbon Transport

Presentation on Outcomes from Public Consultation on Sustainability Indicators, Prof. P. R. Shukla & Prof. Prem Pangotra, IIM, Ahmedabad

Prof. P. R. Shukla made a presentation on macro indicators for 'Sustainable Low Carbon Transport'. The presentation focused on indicators that are the outcome of a consultative process carried out over the past several months with stakeholders. The three stage process included consultations with experts on i) the definition and scope of macro indicators, ii) identification of the indicators, and iii) measurement of the indicators. The second stage included receiving stakeholders' inputs through a questionnaire. During the third stage, the outcome from stage 1 and 2 were discussed at an expert workshop held in Ahmedabad, India on 29 August, 2011. The presentation enumerated seventeen (17) Macro Indicators identified and divided into five broad categories: i) Economic, ii) Social, iii) Environmental, iv) Technical, and v) Strategic. The rationale for selection of these indicators was highlighted, including issues on measurement. Macro Indicators are intended for the aggregate economy and national level assessment.

Prof. Prem Pangotra covered the spatial dimension of indicators and the measurability at disaggregated level. The presentation emphasized that these indicators have different connotations at the local and sector levels than at aggregate economy and national levels. It was suggested that the national modeling and assessment framework for developing a 'national low-carbon transport roadmap' should keep this in mind. He highlighted the Strategic (Meta) indicators - Sustainable Urban Form and Structure, National Logistics Grid, and Investment in Transport Sector Innovations. He suggested that macro indicators need to be made consistent with dynamics in the cities and to be calibrated such that their meaning can be interpreted at the local level.

Presentation by Dr. Jorge Rogat, UNEP Risoe Centre

Dr. Jorge Rogat, in his presentation suggested that indicators have a social dimension and could be related to transportation sector as a subsidy. A transportation system

Workshops on Promoting Low-Carbon Transport in India

provides services like any other service provider and for these to exist in the long run; they need to be economically sustainable. A subsidized transport system is not economical, therefore in this case, subsidies could be considered more as economic rather than social indicators.

The social aspects of accessibility refer not only to the ability to access different transport modes but also to the ability to access different locations efficiently and safely. Environmental, technical, political and institutional aspects have been reflected in the indicators. So these indicators can help to measure progress towards sustainability in the transport sector. Four key comments to be put into consideration include the following:

- **National and City Indicators-** there are no predefined set of indicators. Local conditions differ from city to city, among countries and even within regions. So indicators should be developed at the national and city level. They should consider both short and long term impacts.
- **Avoid lock-ins-**decisions once made may affect future generations. It is important to put these into consideration, including long term impacts of the measures proposed.
- **Data-** development of indicators would depend on the availability of data, otherwise measurability of the indicators would be flawed.
- **Benchmarking-** is required in order to assess whether progress is being made or not. This in turn requires the establishment of a baseline.

Summary and comments from the floor

Some key discussion points raised during the sessions were:

- i. Benchmarking: reference point or baseline is important indication on whether or not we are moving in the right direction
- ii. A question was raised on whether carbon dioxide would be determined purely from transport emissions or from overall development that is taking place.
- iii. A Methodology for calculating the Life Cycle emissions of the project is crucial.
- iv. A question was raised on the existence of a hierarchy in the model, and the usage of weighted averages in emission calculations.
- v. Land use requirement is different for different modes and should be part of the indicators.
- vi. Indicators on safety should be included at the national level.

Session 3: Infrastructure and Sustainable Low Carbon Transport

This session was chaired by Mr. Prabhu N. Shukla, Director, Dedicated Freight Corridor Corporation of India. This session began with a presentation by Prof. Prem Pangotra, followed by panel discussions.

Presentation by Prof. Prem Pangotra, IIM, Ahmedabad

Prof. Prem Pangotra made a presentation on a preliminary case study of the Delhi Mumbai Dedicated Freight Corridor (DFC). The case study covered four related scenarios – business as usual (BAU) scenario with and without the DFC; a low-carbon conventional scenario (LCC) and a low-carbon sustainable scenario (LCS). While the conventional scenario was based on supply side interventions and policy instruments, the sustainable scenario emphasized co-benefits of pursuing sustainable development goals along with strategies for reducing carbon emissions.

Prof. Pangotra highlighted that the BAU scenario incorporated incremental technological changes but not major shifts in technology, development strategy or behavioral responses. It is possible that some of the shifts captured in LCC and LCS scenarios might also occur in the BAU scenario. The preliminary results of the case-study showed that while the LCC scenario results in larger carbon reduction, the LCS scenario would be very different when it comes to indicators such as energy security and inclusiveness. Actual gains would depend on the development path taken.

The Delhi-Mumbai Industrial corridor, which is being planned around the DFC, is an example of how a strong development strategy can significantly enhance the gains of sustainable development while also achieving carbon reduction targets. Prof. Pangotra concluded his presentation with the observation that low-carbon transport infrastructure decisions have to be aligned with sustainable development that encompasses low-carbon actions at several fronts, in order to maximize social welfare gains.

Panel Discussion

Dr. Manoj Singh, Advisor, Transport Planning Commission

Dr. Manoj Singh informed participants that the International Transport Forum, OECD indicates that total CO₂ emissions in India was 1442.15 million tonnes of CO₂ equivalent in 2008 out of which, transport accounted for 146.39 million tonnes, that is 10.2 % of the total. CO₂ emissions from the transport sector in India are well below world standards, which lie at 20-25% of the total world's CO₂ emissions. After disaggregating these figures on a modal basis, road transport had the major share of 83% (121.08 million tonnes), rail 5% (6.88 million tonnes), international aviation around 10% (14.6 million tonnes), domestic navigation about 2% (3.73 million tonnes) and international shipping around 0.45%. This depicts the national picture of CO₂ emissions for the transport sector and in a way, indicates that rail is more environmental friendly than any of the other modes. The Total Transport Study by RITES indicates that India has a road

Workshops on Promoting Low-Carbon Transport in India

dependent economy where 65% of freight in terms of tonne-km is transported by road, 36% by rail, 6% by coastal shipping, 1% by air, in 2008.

By projecting a business as usual scenario for the next 10 years, the situation becomes quite alarming because freight traffic would increase by two and a half times from 1300 billion tonne-km to 3500 billion tonne-km (Excluding via pipeline, 8% of total freight movement was done through the pipeline in 2007 and its share would increase with respect to the movement of petroleum as compared to freight of the same product by rail). Simultaneously, in the near future, rail share will go down from 35% to 25% while road share would increase to 75%. Total CO₂ emissions would rise 1.5 times increasing to about 200 million tonnes of CO₂ equivalent.

Dr. Partho Mukhopadhyay, Centre for Policy Research

Dr. Partho Mukhopadhyay raised the issue of opportunity cost for investment in low-carbon transport and other alternative investments. He highlighted that there has always been a need for essential investment in signal instead of increasing capacity purely by adding lines, but in actuality investment in signaling would improve line capacity significantly. He also raised the question of other investments made to improve the carrying capacity of railway lines. Dr. Mukhopadhyay considered the issue of lock-in as very important. Development of rail based transit has better implications for development of the surrounding. On the other hand, if one has to build a network around a built-up or already developed area, road based transport would be the better option. Building railway lines without building on the activities around it, the movement of things around becomes difficult. He cautioned that the dedicated corridors may create adverse lock-ins into urbanization, which he suggested should be avoided to gain sustained benefits from infrastructures.

Mr. S. A. Verma, Deputy Chief Environment Officer, Delhi Metro Rail Corporation Limited

Mr. S. A. Verma said that the mandate of Delhi metro was to construct and to operate the metro in an environment friendly manner. During the project development they found that the Kyoto protocol provided opportunities for the Delhi Metro to gain carbon mitigation benefits. Delhi Metro developed two Clean Development Mechanism (CDM) projects. The first CDM project, which was registered in 2007, used regenerative braking. The rolling stock regenerative braking technology used in this project was more advanced compared to the rheostatic braking technology used in the earlier Kolkata Metro project. The regenerative braking technology in the Delhi Metro Project required additional costs, but also saved energy and 43000 tonnes of CO₂ emissions annually. The second CDM project considered the carbon dioxide emissions saved due to the modal shift. The carbon accounting across transport modes shows that the emissions per passenger kilo-meters in a metro compared to emissions from utilizing other motorized modes of transport. This was affirmed by the passenger survey in Delhi and the carbon dioxide saving was computed for gaining CDM emissions credits (i.e. Certified Emissions Reduction - CER)

Workshops on Promoting Low-Carbon Transport in India

Summary and Comments from the Floor

In summing up the session, the Chair, Mr P. N. Shukla put forward his views. He pointed out that a key point in the discussions was the segregation of passenger and freight lines which would result in a paradigm shift in the approach to transport in India. Putting freight trains and passenger trains on different corridors would simultaneously increase efficiency and speed of transport. He gave the example of China where separate freight corridors of 200 million tonne capacity were developed. Within a period of seven years, the capacity of these corridors was quadrupled (from 200 to 800 million tonnes) while maintaining their integrity and incorporation of a few minor inputs. Similarly, he also gave the example of Mumbai Metro where separate fast and slow lines exist while sharing the same signaling system and thus helping co-ordination while reducing overall cost.

Mr. P. N. Shukla also emphasized the need for co-existence of the road and rail modes as complimentary rather than competing systems by developing multi modal terminals where both modes can easily exchange goods and passengers. He argued that the DMIC should be linked to the overall urbanization and should not be viewed as a standalone project.

In addition, the key points raised in the session for consideration by the Low Carbon Transport planning for India included:

- i. A shift from road to rail may be hindered by the fact that road and vehicle technology is improving and the competitive dynamics may change as technologies develop in future.
- ii. Studies have shown that building transport corridors do not improve the living conditions of people all along the corridor but may only enhance development in few focal areas which are already doing well. This may be contrary to the national commitment to inclusive growth.
- iii. Rail transport is six times more fuel efficient, consumes less than road transport. Promoting rail transport would reduce consumption of fossil energy. This will contribute both to energy security and carbon emissions mitigation.
- iv. An important component of freight corridor development would be the establishment of multi-modal stations at regular intervals where freight would converge or diverge.
- v. Opportunity cost of additional investments in alternate modes like Metro and BRT infrastructures must be considered.

Workshops on Promoting Low-Carbon Transport in India

Workshop on Developing Low-Carbon Mobility Plans for Indian Cities

Venue: Magnolia Hall, Habitat Center, Lodhi Road, New Delhi

19th& 20th October 2011

Workshop Programme

Day - 1 (19 Oct 2011)

09:30 – 10:00 Registration

Inaugural Session

Chair : Prof. K. C. Sivaramakrishnan, Chairman, Centre for Policy Research, India

10:00 – 10:05 Welcome and Introduction, Prof. Prem Pangotra, IIM Ahmedabad

10:05 – 10:25 Inauguration: Dr. Sudhir Krishna, , Secretary, MoUD, GoI

10:25 – 10:45 Keynote address by Prof. K. C. Sivaramakrishnan

10:45 – 11:05 UNEP Transport Programme and Project Overview, Ms Kamala Ernest, UNEP and Dr. Subash Dhar, UNEP Risoe Centre

11:05 – 11:25 Comments and Q&A from the Floor

11:25 – 11:40 **Tea Break**

Session 2: City Level Indicators for Low Carbon Mobility

Chair : Sh. Shailesh K. Singh, Joint Secretary, MoUD, GoI*

11:40 – 11:45 Moderator & Co-chair: Mr. David Margonsztern, ADB - Opening remarks

11:45 – 12:10 Indicators for Low Carbon Mobility, IIT, Delhi

12:10 – 12:30 Indicators for Inclusiveness in Mobility, CEPT, University

12:30 – 13:00 Discussion

13.00 – 14:00 Lunch Break

Session 3: Urban Low Carbon Mobility

Chair : Prof. Dinesh Mohan, IIT Delhi

14:00 – 14:05 Prof. Dinesh Mohan, IIT, Delhi – Opening remarks

14:05 – 14:35 Methodology for Low Carbon Mobility Plans, Prof. Geetam Tiwari, IIT, Delhi & Prof. Darshini Mahadevia, CEPT University, Ahmedabad

14:35 – 15:00 Macro Considerations for Urban Low Carbon Mobility Plans, Profs. Prem Pangotra & P R Shukla, IIM, Ahmedabad

14:50 – 15:30 Discussion

15:30 – 15:45 **Tea Break**

Session 4: Panel Discussion on Low Carbon Mobility Plans for Cities

Chair : Dr. Jorge Rogat, UNEP Risoe Centre

15:45 – 16:30 **Panelists**

Mr. Ajay Bhadoo, IAS, Municipal Commissioner, Rajkot

Mr. KVN Ravi, Executive Engineer, GVMC, Vizag

Prof. Talat Munshi, CEPT University, Ahmedabad

Dr. Anvita Arora, iTrans, New Delhi

16:30 – 17:00 Comments and Q&A from the Floor

Workshops on Promoting Low-Carbon Transport in India

Day - 2 (20 Oct 2011)

Session 5: Infrastructure for Low Carbon Cities

Chair: Sh. B I Singal, Director General, Institute of Urban Transport

- 9:30 – 10:45 Case Studies (Preliminary Results)
- Study on BRT, Prof. Rutul Joshi, CEPT, University
- Study on Metro, Prof. Geetam Tiwari, IIT, Delhi
- 10:45 – 11:30 Discussants:
Ms. Akshima Ghate, Fellow, TERI
Dr. Ashish Verma, Indian Institute of Science, Bangalore
- 11:30 – 11:45 **Tea Break**

Session 6: Panel Discussion on Sustainability and Mobility: Community Concerns

Chair : Prof. Darshini Mahadevia, CEPT, University

- 11:45 – 13:00 Ms. Anumita Roychowdhury, Centre for Science and Environment
Dr. Ashok Sreenivas, Parisar
Ms. Sujaya Rathi, CSTEP
- 11:45 – 13:00 Conclusion & Summing Up
- 13:00 – 14:00 **Lunch**

Workshop on Developing Low-Carbon Mobility Plans for Indian Cities

Day 1: 19th October, 2011

Inaugural Session

Prof. Prem Pangotra welcomed the delegates and requested Dr. Sudhir Krishna, Secretary, Ministry of Urban Development (MoUD) to inaugurate the workshop. Dr. Krishna delivered the inaugural address, which was followed by the key note address by Prof. K. C. Sivaramakrishnan.

Speech by Dr. Sudhir Krishna, Secretary, Ministry of Urban Development

In his inaugural speech, Dr. Krishna observed that peaking fossil fuel prices and climate change have become the major challenges for sustainable development. The transport sector, with large contribution to energy consumption and CO₂ emissions has taken centre stage. According to the 2006 IPCC Report, 23% of GHG emissions were transport related. Transport emissions are expected to increase by 57% worldwide between 2005 and 2030. Transport activities in developing countries are projected to contribute about 80% of emissions. Current emissions from the transport sector have resulted primarily from the growth in the number of private vehicles and trucks. As transport is an integral part of the problem, solutions need to be sought within the sector.

The **Avoid – Shift - Improve Approach** being promoted by the UNFCCC clearly outlines three strategies to reduce emissions:-

- **Avoid** emissions by managing travel demand, and proper land use planning;
- **Shift** passengers from private to public and non-motorized modes of transport;
- **Improve** vehicle technologies and fuels.

In Indian cities, monitoring of vehicle fleets ensure that they comply with emission norms is an added strategy. The most effective way of dealing with these issues is by integrating these approaches with well designed policies and planning measures.

Over the last few decades, although India has been advancing economically and urbanizing rapidly, although there is room for more sustainable development to take place. The level of urbanization in India has been recorded as 32% in the year 2011 as compared to 28% in 2001. Even the urbanization level does not show a healthy picture of the country's economy. Historically economic progress has been coupled with increase in demand for transport which has led to an increase in vehicular pollution, especially from private cars. The main challenge is to ensure that economic growth happens in a sustainable manner without leading to negative impacts like pollution, congestion and inequity.

As far as transport is concerned, majority of the population cannot afford subsidised public transport. This renders them as 'captive users' who have no other choice but to walk or cycle. However, adequate walking and cycling facilities are not in place. At the

Workshops on Promoting Low-Carbon Transport in India

same time, a significant proportion percentage of the population is experiencing an increase in household incomes and is switching from non-motorized, non polluting modes to motorized and polluting ones; most noticeably, two wheelers. Transport practice in India is still low-carbon as most people in cities either walk, despite inadequate infrastructure for comfortable walking or use human propelled vehicles like bicycles or cycle rickshaws or public transport. Mixed land-use in towns and cities ensures that the average trip lengths are short, thereby fostering the possibility of the use of non motorized travel modes.

We are however losing sustainable paradigms in transport practices with increasing sub-urbanization, motorization and building of high speed expressways and flyovers. We need to preserve and promote these sustainable traditional transport systems and ensure that integration of land-use and transport is the central focus of city development plans. There is no doubt that non-motorized transport is one of the most important components of sustainable transport systems. With changing times, the approach and methods of problem solving need to be changed. We need to make a shift in our approach towards non-motorized mode of transport for low income earners, and make it appealing to all sections of society. It needs to be presented as a fashion statement. In European countries rickshaws are used as fashion modes. We need enabling infrastructure and fresh innovative campaigns that capture the imagination of all people.

Building exclusively for public, non-motorized transport is now being reintroduced as a priority in our cities. We also need to build capacities in educational institutions and project implementation agencies so that they are able to plan effectively, build and maintain the infrastructure and monitor compliance by users. This would ensure that the three Es (Enable, Educate and Enforce) become a corner stone of our intervention. The use of personal vehicles needs to be discouraged, e.g. through disincentives for private vehicles. However, there are no other reliable transport options, and alternatives such as parking policies as demand management strategies need to be explored. There is a need to refrain from road expansions and construction of unnecessary urban highways. These are all statements that can be debated and have to be seen contextually but, as a general policy, high quality alternatives to private transport must be found in the realm of public and non-motorized transport. To bring about sustainability and further development of low-carbon transport in India, the National Urban Transport Policy (NUTP) clearly states that priority should be given to public and non-motorized modes of transport.

The JNNURM is consistent with informed by the NUTP and ensures that funds are released for urban development only if the projects cater to and prioritize public and non-motorized transport. Within the national transport development policy, the urban transport component clearly advocates reorganizing mixed land uses, reducing the need for motorized mobility and emphasis on investment in public transport infrastructure. The National Mission for a Sustainable Habitat, 2010, one of the 8 missions under the Prime Minister's National Action Plan for Climate Change, emphasizes the use of non-motorized transport and public transport to combat the increasing CO₂ emissions. The Ministry of Urban Development is developing gives the standards for walking, cycling and public transport, compact cities, transport impact

Workshops on Promoting Low-Carbon Transport in India

assessment, and financing mechanisms for cities to invest in sustainable transport options.

The Planning Commission report by Dr. Kirit Parikh on low-carbon growth in India also advocates investments in public transport and non-motorized transport while introducing disincentives for the use of private motorized transport. The policy direction from the Government of India (GoI) clearly points towards investment in public transport and non motorized transport for a sustainable low-carbon approach. Urban transport planning schemes allow cities to channel upto 80% of the central government financial assistance to sustainable transport planning at city level. The government has been supporting investments for public transport in the cities. For the congested mega cities with high capacity demand and constructed rights of ways, metro lines are viewed as a viable mobility option. Delhi and National Capital Region (NCR) metro has 189 km of commissioned lines and the metro network is being explained. There is also a plan to introduce Bus Rapid Transit (BRT) systems in all million plus cities. Delhi and Ahmedabad already have operational BRT systems, and other cities are emulating them.

Within the JNNURM, funds for BRT systems have been sanctioned for 10 mission cities, and will also feature dedicated pedestrian and cycle paths across a new network of 437 km at a cost of Rs. 5000crore. With the sanctioning of 15,600 modern Intelligent Transport Systems (ITS) enabled buses for its 61 mission cities under National Urban Renewal Mission (NURM) has not only set stage for complete transformation of city bus transport as seen across India but also brought organized public transport systems to as many as 34 cities for the first time. In order to bring about change, cities have been advised to form Special Purpose Vehicles (SPVs) at local level so that city specific needs and requirements are better addressed. With World Bank and GEF support, as well as adequate support from UNEP, we are putting up models of non-motorized transport, infrastructure projects, BRT, bio-diesel, ITS, etc. to showcase green transport. There is 100% financial support available from the Central Government for enhancing capacities of officials of local agencies and parastatal under state government. The Ministry of Urban Development has also launched service level benchmarks for urban transport in December 2009, to bring about progress in public transport, non-motorized transport, pedestrian facilities, ITS usage, reduction in speeds, parking spaces, road safety, minimization of pollution levels, integration of land-use and transport, and finally sustainability of public transport.

Keynote address by Prof. K C Sivaramakrishnan, Chairman, Centre for Policy Research, India

In his key note address, Prof. K C Sivaramakrishnan observed that the government is in control when it comes to data. Cities perform multiple tasks but the impact factors are quite varied. One aspect he referred to was vehicular growth. He brought out a comparison of vehicular growth with population growth. He was of the opinion that vehicle production is much higher than the population growth, citing a study conducted by Indira Gandhi Institute of Economic Growth during 2001-2005. The study indicates that the population growth of Chennai was a little less than 3% per year whereas vehicular increase was 14% during 2001-2005. In Ahmedabad, population increase was 2.9% while vehicular growth was 18%, and in Jaipur population growth was about 4%

Workshops on Promoting Low-Carbon Transport in India

and 30% for the vehicular population. Quoting Victor Gruen, he said that there will come a time in the world when there would be no space for living, there would be space only for cars and life would consist mainly of sitting and living in a vehicle and move from one filling station to another.

Reports by the Society of Indian Automobile Manufacturers (SIAM) and Automobile Components Manufacturers Association (ACMA) indicate that there is a booming growth of the young generation (about 50% of the population) aged below 25 years. Vehicular density in various cities is very high. Mumbai had a vehicular density of 1, 042 in 1991 and this increased to 2, 147 in 2005, while other cities like Delhi have a vehicular density of 2, 800, Bangalore 3, 200 and Surat and Coimbatore around 6, 000 each. These represent disturbances and distortion as far as allocation of modes is concerned.

The Indira Gandhi Institute of Economic Growth study on 23 metros suggested that total carbon emissions calculated was 4, 600 Mt in 1988, and 15000 Mt in 2005. Talk has mostly concentrated on demand management, with very little implementation taking place on the ground. While transport was a late addition into the JNNURM, it has brought about not only a visual change, but also change in the mindsets of the people. Public transport is public responsibility.

We should recognize the contradictions in public policy. On the one hand we ask everyone to prioritize public transport but on the other hand we do everything possible to facilitate the movement of private vehicles. If we look at the production figures, in 2010 India produced 2.4 million cars, 3.7 million two wheelers and a large number of multi-use vehicles (SUVs).

Public transport is not the sole answer for reducing private vehicle demand. There is a public policy element involved in this. The effects of building flyovers are vast including the motor vehicle image that has been created by the media. What is the lifestyle that we want to pursue, and more importantly where should the taxpayers' money go? Every state follows a different method of taxation. In many states incidence of taxation on private vehicles is atrociously low. There is a term called life-time tax. It is also absurdly low for private cars as compared with public buses. In Delhi, bus passengers bear an incidence of tax which is at least 10-12 times more than what private car owners' bear. These policy contradictions cannot be brushed aside. The economy of large cities in India has become dependent on reasonable mobility within these cities. There is congestion everywhere. Data should be brought forth in such a way that it is easier for people to understand the significant policy actions and measures.

Prof. Sivaramakrishnan concluded his address by expressing the hope that this project will bring about a collaboration of people from various sectors. Further, the stakeholder consultations would not only be meaningful but would also contribute to the success of the project.

Workshops on Promoting Low-Carbon Transport in India

Presentation by Ms Kamala Ernest, UNEP and Dr. Subash Dhar, UNEP Risoe Centre

UNEP Transport Programme Overview: Ms. Kamala Ernest

Ms. Kamala Ernest, Programme Officer, UNEP Transport Unit, based in Nairobi, Kenya, made a presentation on UNEP's transport programme. She began her presentation with an insight into the link between transport and environment. Energy use in the transport sector was identified to be an important issue. About 90% of energy is derived from fossil fuel and is also related to green house gas (GHG) emissions. Currently 23% of CO₂ emissions come from transport. Future trend shows a rise to 33% by 2050. Transport is the major source of urban air pollution.

She informed participants of major issues and challenges faced by modern economies like deteriorating quality of transport systems, declining transit modal shares, lack of integration between land-use and transport planning, faulty policy actions and economic incentives that give rise to private vehicle ownership etc.

She suggested certain sustainable transport pathways that when adopted by various implementing agencies could benefit urban transport. These include urgent need to re-think transportation trends and remove negative impacts, promoting non-motorized transport, moving towards green transport development eventually leading to job creation, poverty eradication, carbon emission reductions, bringing about participatory approach in the decision making process and integration within infrastructure, technology, services and policies that affect people.

UNEP adopted an integrated approach for project development that covers fuel, vehicle, non-motorized transport and also public transport systems, as is the case with the project on Promoting Low-Carbon Transport in India. It will be a learning process for UNEP to see how the project will impact on Indian cities. India is being viewed as the model country that other developing countries can emulate in the future.

Promoting Low-Carbon Transport Project Overview: Dr. Subash Dhar

This presentation provided a quick overview on the project. The three year project on "Promoting Low-carbon Transport in India" was initiated in November 2010, and shall run till 2013. The main implementing agency is United Nations Environmental Programme (UNEP) and four implementing partners led by UNEP Risoe Centre (URC), Denmark alongside Indian Institute of Management, Ahmedabad (IIM-A), Indian Institute of Technology, Delhi (IIT-D) and Centre for Environmental Planning and Technology, Ahmedabad (CEPT). The project has been funded by International Climate Initiative (ICI) of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Germany.

The project has two main objectives:

- Delineating an enabling environment for coordinating policies at national level to achieve a sustainable transport system; and

Workshops on Promoting Low-Carbon Transport in India

- Enhancing capacity of cities to improve mobility with lower CO₂ emissions.

This workshop emphasized on national level objective that focuses on the development of policies pertaining to sustainable transport in India. The institutional structure implementing projects engage with stakeholders and key academic institutions within the country. Therefore the Transport Action Plan which would be implemented at the National level is being worked out in close collaboration with Ministry of Environment and Forestry (MoEF), whereas city related interventions would be implemented through low-Carbon Mobility Plans in collaboration with the Ministry of Urban Development (MoUD). As far as other institutional elements for the project are concerned, funding is provided by ICI.

A high level Project Steering Committee (PSC) comprising of experts from relevant sectors and key institutions with participation from MoUD exists, and provides guidance and oversight to the project.

The key interventions at national level involve analytical exercises and developing toolkits for producing a Transport Action Plan in line with India's National Action Plan for Climate Change. The key analytical outputs consist of macro indicators, national assessment of transport sector for various scenarios, case studies and framework for climate adaptation.

The key interventions at city level similarly involve analytical exercises and toolkits which will result in Low-carbon Mobility Plans and concrete actions in the form of project proposals for funding. Expressions of interest have been received from three cities (Vishakhapatnam, Rajkot and Ludhiana) and agreements to participate in the project would be finalized shortly.

Summary and comment from the floor

Participants of the workshop commented on various issues. Some participants indicated that air traffic is increasing at a rate of around 20% and minimum distances between cities are around 300-400 km. Hence, low-carbon transport modes should be promotion as opposed to air transport. Pollution increases with a shift from one pollutive transport mode to another. Most of these modes rely on fossil fuels. Electrified modes that consume less fuel and emit less or negligible pollutants should be encouraged.

In the methodology for City Mobility Plans, the carbon foot-print of the plan prepared should be calculated and analyzed as this is lacking in the existing CMP methodology. There is a lack of availability of data that could be utilized for the project. Dr Krishna indicated that work flow data collection is better and if the workshop proposes important indicators that need to be measured including possible sources of information, and then this can be easily worked out. Focusing on the toolkit, work should be carried out on its improvement and the workshop itself can provide certain elements for this. He also suggested that work flow based data generation is much better than data collected for the sake of data collection. Data collection can take place at locations such as pollution check centers and vehicle registration centers, as this would provide much more reliable data than data collected from random sampling.

Workshops on Promoting Low-Carbon Transport in India

Electric transit systems could also be improved and would contribute to CO₂ reduction in city transit systems.

Prof. Sivaramakrishnan observed that the issue of how to determine the carbon footprint of city movement since this depends on a number of variables. He said that for developing low-carbon mobility plans, many aspects have to be considered in order to achieve a low-carbon footprint. On average, geographical boundaries in many of our cities have been over-run. Municipal limits are not always relevant. If we do not know the geographical limits, then it would be difficult to measure the carbon footprint. Data collected on this should be related to the city's mobility plan. City level data can be static or historic. Some Indian cities are more vulnerable with regard to carbon emissions. If so, then the big puzzle would be how to generate data and analysis and how to relate CMP methodologies to this.

The scale at which data is available is also of concern. For mass transit systems, access issues are only addressed partially. Bus systems are provided, but these are not converted into transit systems. Only by including access and egress parts can we develop an integrated transit system.

In Pune's CMP, non-motorized transport has not been included in any of the projections done to date. The rebound effect of building infrastructure is not taken into consideration. We have to consider non-motorized transport as a mode of transport that can facilitate large modal shifts. Non-motorized transport should be considered as it enables larger modal shifts. Proper understanding of rebound effect of providing infrastructure is required.

The chair concluded the session by raising the following issues: apart from the technical aspects, we are wrestling not only with technology but also policies as policy objectives are not yet clear. He also suggested that cities can put forth the modal split, mobility quantum as well as the technology choices they would want for their cities with available information. This would help in the calculation of carbon footprint and environmental factor would perhaps motivate people a bit more than fuel efficiency and personal comfort.

Session 2: City Level Indicators for Low-carbon Mobility

This session was chaired by Mr. Shailesh K. Singh, Joint Secretary, MoUD, GoI and co-chaired by Mr. David Margonsztern, ADB.

Speech by Mr. David Margonsztern, Asian Development Bank (ADB)

ADB is a trusted partner in the urban transport sector. ADB is working towards supporting developing member countries on the path of improving the sustainability of their urban transport systems. ADB recently approved the sustainable transport initiative which aims at balancing the urban transport portfolio of ADB towards more sustainable transport modes, focusing on mass transit systems, public transport and also inter-modality with non-motorized transport modes. The number of projects in this sector and in this region is growing. ADB is currently supporting projects like the low

Workshops on Promoting Low-Carbon Transport in India

emission pilot bus line in Kathmandu and first BRT line in Dhaka. Currently, ADB is also looking at working in Guwahati and Jodhpur.

The objective of the session was to consolidate the final list of indicators at city level developed by IIT, Delhi and CEPT University in collaboration with UNEP Risoe Centre, using a participatory approach, including two stakeholder consultations. Indicators that are clear and easily monitored are crucial to measure success of projects being developed. It will also be crucial to determine how to measure mobility, accessibility, integration of transport infrastructure, land-use, safety and security of urban transport systems.

Presentation on Indicators for Low-Carbon Mobility by Prof. Geetam Tiwari, IIT Delhi

Prof. Geetam Tiwari presented the finalized low-carbon mobility indicators. She highlighted the Expert Workshop, held in Ahmedabad in August 2011 that resulted in a final draft list of indicators. She provided information on the framework used to develop city level transport indicators. The workshop not only aims at bringing about change for low-carbon mobility but also explore social sustainability (accessibility and safety) along with economic sustainability (expenditure and finances). Cities should be motivated not only to adopt low-carbon strategies, but also to improve accessibility, safety, expenditure and finances, while reducing other negative environmental impacts.

Three key issues were highlighted as the driving force for these indicators:

- **Pressure:** indicators measuring activities that have an impact on aspects like passenger km and modal share;
- **State:** indicators that measure influences on aspects like pollution levels and accessibility;
- **Response:** indicators that measure policy initiatives adopted in response to attain sustainability in expenditure, land use policy, etc.

In order to achieve the set goals, issues and their relative indicators have been identified. These issues include accessibility and mobility, spatial accessibility, infrastructure quality, safety, comfort and security, cost and affordability, environmental impacts, health impacts and policy response (investments and tax policies). During the presentation, indicators were described, measures and data sources identified and relevance denoted.

In conclusion, she highlighted certain important indicators required to cater for certain issues. These indicators were modal shares, travel time, trip length, land use parameters, infrastructure quality, ease and comfort, safety, security, affordability, emissions, fuel consumption, land resource depletion, health hazards and economic indicators. These indicators would help in the development of the low-carbon mobility plans and would also be a part of the policy measures for achieving sustainability and development goals along with low-carbon transport systems.

Workshops on Promoting Low-Carbon Transport in India

Presentation on Indicators for Inclusiveness in Mobility by Prof. Darshini Mahadevia, CEPT University

In her presentation Prof. Darshini Mahadevia provided an insight into the concept of inclusiveness as part sustainability. She suggested that an ‘Inclusive Approach’ is built on four pillars:

- Environmental sustainability,
- Social equity,
- Economic growth, and
- Political empowerment.

Indian cities have been characterized by high density, mixed land-use urban form. Informal sector forms an integral part of the Indian economy. Inclusiveness would take into account slum location and provision for affordable housing. She also put forward certain input and output indicators which include fiscal instruments, urbanisation, urban settlement structure, urban land policy, health indicators and many more.

At the city level, women have specific travel needs, and in particular, women from low income households. Women multi-task: they work to earn an income and also take care of their households and children. They therefore need to work close to their homes so that they can travel back and forth from the home. Many, walk to work as paying for multiple trips in a day is unaffordable. Women also have fewer transport choices as culturally they do not cycle and they cannot afford to take public transport. Walking to work reduces productive time. Indicators would be very useful for the purpose of inclusiveness of needs of women with low income.

Inclusiveness should be viewed as a base and not as an add-on for planning approaches. Inclusiveness can be brought about by addressing structural inequalities. Multi-focal societal views should be considered so that problems or issues can be investigated from the perspective of vulnerable populations.

Two aspects are important therefore, in developing indicators for low-carbon mobility. One, there has to be benchmarks for some indicators so that acceptable standards for the most vulnerable of urban populations are put in place. Second, we need to develop indicators that capture disaggregation by income, social class and gender perspectives. Data needs to be collected in terms of separate income groups, castes, vulnerable occupational groups and gender. These categories include:

- i. Slum dwellers
- ii. People living in kuchcha housing in the slums
- iii. Households where a woman is head of the family
- iv. Minority groups (including schedule caste)
- v. Street vendors.
- vi. The elderly

Data collected from these groups should be separate for every member of the household. Only then the aspect of gender inequality can be captured. Further, the data

Workshops on Promoting Low-Carbon Transport in India

should be for different age groups so that indicators on certain vulnerable age groups can also be developed such as for elderly, and for children.

Summary and comments from the floor

Mr Shailesh K. Singh indicated that parameters have been identified and that now, element of measurability for indicators need to be identified not only for low-carbon mobility options but also provide maximum inclusiveness in the study of Indian cities.

Members were requested to exercise caution when relying on data from CTTS and CMP as most of the time, information on slums and urban poor data are omitted. As for data on security, various city level technologies would be used for the collection of the same.

It was suggested that measurement of peak and non-peak movement in the city would ensure adequate data generation. It was also suggested to utilize absolute rather than average data. Indicators should manifest transport demand management and not mention transport as a fragmented part of the city.

The issue of environmental cost as an indicator was raised. Integration of various modal systems should be looked into with respect to data collection. Traffic messaging and monitoring centers should be established either for each city or country as a whole. The participants also brought out the idea for a centralized data centre that would provide access to data on real time traffic as well as carbon emissions etc. This might help maximum utilization of the existing infrastructure rather than providing more of it.

Session 3: Urban Low-carbon Mobility

This session on Urban Low-carbon Mobility was chaired by Prof. Dinesh Mohan. Prof. Mohan began by indicating that we should first identify a problem, and then look for a solution. During the problem identification process, we should define boundary condition for the problem and then define what the constraints are in the system and finally provide a solution to the problem. He also suggested that we should look at low-carbon solutions within the context of theories and science and technologies that would help in generating current solutions within the economy, while engaging local communities in the process. Once indicators are finalized, only then cost effective solutions that cater for all sectors in society, including vulnerable populations can be suggested.

Presentation by Prof. Geetam Tiwari, IIT, Delhi & Prof. Darshini Mahadevia, CEPT University, Ahmedabad

The presentation was on the development of a Methodology for Low-carbon Mobility Plans (LCMPs). Prof. Geetam Tiwari began her presentation by stating that the task at hand is to develop a methodology in order to develop low-carbon mobility plans. The methodology would be based on the discussed indicators. Traditional mobility plans have focused on the achievement of mobility and accessibility with the least carbon emissions and this has led to maximization of accessibility. The focus would be on non-motorized transport and public transport. An additional factor to those impacting emission levels is the life cycle cost of infrastructure. Changes experienced would not

Workshops on Promoting Low-Carbon Transport in India

only impact technology, but planning and policy initiatives as well. The methodology developed needs to capture these issues with respect to utilization of non-motorised transport and public transport systems.

The expected outcomes of the LCMPs will mostly propose strategies and plans that would result in a shift of users from being captive to choice users, provide technological improvements to reduce emissions from motorized transportation as well as take into consideration land use and shelter policies that would eventually lead to evaluation of the impacts of strategies, plans and projects on emissions, accessibility, and social sustainability.

In the presentation Prof. Tiwari also made a comparison between CMPs and LCMPs, and explained the steps that would be required for the preparation of the LCMPs. Data collection would include obtaining data on all available modes including information on slum dwellers, migrants, street vendors etc

She indicated that LCMPs require a desirable scenario in order to have maximum impacts on reducing emissions and improve social sustainability. These scenarios would be derived by looking into the alternative transport and land-use scenarios. Finally, she put forward a conceptual scheme of the LCMPs.

Prof. Darshini Mahadevia contributed to this presentation by adding that there would be public consultations at different stages during preparation of the LCMPs, for example during initializing, scenario development and project development stages.

Presentation by Prof. Prem Pangotra and Prof. P. R. Shukla, IIM, Ahmedabad

Prof. Pangotra's presentation was on the Macro Considerations for Urban Low-carbon Mobility Plans. The most important task at hand is linking all city and national level aspects, and how certain plans on low-carbon transport for India could be aggregated and disaggregated at the national and local level. Every city has its own dynamics and a different city plan. National level plans will not address micro details, but at indicator level, certain connection is required. Results would show that the aggregate activities performed at the city level and disaggregated activities performed at the national level, do not contain significant variance.

Prof. Shukla began his presentation by providing a brief meaning of the term low-carbon and provides insights on the sustainable low-carbon mobility framework that would be utilized. He further provided information on macro indicators for sustainable low-carbon transport. The indicators would encompass all sectors as well as all regions for the period between 2010 and 2050. After public consultations, a total of 17 indicators had been finalized and were divided into five categories i.e. Economic, Social, Environmental, Technical and Strategic Indicators. Indicators such as the Carbon Intensity of Transport, Energy Security, Transport Infrastructure Investment, and Total Cost of Transport have been finalized and capture the economic aspect of sustainable transport.

Workshops on Promoting Low-Carbon Transport in India

Prof. Prem Pangotra suggested that precise mapping of city level indicators onto macro indicators was neither necessary nor realistically feasible. He reiterated that the methodology for Low-Carbon Mobility Plans for cities contain several elements that need to be consistent with the macro framework for national level assessment. These include technological choices, investment requirements, access and affordability. The challenge for low-carbon transport strategies is to align – local, national and global policies; short term actions and long term goals; and macro and micro perspectives.

Summary and comments from the floor

A query on the consideration of policy initiatives as opposed to preparation of projects based on LCMPs at the city level was raised. Institutional mechanism and capacity building issues were also raised. These queries relate to national targets and how a city would achieve these targets, and how cities would build scenarios that have been identified.

An issue on industrial shift was raised. However, a shift in economic structure would be difficult to predict for the city as compared to the national level. Prof. Shukla indicated that tax collected on one tonne of consumed coal is equivalent to one US dollar, and that these funds could be used to support renewable sources.

The Chair, Prof. Dinesh Mohan, summed up the session by adding that every living human being has a quota of about 2 tonne of CO₂ emissions, meeting such targets would be beneficial at city level in the LCT project for India would assist in providing clarity on the consequences of policy. Mode choice modeling should be considered when developing the low-carbon city plan. This would be a first step towards the right direction.

Session 4: Panel Discussion on Low-carbon Mobility Plans for Cities

This session was based on low-carbon mobility plans for cities. Representatives from two cities and two public consultants were present for the discussion. The session was chaired by Dr. Jorge Rogat, UNEP Risoe Centre.

He opened the session with three main remarks as follows:

- **Demand side management:** Focus on technical options alone or demand side management cannot be relied upon to address problems in isolation. These need to be integrated.
- **Rebound effect:** Technical improvement brings about an associated negative impact for instance fuel efficiency in cars would in turn increase its usage rather than reduce it.
- **Inclusiveness:** The main goal here is to provide better transport services and sustainable transportation for cities.

Panel Discussion

Prof. Talat Munshi, CEPT University, Ahmedabad

Prof. Munshi observed that the project aims at encouraging use of public transport and non-motorized transport and not private modes of transit. He suggested that the project should look at measures that will ensure retention of people who use non-motorized and public transit modes with their present choice of preference being low-carbon modes. Policy measures should be initiated to bring about the shift from self owned motorized modes to non-motorized transport and public transport. In order to bring about a change in efficiency, the project should look into technical development. He suggested that density, design, destination accessibility, diversity, demand management etc. should be looked into as they influence travel demand.

Safety, security and inclusiveness are very relevant in the Indian context. In addition, design variable for the Indian context, distance to transit and access to transit provides jobs are also important elements. He also spoke about the latent demand influences for mode choice. He suggested that inter-linking land-use and transport is very important and would eventually enable easy transit.

The project should also look into the communication with the decision makers along with the decisions that would be taken with respect to the type of projects that would be carried out. In his concluding remark, he reiterated that the three points raised by Dr. Rogat are very important and would be beneficial for all the cities if considered.

Dr. Anvita Arora, iTRANS, New Delhi

Dr. Anvita Arora began her discussion by highlight in two main points:

- Retention of what we already have; and
- Realizing the realities on ground and provide solutions accordingly.

Citing an example of Fazilka she indicated that public transport has been organized on the basis of dialer rickshaw services and better rickshaws design and technology wise have been provided bringing about a well deserved boost for non-motorized transport.

She also suggested identification of existing sustainable solutions and utilizing these to facilitate low-carbon transitions. Top-down models do not engage the citizenry and their involvement is highly beneficial. She also suggested that innovative solutions from the grassroots need to integrate inclusivity along with other elements.

Mr. Ajay Bhadoo, IAS, Municipal Commissioner, Rajkot

Mr. Ajay Bhadoo began his presentation by highlighting the following issues:

- The focus of the project is from macro to micro levels;

Workshops on Promoting Low-Carbon Transport in India

- Policy formulation and implementation process though difficult, is possible.

Integration of city development plans, CMPs is essential for JNNURM funding. He said that Rajkot has shelter plans mandated by Rajiv Awas Yojana and town planning schemes etc. Integration of all of the various elements would be an issue.

Funding for non-motorized transport has not been adequate so there is no policy on subsidies. Measurability of the outcome is also difficult. The Lifecycle approach has not been considered for Indian cities and the current approach is 'build-neglect-rebuild'.

He concluded by saying that it is possible to change the behaviour of the people by increasing awareness and with provision of activities which aim to achieve objectives.

Mr. KVN Ravi, Executive Engineer, GVMC, Vishakhapatnam

Mr. K.V.N. Ravi spoke of various development projects that have been taken up. In his discussion he said that Vishakhapatnam has a bus share of 18% currently and work is ongoing to increase it to 30%. Wilbur Smith Consultants has been selected for preparation of a CMP for the city. The best option would be to integrate the CMP and the LCMP.

The previous outlook of GVMC was more towards the macro level but this would change to factor in macro considerations as well.

Summary and comments from the floor

The Chair, Dr. Jorge Rogat, provided some insights from Latin America. Change in technology is not the only option for the efficient running of systems, and includes other developmental factors.

Citing an example, Prof. Dinesh Mohan said that policy makers in Delhi started the Resident Welfare Association in order to provide inputs to the Government. Only interest of the upper class was taken into account and implemented. This was because, the resident associations from the poor areas were considered to be illegal. He suggested that if there are welfare associations that represent all sections of the society only then they can create political pressure for the facilities.

A suggestion was put forward to translate indicators into more non-technical language, so that politicians and local corporators can understand them.

The Chair summed up the session by stating that problems in many developing countries are similar. Adapting some of the solutions that have been implemented in other parts of the world would be beneficial.

Day 3: 20th October, 2011

Session 5: Infrastructure for Low-carbon Cities

Prof. Prem Pangotra made introductory remarks during the session that was chaired by Mr. B. I. Singal, Director General, Institute of Urban Transport. Panelists included Prof. Rutul Joshi, Prof. Geetam Tiwari, Ms. Akshima Ghate and Dr. Ashish Verma.

Presentation by Prof. Rutul Joshi, CEPT University, Ahmedabad

Prof. Rutul Joshi made a presentation on the preliminary results of case studies for cities with BRT systems. The main focus of the study is to evaluate the system as an inclusive transport system. He began by presenting an overview of macro trends and stand-points of the research. Vehicular growth is increasing rapidly with IMF (International Monetary Fund) and Virginia University estimates indicating that this would be 200 cars per 1000 people in India, by the year 2050. India's rapid motorization has been fuelled by biased advertisements, cheap car loans, free parking, etc and this rapid motorization is changing cityscapes very fast.

There is strong political demand for road infrastructure favoring motor vehicles in cities. Even under the JNNURM, trend of road widening and fly-over construction has continued. He quotes the 2008 MoUD Report manifests some national level trends in urban transport scenarios e.g. the fact that 2-wheelers have been increasing at a rate of 12% per annum in the last two decades; the modal share of cycling has decreased from 30% in 1994 to 11% in 2008, only 30% of city roads have walkways for pedestrians, etc. He also suggested that non-motorized transport and public transport as an integral part of the transport system.

For the purpose of this study, two major components have been looked into - rapid assessment of BRT experience in Indian cities and a detailed assessment of the Ahmedabad case. The latter would be done through surveys of the travel needs of the urban poor and vulnerable groups and the outcomes of the study would include travel needs of the urban poor, user preferences of better transport systems, and recommendations for an inclusive transport system.

He suggested that bus systems are an integral part of the urban transport system and no single system can address all the traffic issues in the cities. Public systems need to be integrated in terms of physical access, fares, ticketing and marketing (also in terms of institutional co-ordination).

On BRT, he quoted Cervero 2010, stating that BRT is key in absorbing traffic displaced by road capacity losses. It is impossible to have a singular 'successful' model for BRT. Each city will have to evolve and adopt the concept of BRT (prioritized bus corridor with adequate walking-cycling paths). Policies and funding should encourage this. However, there is greater consensus with regard to construction of BRT lines along central median dedicated corridors. Debates about open vs. closed systems exist.

Inclusive BRT System would not only capture systems performance but also provide insights into the social benefits and the implications of the system in the city. This

Workshops on Promoting Low-Carbon Transport in India

would include safe physical access to bus stops, easy boarding of the bus, dedicated bus corridors with NMT infrastructure, affordable fares, road-ways integrated with street-hawking activities etc

He also highlighted Delhi, Pune, Jaipur study, and a detailed case study of Ahmedabad. Main issues coming out of these studies include bus operations, status of non-motorised transport infrastructure and the integration of systems with those currently in existence.

Presentation by Prof. Geetam Tiwari, IIT, Delhi

Prof. Geetam Tiwari provided interim results of data that has already been collected. Final results are expected soon. Her presentation was based on secondary data collection and an extensive survey that has been going on simultaneously.

An overview on the history of existing metro systems was provided. The 12th plan proposal suggests that all 2 million plus cities should plan for corridors that have 15000pphd (passenger per hour per direction) for 5 km of continuous corridor. Average trip length of motorized trips should be more than 7 km. The data presented here are based on the financing aspects. The city of Kolkata and Delhi already have fully functioning metro systems. Metros in cities like Mumbai, Chennai, Bangalore, etc are under construction. Pune, Chandigarh, Lucknow and Ahmedabad have planned metro systems.

Financing a metro system is not easy. Financing structures of metro systems were covered during the presentation. State governments have contributed to this, and there has also been a strong loan component. JICA provided 53% of the funds in the form of a loan for the development of Phase I and II of the Delhi metro. Except for Kolkata, all the other metro systems have been or are being developed with the help of special purpose vehicles.

The Delhi metro is one of the most successful metro systems running within the country, and has been operational since 2002. Currently 4-5% of trips in the city of Delhi are by metro. The Delhi metro enjoys subsidies and tax exemption schemes. The Delhi Metro Rail Corporation (DMRC) pays Wealth and Fringe Benefit Tax, but has been exempted from Property, Sales, Work contracts, Income, Capital Gains, Customs and Excise Tax.

Revenue and expenditure structures of the Delhi metro were presented. She highlighted certain issues facing the metro line and relevant solutions for the same. These issues include high capital/operational and maintenance cost, government subsidies, displacement of households/ businesses, permanent structural changes (elevated metro) that impact on the landscape etc.

Workshops on Promoting Low-Carbon Transport in India

Panel Discussion

Ms. Akshima Ghate, Fellow, TERI

Ms. Ghate presented options of how to direct the urban transport sector towards a low energy and low-carbon path, while focusing on passenger transport in million-plus cities. She highlighted key issues facing these cities such as lack of integrated land use and transport planning, inadequate public transport and non-motorized transport infrastructure etc. The study mostly focused on million plus cities since vehicle numbers and growth rates and ownership are very high.

The study looked at 23 of the 35 million plus cities in India. Estimated fuel consumption in these cities in 2001 was 12.6 mtoe (million tonnes of oil equivalent) while CO₂emissions was 18.9 MT.

Through her study she suggested that the 'Avoid, Shift, and Improve' approach if adopted would contribute to reduction in private vehicles on the roads, increase in the public and non-motorized transport share, and cleaner vehicle fleets.

Life cycle studies of the various modes would be essential. Recent studies have shown that high capacity public transport systems are much more carbon and energy intensive. So essentially, talk is on for low-carbon transport. Studies should assess entire economies and determine how carbon and energy intensive these modes are. The extensive study of the 23 cities indicated an estimated baseline for carbon impacts is being developed including how to monitor the reduction in carbon emissions. By finalizing the baseline, cities could look into the development of strategies for non-motorized transport and public transport systems and build an understanding towards reduction of carbon emissions.

There is need for good databases and for setting of carbon reduction targets in mobility plans for cities and for an approach that meets carbon reduction targets.

Dr. Ashish Verma, Indian Institute of Science, Bangalore

Dr. Ashish Verma provided insights into the transport sector in Bangalore. Street hawkers should be taken into consideration in all this as they are an integral part of the economy.

Some studies have highlighted the fact that bus stops are owned by municipalities and not by Bus Company and this creates a problem for services provided by bus companies as it affects the overall quality of service.

Taxation policy is flawed and discourages sustainable transport since these vehicles pay more taxes, depending on the number of passengers that they carry. This is in contrast to the philosophy of promoting space efficient and capacity intensive modes. Taxes are much higher for them than for private vehicles. Some arguments state that service provision for non-motorized transport may not exist as they do not pay taxes on walking and cycling infrastructure, whereas motorized vehicles pay taxes that are used to maintain the carriage ways.

Workshops on Promoting Low-Carbon Transport in India

When developing a transport system for any city, BRT and metro lines are found to be the most relevant options, but other options such as Light Rail Transit (LRT) and tram are completely overlooked.

He also said that while there is a provision for infrastructure for sustainable public transport or non-motorized transport, unless these are supported by policy interventions, real benefits for public transport systems cannot be achieved.

On the issue of captive and choice users various transport modes, the aim should be to improve the quality of service for the captive riders while attracting choice riders, since the real benefits of public transport are achieved when we are able to influence people to utilize public transport. A choice rider would shift to public transport only when it become a natural choice to him or her, as people tend to select modes that cost less despite improvements in infrastructure. In essence, it costs less to utilize public as opposed to private means.

Infrastructure provisions need to be augmented with policy interventions, which mainly focuses on incentives for private vehicles and policy interventions such as parking. Infrastructure provision needs to be related to policy interventions for meaningful change.

Summary and comments from the floor

The Chair pointed out issues on institutional weaknesses and how integration is difficult and directly attributable these weaknesses. Hopefully, the 12th Five Year Plan will address some of these issues.

Policy makers have been resisting buses as mass transit options, and insist that BRT lines should operate as commercial ventures. This means that these infrastructure projects are not entitled to financing by the Government. The 12th Five Year Plan will try to resolve this discrepancy as well.

Mr. Singal mentioned that people living along metro lines are those who cannot afford to utilize this mode of transport. DMRC are trying to encourage public transport usage by providing tax concessions. If this is done for bus companies, they will become self financing and viable. It will take some time but eventually benefits would be realized.

Comments from the rest of the participants included the following.

- i. The cost of a BRT construction per km in comparison to metro construction over a similar distance.
- ii. Target groups for the Ahmedabad BRT study. Suggestions were made on the ridership social and economic profiles with a focus on low income mobility patterns.
- iii. Data collection that would result in carbon benchmarking for the city as complete relevant data is not available.

Session 6: Panel Discussion on Sustainability and Mobility: Community Concerns

This session was chaired by Prof. Darshini Mahadevia, CEPT University. She indicated that transport is not only a technological issue, but also a social issue.

Ms. Anumita Roychowdhury, Centre for Science and Environment

Increase in number of vehicles results in an increase in fuel consumption, which ultimately results in increased emissions from the transport sector. The time is ripe to promote low-carbon economies as communities are becoming more aware and more susceptible to positive change. A lot of investments are being directed toward promotion of public transport. Some of these investments are resulting in unprecedented negative impacts e.g. erosion of these systems and increased dependency on private vehicles. Segregation between deluxe and ordinary buses for public transport means that the ordinary buses are neglected and become dilapidated, yet a greater proportion of the population relies on the latter for their daily commute.

Urban planning requirements such as segregation of 60% of commercial areas for parking, only encourages use of private cars. In other cities, parking space needs to be available before one is allowed to purchase a vehicle. Cities are adopting different policies, directions and conventional (vehicles) versus non-conventional options for addressing urban mobility concerns. Need to define the right principles that will guide planning within urban areas.

Ms. Roychowdhury said that whether it is climate or energy guzzling or air pollution; all that are going to get worse in India because of the way the aspirations are going to drive the travel choice in our city. We have already seen the numbers that how personal vehicles are going to grow and guzzle energy and not only the number but also the size of the car as well. We are clearly noticing the shift, happening in this as well in our country. Everyone is saying that the personal vehicle segment will actually use up more energy by 2030 than total transportation energy today. The challenge for us is the co-benefits challenge that whatever we do today in Indian cities should protect our health. We have to minimize the impact of energy and climate impact of motorization.

The story is different to the base line that has been talked about so much for the low-carbon transport. The way we travel: are cycles, we use are buses, we walk all together, the sheer share of the low-carbon trip is phenomenally high. When we place ourselves on the global scale then that makes us conscious of the advantage and also the opportunity. It is amazing to begin with a baseline and we can stop it, we can prevent further deterioration. It is important to know the action but it is also important to know whether our principles are right or wrong.

The investment in public transport has scaled up the JNNURM state government policies to invest in buses public transport is good is happening but overall pattern of transport funding also gives us the signal and idea whether we are doing right or not. It is clear that where we are spending the money is not the right way but in the name of the public transport something else is happening. We look at the JNNURM funding; more than 70%

Workshops on Promoting Low-Carbon Transport in India

of the fund that they spent is already on road widening or on more road flyovers. We know that if this kind of investment continues its going to lock up enormous amount of energy and carbon in urban infrastructure for the future.

If we look at the investment that is happening in public transport or scaling up of public transport even there we find that there are intended consequences. If we again look at the JNNURM example, the top down prescription we have of promoting bus transport somewhere national and city government has not been able to balance the need of formal and informal transport we already have in our cities. The role of informal transportation, the role of para-transit, and if we are not sensitive to the incorrect measures, we would actually end up in causing the much more damage even with investment in public transport. We understand the formal transportation. It takes an individual beyond the affordability range of the majority of the city. Today when we talk about the urban poor they are not just the marginal sector they are the urban majority. If the equity principle is not going to define the basis parameter then it is really going to be a disaster for our city.

If bus systems are being deployed in our city, e.g., Hyderabad started deluxe buses and taken them beyond the affordability range of the common people. So there is the ordinary bus and the deluxe bus and the ordinary buses kept getting neglected, their frequency reduced and therefore those who used that system cannot use it any more. They are marginalized about public transport. It is not just about getting the hardware and just deploying the system, it is much more than that public transport investment which will then not give the right benefits.

We are still providing more and more parking space which is inducing more and more vehicle ownership. Therefore it is very disturbing where in cities norms are set aside to exclude the 60 % commercial area set aside for parking in Hyderabad.

Large amount of investment in the roads are there but why we have not seen also as an opportunity for the road design for incorporation the needs of non motorized transport.

When we talk about the alternatives, our cities demand for funding and finance. It's gone beyond the conventional matrix of revenue generation that cities have that can fund this transition and this is why we are talking about the dedicated urban transport and news sources to fund the transition

In case of conventional sources like diesels road taxes one can apply the TDM principle but we can tax the bad to fund the good but that has not been done. Then if we talk about the non conventional sources the land value capture, the FSI and the property rent but what we have understood is that we link to TOD. This is becoming real estate led development. May be we want to achieve some densification level but it is quite inclusive already and compact Indian cities. So we have to understand the density concept in Indian context TOD cannot be a design solution. TOD require TDM solution as well design should not only be transit oriented but the community living there should be transit oriented so one can implement TOD without the TDM and whole equity principle so all have to integrated to get the right benefit.

Workshops on Promoting Low-Carbon Transport in India

She said that we have the opportunity to pick the right strategies and low-carbon transportation is going to look the mitigation strategies. But somewhere down the line mitigation strategies going to link up with adaptation strategies that's where the whole planning will get the entirely new approach

She concluded by saying that we have inherited the legacy of low-carbon transportation regime in our cities and so it is our favor to preserve our legacy and build on it.

Dr. Ashok Sreenivas, Parisar, Pune

He highlighted social aspects of transport sector while putting light onto the non-motorized transport for the cities in India. He added that road construction is biased towards providing facilities for motorists and not for non-motorized transport users. Non motorized transport has been considered to be marginal to other modes of transport. Politicians have not been promoting these issues either. The political attention focuses towards development of mass rapid transit systems

He concluded by saying that walkability, cycling and promotion of non-motorized transport integrated with public transport use, should become an inherent aspect of the country due to its low-carbon aspects.

Ms. Sujaya Rathi, CSTEP

Mobility is key in improving the livelihoods of the urban poor.

Challenges being faced by the urban poor include:

- Lack of safe crossways, and poor regulation e.g. public buses picking or dropping off passengers haphazardly.
- Buses do not give priority to bus pass holders.
- Routes have been rationalized based on revenues.
- Safety is compromised and pedestrian and cyclists harassed while on the road. There are also no policies that promote safe facilities for these vulnerable users.
- Construction of cycling track is underway in some places, but this does not cater to the needs of majority of the population.
- Increase in pollution and landscape destruction e.g. tree felling to expand motor carriage ways.

Politicians are more interested in promoting high level projects that attract a lot of funding and publicity e.g. construction of highways and neglect 'low key' projects e.g. construction of cycling lanes and walkways. Policies in place also favor the needs of motorized users as opposed to NMT users

Workshops on Promoting Low-Carbon Transport in India

In her concluding remarks, she highlighted the need for policies that address the needs of vulnerable members of society.

Summary and comments from the floor

The Chair of the session, Prof. Darshini Mahadevia, summarized key points that emerged from the discussions as follows:

- Difference in travel demands from different communal groups as well as socio-economic aspects need to be considered when analyzing the transport system.
- Disaggregated urban transport sector in medium size cities needs to be looked at.
- Access and informalities are very important while planning for an efficient transport system for Indian cities.

75% of JNNURM phase 2 funding would be given to urban roads, hence it is important to ensure that sustainable transport systems are promoted and implemented on the ground. Availability of funding will be guided by CMPs. Traffic Demand Management (TDM) measures need to be incorporated to ensure that more people are encouraged to use public transport as opposed to encouraging use of private vehicles e.g. policies such as those that provide free parking in some areas should be discouraged. It is important to note that Transit Oriented Development (TOD) is being used as a proxy to build metro systems. A wide range of viable solutions that would work, within the Indian context, need to be promoted, to avoid bias toward one set of options. Integrate all available modes of transport including water transport, as some Indian cities have good water channels.

The floor brought out certain issues that have been mentioned here. Five CMP which are either approved or in progress of approval are not talking about TDM measures, if they do, substantial action to implement, there is no focus on TDM in any TDM measures. Instead of increasing the parking charges, several places are found to have free parking. Transit Oriented Development (TOD) - measures reduction in the trip or length of trip. City Mobility Plan (CMP) is an instrument to achieve low-carbon transport. CMP has no linkages with land use planning, making it quite weak. TOD comes from where cities have density 10 per hectare. In India, density is more than 100 per hectare; we do not need to densify. TOD is used as a proxy for building the metros.

Workshops on Promoting Low-Carbon Transport in India

List of Participants

Ahuja, Rajnish
Research Information Systems
Delhi "Zone IV-B, Fourth Floor
India Habitat Centre,
Lodhi Road,
New Delhi-110 003
Phone: 011 24682177-80
Fax: 011 24682173-74
Email: dgoffice@ris.org.in

Arora, Dr. Anvita
Director & CEO
iTRANS
Synergy Building, IIT Delhi
Email: anvitaa@gmail.com

Bajpai, Arosha A.
Director
Association for Intelligent
Transportation Systems
A-3, Basement, Marble Arch Apartments
9 Prithviraj Road, New Delhi 11001
Phone: 011 24645861
director@itsindia.org

Barnwal, Alope
Principal Consultant,
Sustainability and Climate Value
Advisory,
Emergent Ventures India Pvt Ltd
5th Floor, Universal Trade Tower
Gurgaon- Sohna Road, Sector 49
Gurgaon-122001, Haryana
Phone: 0124 4353100
Fax: 0124 4102980
Email: aloke@emergent-ventures.com

Bazaz, Dr. Amir B
Expert Consultant,
NATCOM Project Management Cell
Winrock International India
S-212, Second Floor, Panchsheel Park
New Delhi 110 017
Phone: 011-26013876
Email: amir@winrockindia.org

Bhadoo, Ajay
Municipal Commissioner
Rajkot Municipal Corporation
Dhebar Road, Rajkot-360001
Email: mc_rmc@yahoo.co.in

Bhandari, Priyanka
Student
Faculty of Planning and Public Policy,
CEPT University
Navrangpura, Ahmedabad-380009
Email: priyanka_nithmr@yahoo.com

Chhajed, Paresh
Student
Faculty of Planning and Public Policy,
CEPT University
Navrangpura, Ahmedabad-380009
Email: ar.pareshchhajed@yahoo.com

Chokkakula, Srinivas
Centre for Policy Research,
DharamMarg, Chanakyapuri,
New Delhi – 110021
Phone: 011-26115273-76 (4 Lines)

Dahdeech, Ankur
SG Architects
Delhi

DasguptaPurnamita
Institute of Economic Growth
University Enclave
University of Delhi (North Campus)
Delhi 110 007, India
Phone: 011-27666364/6367/27667101
/7288/7365 /7424
Fax: 011-27667410
Email: purnamita.dasgupta@gmail.com

Workshops on Promoting Low-Carbon Transport in India

Dasgupta, Subhagato
SNPUPR, DFID-GOI Project,
DFID,
British High Commission,
B-28 Tara Crescent,
Qutab Institutional Area,
New Delhi-110016
Phone: 011-26529123
Fax: 011-26529641
Email: shubhagato@hotmail.com,

Date, Abhijeet
Research Associate
Centre for Urban Equity;
Faculty of Planning and Public Policy,
CEPT University
Navrangpura, Ahmedabad-380009
Email: adatey@gmail.com

Dhar, Dr.Subash
Senior Economist,
Systems Analysis Division,
UNEP Risoe Centre
Technical University of Denmark,
Risoe National Laboratory for
Sustainable Energy,
Frederiksborgvej 399,
P.O. Box 49,
Building 142, DK 4000
Roskilde,
Denmark
Phone: +4546775135
Email: sudh@risoe.dtu.dk

Dhariwal, Vivek
Business Manager
Emergent Ventures India Pvt Ltd
5th Floor, Universal Trade Tower
Gurgaon- Sohna Road, Sector 49
Gurgaon-122001,
Haryana
Phone: 0124-4353100
Email: vivek.dhariwal@emergent-ventures.com

DhingraChhavi
Urban Transport Specialist,
GIZ, Sustainable Urban Transport
Project
S-35 A, PanchsheelPark,New
Delhi 110017,
Phone: 011 47773546,
Fax: 011 47773555
Email: chhavi.dhingra@gtz.de

Ernest, Kamala
Transport Unit
Division of Industry, Technology and
Economics (DTIE)
United Nations Environment
Programme (UNEP)
P.O. Box 30552-00100
Nairobi, Kenya
Kamala.Ernest@unep.org

Frank, Jurgen
Councillor
Embassy of the Federal Republic of
Germany
6/50 G, Shantipath, Chanakyapuri,
New Delhi- 110021
Phone: 011 44199163
Fax: 011 26877706
Email: juergen.frank@diplo.de

Gadepalli, S.B. Ravi
iTRANS
Synergy Building, IIT Delhi
Email: ravi.gadepalli@gmail.com

Gandhi, Sandeep
SG Architects
Delhi
Email: gandhi.sandeep@gmail.com

Ghate, Akshima
Fellow
TERI
Email: akshima@teri.res.in

Workshops on Promoting Low-Carbon Transport in India

Ghorpade, AshishRao
Senior Manager - Urban
ICLEI
Local Governments for Sustainability
Ground Floor,
NSIC-STP Complex,
NSIC Bhawan,
Okhla Industrial Estate,
New Delhi - 110020
Phone: 011 41067220
Fax: 011 41067221
Email: ashish.rao-ghorpade@iclei.org

Goel, Rahul
Project Scientist
TRIPPS,
Indian Institute of Technology
HauzKhas, New Delhi

Grover Sudeep
Student
Indian Institute of Technology
HauzKhas, New Delhi

Gupta, Nupur
Senior Transport Specialist
South Asia Sustainable Development,
The World Bank
50 M, Shantipath, Chanakyapuri,
New Delhi- 110021
Phone: 011 41177805, 011 24617241
Fax: 011 41177849
ngupta1@worldbank.org

Jain Deepty
Project Scientist
TRIPPS,
Indian Institute of Technology
HauzKhas, New Delhi

Jain, Himani
Programme Officer,
Transportation
Shakti Sustainable Energy Foundation
Capital Court, 104 B/1,
4th Floor
Munirka Phase -III
New Delhi 110067"
Phone: 011-47474022
Fax: 011-47474043
Email: himani@shaktifoundation.in

Jain, Umang
Associate - Urban Transport
EMBARQ India
Godrej and Boyce Premises,
Gaswork Lane,
LalbaugParel, Mumbai-400012
Phone: 022 24713591
Email: ujain@wri.org

Jha, Abhay N
VOICE

Joshi, Prof. Rutul
Assistant Professor
Centre for Urban Equity;
Faculty of Planning and Public Policy,
CEPT University
Navrangpura,
Ahmedabad-380009
Email: joshirutul@gmail.com

Jyothi, Chava
iTRANS
Synergy Building, IIT Delhi
Email: chavajyothi@gmail.com

Kalaga, Dr. R. R.
Indian Institute of Technology
[Email: rrkalaga@civil.iitd.ac.in](mailto:rrkalaga@civil.iitd.ac.in)

Kamal, Rakesh
SREI

Workshops on Promoting Low-Carbon Transport in India

Khanna, Ashish
Research Analyst
India Infrastructure Publishing
B-17, Qutab Institutional Area,
New Delhi-110016
Phone: 011 40687314/
41034600/4601
Fax: 011 26531196
Email: ashish.khanna@indiainfrastructure.com

Khurana, Namita
TERI

Kinyanjui, AnnemarieWanjiru
Transport Unit
Division of Industry, Technology and
Economics (DTIE)
United Nations Environment
Programme (UNEP)
P.O. Box 30552-00100
Nairobi, Kenya
Email: Annemarie.Kinyanjui@unep.org

Krishna, Dr. Sudhir
Secretary
Ministry of Urban Development,
Government of India
NirmanBhawan,
New Delhi
Phone: 011-23062377
Fax: 011 23061459
Email: secyurban@nic.in

Kumar, Pramod
Town Planner
Greater Cochin Development Authority
Email: pramodkumarcp@rediffmail.com

Mahadevia, Prof. Darshini
Professor
Centre for Urban Equity;
Faculty of Planning and Public Policy,
CEPT University
Navrangpura,
Ahmedabad-380009
Email: darshini@cept.ac.in

Manglik, S. K.
Vice President
Institute of Urban Transport
NirmanBhawan Annexe
Maulana Azad Road,
New Delhi-110 011
Email: mangliksk@gmail.com
Margonsztern, David
South Asia Regional Department
ADB
Email: dmargonsztern@adb.org

MathurUdit
DFID,
British High Commission,
B-28 Tara Crescent,
Qutab Institutional Area,
New Delhi-110016
Phone: 011-26529123
Email: 011-26529641
Mathur, Shalini
Research Scholar
IMT, Ghaziabaz
Email: shalinimathurdelhi@yahoo.com

Mathur, Prof. Om Prakash
National Technical Advisory Group,
National Institute of Public Finance
Policy PSC
18/2, Satsang Vihar Marg,
Special Institutional Area,
New Delhi – 110 06
Phone: 011-26563688
Fax: 011-26852548
Email: opm@nipfp.org.in

Mathur, Shailesh
Electrical Engineer,
Electrical Transmission Utility of Delhi
Govt
Government of Delhi
Email: smathurdtl@yahoo.com

Workshops on Promoting Low-Carbon Transport in India

Mitra, Shantanu
Team Leader,
Climate Change and Development,
DFID,
British High Commission,
B-28 Tara Crescent,
Qutab Institutional Area,
New Delhi-110016
Phone: 011-26529123
Fax: 011-26529641
Email: S-Mitra@dfid.gov.uk

Mittal, Shivika
Doctoral Candidate
Public Systems Group,
Indian Institute of Management
Vastrapur,
Ahmedabad-380015
Email: shivikam@iimahd.ernet.in

Mohan, Prof. Dinesh
Volvo Chair Professor Emeritus
TRIPPS;
WHO Collaborating Centre,
Indian Institute of Technology
Room 815, 7th Floor, (Main Building)
HauzKhas, New Delhi
Phone: 011-26591147
Fax: 011 26858703
Email: trippdelhi@hotmail.com

Mukhopadhyay, Dr.Partha
Centre for Policy Research,
DharamMarg,
Chanakyapuri,
New Delhi - 110021
011-26115273-76 (4 Lines)
011-26872746
Email: pmukhopadhyay@gmail.com,
partha@cprindia.org

Munshi, Prof. Talat
Associate Professor
Centre for Urban Equity;
Faculty of Planning and Public Policy
Navrangpura,
Ahmedabad-380010
talat@cept.ac.in

Nair, Dr.Valsala
Director Transportation
Wilbur Smith
8, 80feet Road, RT Nagar,
Bangalore-560032
Phone: 080-39187500
Email: vnair@wilbursmith.com

Pangotra, Prof. Prem
Professor
Public Systems Group,
Indian Institute of Management
Vastrapur,
Ahmedabad-380015
Email: pangotra@iimahd.ernet.in

Partridge, Ian
PhD Student
University of Texas, Austin
Email: iap@utexas.edu

Patel, Tejal
Centre for Urban Equity;
Faculty of Planning and Public Policy,
CEPT University
Navrangpura,
Ahmedabad-380010
Email: tejalraj1412@gmail.com
Pradhan, Dr.Basanta K.
IEG India
Email: basanta@iegindia.org

Rahode, Shashank
Coordinator
Association for Intelligent
Transportation Systems
Email: coordinator@itsindia.org

Rathi, Sujaya
CSTEP
Email: sujaya@cstep.in
Ravi, K. V. N.
Executive Engineer
Greater Visakhapatnam Municipal
Corporation,
Phone: 0891-2568545
Email: eepd2_gvmc@yahoo.co.in

Workshops on Promoting Low-Carbon Transport in India

Rogat, Dr. Jorge
Senior Economist,
Systems Analysis Division,
UNEP Risoe Centre
Technical University of Denmark,
Risoe National Laboratory for
Sustainable Energy,
Frederiksborgvej 399,
P.O. Box 49,
Building 142, DK 4000
Roskilde, Denmark
Phone: +4546775133, 46322288
Fax: +4546321999
Email: jorge.rogat@risoe.dk

Roy, Trishita
Research Associate
Public Systems Group,
Indian Institute of Management
Vastrapur,
Ahmedabad-380015
Email: trishitar@iimahd.ernet.in

Roychowdhury, Anumita
Centre for Science and Environment
41, Tughlakabad Institutional Area,
New Delhi, Delhi 110062
Phone: 011 2995 5124
Email: anumita@cseindia.org

Sagar, Prof. Ambuj
Indian Institute of Technology
Department of Humanities and Social
Sciences,
Room MS 608B
Indian Institute of Technology
HauzKhas
New Delhi-110016
Phone: 011 26591001
Email: asagar@seas.harvard.edu,
asagar@hss.iitd.ac.in

Sharma, Bhanu
Research Information Systems
Zone IV-B, Fourth Floor
India Habitat Centre,
Lodhi Road,
New Delhi-110 003
Phone: 011 24682177-80
Fax: 011 24682173-74
Email: dgoffice@ris.org.in

Sharma, Dr. Chhemendra
Scientist E-II,
Radio and Atmospheric Sciences
Division
National Physical Laboratory
Dr. K. S. Krishnan Road,
New Delhi-110012
Phone: 011-45609387
Fax: 011-25726938
Email: csharma@mail.nplindia.ernet.in,
chhemendrasharma@gmail.com

Sharma, Dr. Subodh
Ministry of Environment and Forests
Email: sbodh.kumar@nic.in

Shikha
Centre for Policy Research,
DharamMarg, Chanakyapuri,
New Delhi – 110021
Phone: 011-26115273-76 (4 Lines)

Shreenivas, Dr. Ashok
Programme Director
Parisar
Yamuna ICS Colony,
Ganeshkhind Road,
Pune, Maharashtra 411008
Phone: 020-25512122
Email: ashok.sreenivas@gmail.com,
ashok@parisar.org

Shukla, Prabhu N.
Director Operation & BD
Dedicated Freight Corridor Corporation
Phone: 011-23454630
Email: pnsukla@dfcc.co.in

Workshops on Promoting Low-Carbon Transport in India

Shukla, Prof. P. R.
Professor
Public Systems Group,
Indian Institute of Management
Vastrapur,
Ahmedabad-380015
Email: shukla@iimahd.ernet.in

Singal, B. I.
Director General
Institute of Urban Transport
Room No- 203, G-Wing,
NirmanBhawan Annexe
Maulana Azad Road,
New Delhi-110 011
Phone: 011-23063498
Email: iutindia@gmail.com

Singh, Dr. Anil
Transport Planning and Environment
Division
Central Road Research Institute
P.O CRRI
Delhi Mathura Road New
Delhi 110020
Phone: 011-26921830
Fax: 011-26845943
Email: anil.crri@nic.in
anilsingh1234@gmail.com

Singh, Dr. Inderjeet
Senior Manager,
Sustainability FAS
PricewaterhouseCoopers Pvt Ltd
Building No. 10, 17th Floor,
Tower-C, DLF Cyber City,
Gurgaon-122002
Phone: 0124 3306000, 0124 3306353
Fax: 0124 3306999
Email: inderjeet1.singh@in.pwc.com

Singh, Dr. Manoj
Advisor (Transport)
Planning Commission,
Room No. 356, YojanaBhavan,
SansadMarg,
New Delhi - 110001
Phone: 011 23096673, 011 26261364
Email: manoj.singh04@nic.in

Singh, Shailesh K.
Joint Secretary, UT
Ministry of Urban Development,
Government of India
NirmanBhawan,
New Delhi
Phone: 011 23061558
Email: shaileshksingh@gmail.com

Singh, Tanaya
Manager Rapid Metro Rail Gurgaon Ltd
Second Floor, Ambience Corporate
Towers, Ambience Island,
National Highway # 8,
Gurgaon-122001, Haryana,
Phone: 951244716259
Fax: 9512404716225
Email: tanaya.singh@ilfsindia.com

Singla, Siddharth
Advocate
Central Law Agency
N-217,
Greater Kailash-1,
New Delhi-110048
Phone: 011 29243834
Fax: 011 29232216
Email: sidsinglaus@yahoo.com

Sivaramakrishnan, Prof. K C
Chairman
Centre for Policy Research
DharamMarg,
Chanakyapuri,
New Delhi - 110021
Phone: 011-26115273-76 (4 Lines)
Email: kcsrkrish@gmail.com

Thukral, K.L.
Senior Research Fellow
Asian Institute of Transport
Development
Phone: 011-26156294/26155310
Fax: 011-26156295

Workshops on Promoting Low-Carbon Transport in India

Tiwari, Prof. Geetam
Professor
TRIPPS,
Indian Institute of Technology
Room MS 815 (Main Building)
HauzKhas, New Delhi
Phone: 011-26858703
Email: geetamt@gmail.com

Vaidya, Parth D.
Research Associate
Public Systems Group,
Indian Institute of Management
Vastrapur,
Ahmedabad-380015
Email: parthv@iimahd.ernet.in

Verma, S. A.
Dy. Chief Environment Officer
Delhi Metro Rail Corporation Ltd.
Office of CPM (East),
Seed Bed Park,
Opp. GurudwaraShakarpur,
Delhi- 110092
Phone: 011 22483216/17/18 Extn: 242
Fax: 011-22483215
Email: saverma@dmrc.org

Verma, Dr.Ashish
Assistant Professor
Faculty Centre for Infrastructure,
Sustainable Transportation, and Urban
Planning (CiSTUP), Dept. of Civil
Engineering,
Indian Institute of Science (IISc),
Building, SID Complex,
Indian Institute of Science (IISc)
Bangalore-560012,
Karnataka
Phone: 080-2293 2329/ 2293 2043
Fax: 080-23600404
Email: ashishv@civil.iisc.ernet.in,
rsashu@yahoo.com

Wankhade, Kavita
Consultant
Indian Institute of Human Settlements
(IIHS)
803 Surya Kiran,
19 Kasturba Gandhi Marg
New Delhi 110001
Phone: 011-43602798
Fax: 011-23320477
Email: kwankhade@ihs.co.in