



Promoting Low Carbon Transport in India

Report

UNEP Climate Day on 26 November 2015

(Final Workshop for Promoting Low Carbon Transport in India project)

Venue : Urban Mobility India - Conference and Exhibition

Manekshaw Bhawan

Organised by

UNEP DTU Partnership , Copenhagen

Indian Institute of Technology, Delhi

in collaboration with

Ministry of Urban Development

Institute of Urban Transport, Delhi

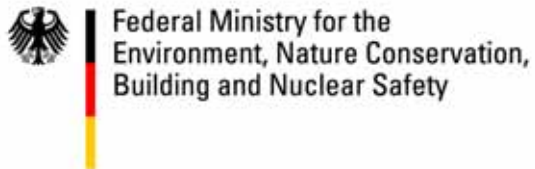


*UNEP DTU Partnership, Centre on Energy,
Climate and Sustainable Development Technical University of Denmark*

This publication is part of the 'Promoting Low Carbon Transport in India' project

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Final Workshop /UNEP Climate Day at UMI

Executive Summary

The Promoting Low Carbon Transport in India project organized a one day workshop within the 8th Urban Mobility India (UMI) Conference and Exhibition at Delhi on November 26, 2015. The workshop focused on “Developing Policies and Strategies for Low-Carbon Transport in India”. The workshop themed as Climate Day @ UMI is also the final conclusion workshop for the project.

“Promoting Low Carbon Transport in India” project is 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 was being jointly implemented by the UNEP DTU Partnership, Denmark (UDP); Indian Institute of Technology, Delhi (IIT-D); Indian Institute of Management, Ahmedabad (IIM-A); and CEPT University, Ahmedabad

The workshop involved presentation and panel discussions and had a common theme of how to address the issue of climate change. The analysis carried within the project had clearly shown (Figure 1) that reduction of CO₂ emissions from the transport sector would require a portfolio of options and there was no silver bullet. Fuel economy, electric vehicles and biofuels can address the emissions from a growing fleet of vehicles however a more long term transformation of transport sector would require measure that address the issue from demand side. Sustainable mobility measures both for urban and intercity transport can moderate increase in demand and shift to more low carbon modes. Similarly demand for freight would need to moved away from dependence on road transport.

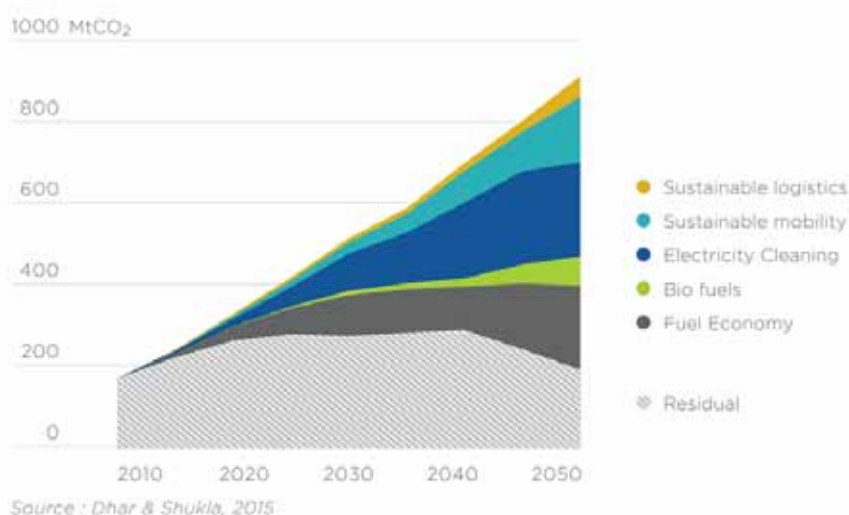


Figure 1 CO₂ Mitigation Wedges from Transport Sector

The discussions were organised into accordingly arranged into four themes

1. Fuel Economy and Alternative Fuels and Vehicles

2. Urban Transport
3. Intercity Transport and the Role of Rail Transportation
4. Financing and Technology for Low Carbon Transport

The discussions clearly highlighted that transport would play an important role in addressing climate change and were focused on the actions that would be required for improving fuel economy, electric vehicles, built form with cities, public transport and strengthening of rail for passenger and freight transport. It also came out clearly that India has initiated a number of initiatives that are going to help in addressing climate change. The key factor would be the speed at which these initiatives are implemented and therefore financing would play a major part.

Programme

Final Conclusion Workshop: Promoting Low Carbon Transport in India Project

Venue: Ashoka Hall | Date: 26th November 2015 | Time: 0930 to 1800

0930 – 1100	<p>Technical Session 8 (coordinated by the United Nations Environment Programme UNEP)</p> <p>Chairperson: Dr. Oliver Lah, Project Coordinator, Wuppertal Institute</p> <p>8a - Strategies for Low Carbon Transport</p> <p>Opening Remarks and Key Messages from Promoting Low Carbon Transport in India project – Ms Kamala Ernest, Programme Officer, UNEP</p> <p>8b - Fuel Economy and Alternative Fuels and Vehicles</p> <p>Global trends in fuel Efficiency - Ms Kamala Ernest, Programme Officer, UNEP Harmonizing fuel economy in the ASEAN region - Mr. Parthaa Bosu, India Director and South Asia Liaison, Clean Air Initiative, CAI Asia Alternative Fuels and -Vehicles: Co-benefits and Co-costs for India - Dr. Subash Dhar, Senior Economist, UNEP DTU Partnership</p>
1100 – 1130	Coffee Break
1130 – 1300	<p>Panel discussion 1: Mitigating Climate Change through initiatives in Urban Transport (coordinated by UNEP)</p> <p>Chairperson – Mr D.S. Mishra, Additional Secretary, Urban Development, Ministry of Urban Development (MoUD), India</p> <p>Moderator: Dr Shobhakar Dhakal, Associate Professor- Energy Field of Study, Asian Institute of Technology, Thailand</p> <p>UNEP Transport Project : Key messages on urban transport - Dr. Subash Dhar, UNEP DTU Partnership Technology – Mr Shashi Verma, Director of Communications, Transport for London (TfL) Mobility – Dr Geetam Tiwari, Professor, IITD Inclusiveness – Dr Darshini Mahadevia, Professor, CEPT University</p>
1300 – 1430	Lunch
1430 – 1600	<p>Technical Session 11 (coordinated by UNEP) – Facilitating rail for Intercity Transport</p> <p>Chair : Mr. B K Tripathi, Member Secretary, National Capital Region Planning Board UNEP Transport Project : Key messages for Intercity transport - Dr. P.R. Shukla, Professor, IIM, Ahmedabad Intercity Passenger & Freight transport – Dr. Manoj Singh, Advisor (Transport), Niti Aayog Metropolitan Regional Rail Transport - Mr. B K Tripathi, Member Secretary, National Capital Region Planning Board Japanese experiences in High Speed Rail –Dr. Atsushi Koike, Professor, Kobe University</p>
1600 – 1630	Coffee Break

1630 – 1800	<p>Plenary Session 2 – Financing /Technology for Low carbon transport (coordinated by UNEP)</p> <p>Chairperson : <i>Dr. Dipak Dasgupta, Alternate Director (India) Global Climate Fund Board & Chair Investment Committee</i></p> <p>Moderator : <i>Dr P.R. Shukla, Professor, IIM, Ahmedabad and Co-Chair, Intergovernmental Panel on Climate Change, WG III</i></p> <p>Panelist</p> <ul style="list-style-type: none">• Mr Peter Hilliges, Director, KfW Office, Delhi• Dr. Jorge Rogat, Project Manager, UNEP Technology Needs Assessment Project, UNEP DTU Partnership• Ms Annett Baessler, Counsellor of Economics and Environmental Affairs, German Embassy, New Delhi• Mr I.C. Sharma, National Project Manager, Sustainable Urban Transport Project (SUTP) <p>Conclusion and closing remarks –UNEP</p>
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Summary of discussion:

Session 1: Technical Session 8: Strategies for Low Carbon Transport

Chairperson: Dr. Oliver Lah

Opening Remarks

MS. KAMALA ERNEST, UNEP

In her opening remarks, Ms. Kamala Ernest from the United Nations Environment Programme (UNEP) and the Programme Manager for the Promoting Low Carbon Transport (PLCT) in India project welcomed the participants attending the final workshop for the PLCT project.

She said that UNEP was honored to be part of the Urban Mobility India (UMI) Conference, 2015 and thanked the Ministry of Urban Development (MoUD) of the Government of India for allowing the final workshop for the PLCT project to be held within the UMI.

Ms. Kamala further extended her gratitude to the participants of the PLCT project particularly those who directly contributed to the implementation of the project including Indian Institute of Technology (IIT), CEPT University, Indian Institute of Management (IIM), Ahmedabad as well as participants from the cities of Rajkot, Vishakhapatnam and Udaipur where the project was implemented. She also appreciated the presence of participants from outside India.

Ms. Kamala highlighted that PLCT was a major project of UNEP. She observed that the final workshop for the project was quite timely since in a few days, COP 21, a major international event on climate change would be taking place in Paris. During this event, India will be keen on communicating its intended Nationally Determined Contributions (INDCs). INDCs will be an important component of COP-21. India's INDC includes a decarbonization target of 33-35% of CO₂ intensity of GDP till 2030. India has specific targets for its transport sector. India also has transport specific measures in its National Action Plan on Climate Change. This project is aimed at helping India meet these target by helping India integrate the climate agenda into the promotion of sustainable transport development. This project started in 2010. It looks at socially inclusive transport solutions at the city and national level. She indicated that the final workshop of the PLCT project would highlight some of the detailed assessments and action plans conducted under the project on how to achieve India's INDC targets on key subjects including electric mobility, biofuels, fuel economy and high speed rail.

"The objective of the workshop is to share and disseminate the findings of the project and highlight how India's INDCs can be achieved through low carbon strategies", explained Kamala.

At the national level it looked at areas such as long distance transport, high speed rail and the impact assessment of different transport technologies. It also looked at the development of macro indicators for the transport sector which included social and environmental factors. It also looked at developing an adaptation framework, with a roadmap of actions to be taken- which includes looking at electric vehicles, biofuels and high speed rail. A policy plan for light and high speed rail has also been developed. A transport plan for India which included developing transport scenarios for India

At the city level it looked at indicators for sustainable mobility and a method to prepare low carbon mobility plans (LCMP) which were piloted in Vishakhapatnam, Rajkot and Udaipur. UNEP along with its partners also worked with MoUD on the development of the Comprehensive Mobility Planning (CMP) toolkit using the experience of implementing LCMP in the three cities.

The integrated assessment highlighted that there is no silver bullet and a portfolio of options would be required for reducing the CO2 emissions from transport sector (Figure 1). These options or wedges necessary for a low carbon transition are required in the following areas:

- **Electricity cleaning**- uptake of electric vehicles and the decarbonisation of electricity in India's power grid.
- **Fuel Economy** Setting stringent fuel economy targets
- promoting **sustainable mobility**- such as metro and Bus Rapid Transit (BRT) systems for passenger transport along with integration of non-motorized modes and higher share of rail for intercity transport
- **biofuel** penetration- through national policies and enabling mechanisms
- **Freight transportation** through implementation of dedicated freight corridors.

These options can achieve a savings of 13 billion tons in CO2 between 2010-2030.

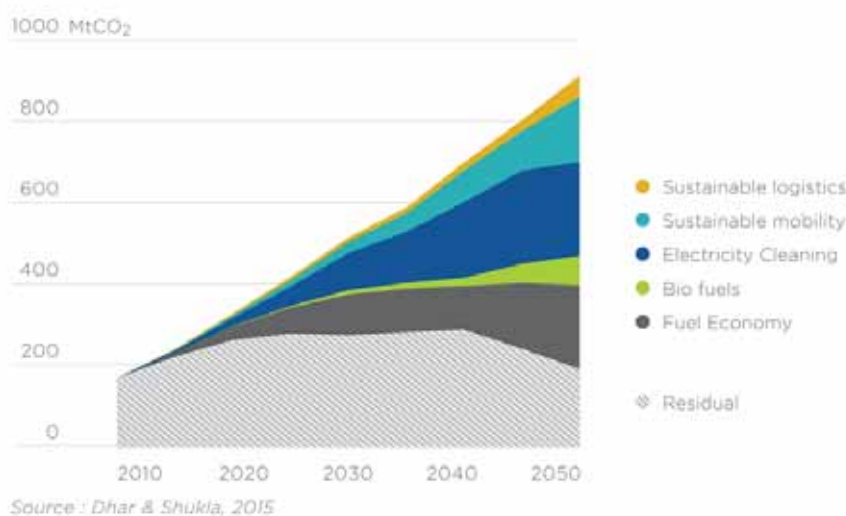


Figure 1 Mitigation wedges from transport

In her conclusion, Ms. Kamala thanked the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building, and Nuclear Safety (BMUB), for funding the project and acknowledged the role of UNEP DTU Partnership as the key implementing agency of the project. She extended her appreciation to other implementing partners for the project including Indian Institute of Technology Delhi (IITD), CEPT University, Indian Institute of Management Ahmedabad (IIMA), as well as the Ministry of Environment, Forest and Climate Change (MoEF&CC) of the Government of India for supporting the project. Further, she applauded the three cities and the three consultants involved in the project.

Global Fuel Economy Initiative: Achievements and Impacts

MS. KAMALA ERNEST, UNEP

Ms. Kamala informed about Global Fuel Economy Initiative (GFEI) which is a partnership of 6 partners including FIA foundation, ICCT, international Transport Forum, UNEP, UC Davis Institute of Transportation Studies and IEA. It was formed to improve vehicle efficiency.

GFEI's has a global target to double the efficiency of the global fleet by 2050. Interim target by 2030 is to improve global fuel efficiency by 50%. It aims to double the efficiency of the global fleet by 2050. In OECD countries we have seen an improvement in fuel efficiency by 2.6% from 2005, whereas for non-OECD countries the improvement is of only 0.2%. Overall, we see an improvement in 2% in fuel efficiency of vehicles.

UNEP focus is to work with developing countries on improving fuel efficiency. GFEI work is well integrated as part of the Sustainable Development Goals (SDGs) to improve fuel efficiency. During the UN Secretary General's Climate Summit in 2014, GFEI was recognized as one of the key accelerators for achieving the fuel efficiency target under the SDGs. GFEI's target is to reach 100 countries and the programme started with four countries: Chile, Ethiopia, Indonesia and Kenya in 2010. Another 23 countries have since joined in and 26 other countries have expressed interest in joining this scheme. GFEI is also looking at targeting sub-regional government bodies.

Globally, GFEI monitors fuel efficiency policies through maps to track progress. UNEP provides policy advice and sets the baselines. A study was conducted under GFEI on baseline for light duty vehicles. These studies have helped in development of fuel efficiency policies in countries and case studies of Chile, Mauritius, Vietnam and Kenya were presented.

Achieving GFEI goals on fuel efficiency would save 0.5Gt of CO₂ a year by 2025 and 1.5Gt a year by 2050, resulting in total CO₂ savings of 33Gt by 2050, and fuel savings worth over \$8 trillion. Looking ahead, UNEP is starting activities to promote electric vehicles with an initial focus on electric 2-3 wheelers.

The session was followed by question answer session which showed keen interest of participants in the GFEI. The latest initiative of UNEP on EVs also generated interest from countries. Participant from Bhutan wanted to know how awareness on EVs can be improved. Participants were also worried that fuel economy and EVs do not address other externalities due to vehicles e.g., congestion on roads.

Accelerating Fuel Economy Policies in the ASEAN Region

MR. PARTHAA BOSU, CLEAN AIR INITIATIVE (CAI) Asia

Mr. Partha informed about CAI activities and main programmes related to air quality and climate change; low emission urban development; clean fuels and vehicles and green freight and logistics.

Southeast Asia will be home to about 785 million people in 2050 which translates to 8% of the world's population. The weighted GDP per capita will increase almost 10-fold from 2005 to 2050. Vehicle fleet will also grow to 515 million vehicles in 2050 with 2.5 million vehicles and 5.3 million motorcycles being added per year. On the other hand, transport CO₂ emissions will increase by 4.6- fold from 2005-2050. CO₂ emissions per capita will increase to 1.32 tons/year from 0.37 tons in 2005. Road transport interventions including fuel economy policies are therefore important.

The ASEAN Economic Community is one of the key pillars of ASEAN which intends to create a single market and production base in the region. Regional fuel economy discussions can lead to synergies such as increasing regional market integration and the possibility of improving energy security while reducing greenhouse gas emissions.

A study of fuel economy interventions for HDVs and LDVs in four countries: Indonesia, Thailand, Philippines and Vietnam showed that fuel economy can lead to fuels savings of up to 446 b litres of diesel and 134 b litres of gasoline and consequently, CO₂ reductions of up to 16% for light duty vehicles (LDVs) and 26-27% for LDVs and heavy duty vehicles (HDVs) combined.

There are already national initiatives for fuel economy in the ASEAN region in countries such as Thailand, Indonesia, Malaysia, Vietnam and the Philippines. For instance, Indonesia has Green Car programme, which offers incentives for producing fuel efficient vehicles.

CAA, UNEP, GFEI and GIZ have worked towards the inclusion of fuel economy as a strategic action in the post-2015 ASEAN Strategic Transport Plan. There is need for a common regional roadmap (ASEAN) to guide national governments on policy options for fuel economy improvements in road transport. National governments in ASEAN can also learn from the experiences of other nations in Asia such as India.

Alternative Fuels and Vehicles: Co-Benefits and Co-Costs in India

Dr. SUBASH DHAR, UNEP DTU

The analysis of alternative fuels and vehicles looked at the co-benefits and co-costs and was based on the work done under PLCT project in India. Two wheeler and four wheeler ownership is on the rise in India within both urban and rural areas. The Government of India to limit the impacts from growth of vehicles has put in place policies for improving fuel

efficiency of LDVs, a National Policy on Biofuels, National Electric Mobility Mission Plan and Auto Fuel Policy. The analysis covered all these policies on the supply side.

Global comparisons in terms of fuel economy and vehicle ownership show that vehicle ownership is growing in India but still very low compared to European Union and North America. In terms of vehicle efficiency India is better than OECD because the vehicle growth is characterized by more small cars which are more fuel efficient. However, this is likely to deteriorate in the future as preference for larger cars is expected.

Therefore keeping in mind the future challenges from transportation an integrated assessment of transport sector was carried for India. The analysis revealed that since growth of vehicles will happen it will require interventions such as decreasing demand for fuels through fuel economy initiative for vehicles, use of renewable energy such as from biofuels and introduction of electric vehicles to limit the impacts from growth of vehicles.

The fuel economy policy in the form of CAFÉ standards has been formulated by government and India would be able to achieve the GFEI target under the sustainable scenario. Achieving the 20% target for biofuels set by the government would be challenging. In case of diesel since the reliance is mainly on Jatropha this is a challenge due to limited land for production of Jatropha and productivity of Jatropha on marginal lands. Similarly for ethanol the amount of bagasse available is limited. Biomass potential is sufficient for both biodiesel and ethanol production but cost of supplying biomass is high. However using biomass for biofuels has co-benefits for energy security through oil savings and fuel mix diversification as well as job creation especially in rural areas. Therefore, second generation biomass is key pathway for biofuels.

Electric vehicles have a lot of potential for electric two wheelers because of short trip lengths. The share of electric vehicle could grow if policy and incentives for electric vehicle are put in place. Electric vehicles can contribute to improved energy security for India. CO₂ emissions impact of electric vehicles will depend on the type of electricity used. CO₂ emissions for electric vehicles are likely to go down with an increase in use of sustainable energy.

During the questions answer session some participants said that a lot of focus of vehicle efficiency is on cars however enhancing bus and heavy duty vehicle fuel efficiency is also necessary. Electric vehicle technology availability and a clear model of how they will operate e.g. charging systems was indicated as a barrier for electric vehicles.

Session 2: Panel Discussion 1: Mitigating Climate Change through initiatives in Urban Transport

Chairperson: Mr D.S. Mishra, Addl. Secretary, Ministry of Urban Development

Moderator: Dr. Shobakar Dhakal, Professor, Asian Institute of Technology, Bangkok

Panellist's:

- Dr. Subash Dhar, UNEP DTU Partnership
- Mr. Shashi Verma, Transport for London
- Prof Geetam Tiwari, IIT Delhi
- Prof Darshini Mahadevia, CEPT University

Ms. Anvita Arora, iTrans opened the session with a welcome address and invited the chair, moderator and panelists.

Opening remarks

Mr D.S MISHRA, ADDITIONAL SECRETARY, MINISTRY OF URBAN DEVELOPMENT, MoUD

Mr Mishra gave an overview of present context of India's urban transport. Urbanization is expected to grow from 32% in 2011 to 40% by 2031 and more than 50% by 2051 to 85 crores due to rural-urban migration. Indian cities are characterized by high urban densities and need better infrastructure. There is heavy congestion e.g., in Delhi despite 300 Kms of Metro. Vehicles are growing at the rate of 8-10% per year in urban area. The larger cities of India like Delhi and Bangalore see a vehicle growth rate of almost 10% per annum. This adds to a great amount of pollution.

Government has besides metros implemented bus rapid transit systems, guided buses, and intelligent transport systems in different cities. The government of India has recently funded high efficient buses. He highlighted the public transport initiatives taken up by the central government that are expected to reduce the GHG emissions by 18 million tons by 2021. This will contribute towards achieving India's INDC targets to reduce CO₂ emissions by 30-35%.

Key messages for Urban Transport

Dr. SUBASH DHAR, UNEP DTU PARTNERSHIP

Dr. Dhar outlined the details of the UNEP sponsored 'Low-carbon mobility plans (LCMP)' in three Indian cities of Rajkot, Vishakhapatnam and Udaipur. He indicated that the current situation analysis shows that typically the trip rates and trip lengths are relatively lower than global experiences. Although these characteristics vary according to the size of the city, they are expected to growth in the future. Urbanization and growth of per capita GDP will be the key drivers for these trends. This would lead to increase in the vehicle ownership and growing city size due to rapid urbanization. The growing income levels also correlate to increased mobility needs. The project looked at four mitigation strategies namely non-motorized transport (NMT), improved public transport, managing urban sprawl through improved urban structure and enhanced role of information technologies and transport technologies since the growth of vehicles is inevitable. The LCMP case studies showed that land use and public transport can help in reducing the travel demand and bring a modal shift

towards public transport. This can further lead to reduced CO2 emissions and co-benefits of reduced travel time, trip length, accidents and improved local air quality.

Technology for Low Carbon Transport

Mr. SHASHI VERMA, TRANSPORT FOR LONDON

Mr. Verma stated that India has very low per capita emissions e.g., compared to the US, India has only about a 10th of per capita emissions. Out of these emissions transport sector comprises of 20-30% GHG emissions whereas housing, heating and air conditioning are the bigger source of GHG emission. Due to smaller houses in urban areas and higher densities, there is less GHG emission from cities. However, with increasing incomes, the housing quality in India will increase. Thus, the carbon footprint of cities is higher than the rural India. Emissions from cities in the developed countries is however lower than that of emissions from rural areas. People in cities live in smaller houses (less heating use) and use public transport – this brings down their emissions significantly. Level of income in urban and rural is proportionate in developed countries. But in India it is disproportionate as there are bigger houses in urban than rural areas.

The technology needs for urban transport should address firstly accessibility to metro and other mass transit systems. Therefore promoting non-motorized transport and especially walking is most important for accessibility. Efficient public transport as a feeder to mass transit systems is also essential for accessibility. He noted that the optimization of mass transit system through better signaling technology is a very cost effective technology. He shared his experience of increasing the number of trains per hour in London from 30 to 34 to 36 which is 20% capacity increase by spending marginally on the signalling technology rather than investing large amounts on new lines making the investments more efficient. He also noted that the IT systems work well in case of roads as well in case of effective traffic enforcement.

Mobility in India

Prof. GEETAM TIWARI, IIT DELHI

Prof. Tiwari emphasized that in mid-sized cities of India, where the future growth is going to be very high, the NMT is the most dominant mode of transport and not the cars. However, the intermediate public transport also dominates along with motorized two wheelers. Use of whatever limited public transport is available is also high.

Thus, it becomes important to decide on what kind of public transport becomes more attractive in case where more than 50% trips are through NMT. Trip length distribution was found to be important in determining most attractive mode of transport. For instance, for longer trips, metro are most attractive and for shorter trips, buses are most attractive. Therefore looking at average trip lengths do not provide an accurate picture and hence it becomes important to understand the percentages of shorter and longer trips in order to

decide the type and mode of the public transport. Delhi has almost 40% trips below 5 kms and 70% below 10 kms and in mid-sized cities almost 80% of the trips are less than 5 kms.

The, access to public transport besides provision of public transport is also important. If all efforts are spent on developing metro lines while overlooking the issue of accessibility, then the intended objectives of moving people to public transport won't be achieved. Improvement of pedestrian infrastructure and bicycle lanes for accessing public transport is a good strategy. She also stressed the need for appropriate provision of pedestrian infrastructure and bicycle lanes on arterial roads.

Addressing the mobility challenge can also help in reducing CO2 emissions and therefore sustainable solutions should address local issues along with the global issues. For example the assessment show that bicyclists have lower risk only when both NMT and public transport is improved however if only public transport is improved the safety goes down for pedestrians and cyclists .

Inclusive Low Carbon Transport: Policies and Planning

Prof. DARSHINI MAHADEVIA, PROFESSOR, CEPT UNIVERSITY

Prof Mahadevia explained inclusiveness through the concept of accessibility. Accessibility planning puts people at the Centre. Accessibility is ease of reaching goods, services, activities and destinations – opportunities- at the time desired and mode possible. She noted that a section of the urban population of the country does not have access to the public transport. About 42% of those who undertake trips in a city are walkers or cyclists. The NMT users today are no-choice users and it needs to be converted into a choice situation. Therefore infrastructure for walkers and bicyclists should be improved. Only a minimal share of the trips are undertaken by public transport and there is high dependence on Intermediate Para Transit (IPT) which is not safe, inefficient (energy) and discriminatory as women do not feel safe in using the IPT. Their study in the slum areas of Ahmedabad found that 78% of the trips are less than 5 kms but only 2% slum dwellers surveyed use the BRT system. This is inspite of living very near to it as it is unaffordable for most of the population. Women walk longer distances and tend to use public transport more than men. In Ahmedabad, BRT is mainly used by people in the private sector with middle incomes levels. Moreover the walking infrastructure and access to BRT are not very inviting. The use of public transport is less with people with income lower than 5000 per month and high income group. It is only the middle class that is the heaviest user of this mode. Similarly within same income groups women are also not very big users of mass transit modes. Thus, there is a need to think about the pricing as well as the timings to make it a better option for all socio economic groups.

In terms of long term solution there is a need to look at the urban planning and the land policies since they have a direct bearing on the house ownerships and land prices. The low-income households' trade transport costs against health and education costs and hence if they are pushed to city peripheries that increase their transport costs it can be at a high social cost. In medium term and short term, the city level strategies and trade-offs of municipal budgets need to be considered to make transport affordable. There is also a great need for regulating the Intermediate Para Transit modes, improving street design and urban

design aspects to address the safety and security aspects. The fiscal policies and financing of inclusiveness also needs to be reviewed at national level. Inclusiveness has to be an integral part of the design and not an afterthought.

Roundup by Moderator

Dr. SHOBAKHAR DHAKAL, AIT THAILAND

Dr. Dhakal who is also a lead author of Intergovernmental Panel on Climate Change (IPCC) remarked that IPCC has acknowledged the importance of cities in the climate change debate by including a chapter in the 2014 report. However, the window of opportunity for action is narrowing and if not planned for now, the increasing urbanization could land us in a very bad situation. There is increasing infrastructure stock in the developing countries and need for materials to build them which lead to increased emissions. Rebound effect has to be an important consideration. As road infrastructure provision increases, more and more people start using cars. There is need to understand how to handle such situation. Technological, social and economic planning is important. Multi-modal integration needs are very fundamental to the solutions. He further emphasized the needs to streamline climate change needs in all we do.

Question and Answer Session

The participants wanted to know if within the TOD discussions in government if there is a provision for reserving spaces for urban poor along the corridor? The session chair, Mr. Mishra noted that NMT is essential for the urban poor and informed the participants that the Government of India has recently introduced an urban plan that includes Transit Oriented Development (TOD) and NMT is factored in. Prof Mahadevia was of the idea to proceed with caution with regard to the TOD idea since TOD is associated with increased Floor Space Index (FSI) along transit corridors. However a higher FSI can be taken up by high income HHs for bigger houses rather than being used for developing housing for poorer people. Prof Tiwari also advised caution with transit oriented development. Giving the example of Delhi Metro she said that many low income HHs that were displaced by the project and have further not benefited from the project and do not use it due to affordability issues. Land prices have also increase along the metro lines and this has an effect on their livelihoods.

The second concern of participants was with regard to intermodal integration. Mr Verma was of the view that this is due to various agencies in-charge of these modes working in isolation. He observed that transport in London is more inclusive since development of housing follows the development of transport and therefore planning is coordinated. Secondly there is a need for institutional integration. Transport for London is responsible for all transport planning and coordination for transport. Thus, creating central agencies like 'Transport for London' helps in solving such issues.

Session 3: Technical Session 11: Facilitating Intercity Transport

Chairperson: Shri B.K. Tripathi

Opening Remarks

Shri. B.K. TRIPATHI, MEMBER SECRETARY, NCR PLANNING BOARD

The Chair highlighted the importance of regional rail transport system (RRTS) and the need to integrate metro and regional rail. There are globally best practices– London, Paris, San Francisco which can be relevant for a city like Delhi. In Delhi NCR planning board prepared Integrated Transport Plan for NCR 2032. RRT is important since 22% people go out of Delhi while 34% come in. Eight RRTS have been identified for NCR region and 3 corridors are prioritized - Delhi-Alwar / Delhi- Panipat and Delhi –Meerut corridor The speed will be 160 km/hr and the total cost for 3 corridors will be Rs. 72000 crores.

Intercity rail transport and Climate Change: Key messages from case studies

Prof. P. R. SHUKLA, INDIAN INSTITUTE OF MANAGEMENT, AHMEDABAD

Prof Shukla started by highlighting that transport infrastructures are capital intensive, long life assets and can significantly influence behavior and consequently energy and CO2 emissions. High speed rail can help increase the share of rail in intercity transport and compared to air, this can deliver a more balanced regional development. Similarly green freight strategies including coal by wire and dedicated freight corridors can simultaneously have benefits for development and CO2 emission. Infrastructures due to their long life are also vulnerable to long term climate risks and it is wise to include climate risk assessment in planning for these infrastructures.

Intercity Passenger & Freight transport

Dr. MANOJ SINGH, ADVISOR (TRANSPORT), NITI AAYOG

Population, GDP, urbanization, personal incomes and internal migration are driving passenger travel demand. However railway has been unable to benefit from the demand growth on account of constraints of capacity. Besides railway facilities have not improved substantially. Underinvestment in railways is leading to congestion and overutilization and as a result created issues related to safety, service quality and pulled railways into a vicious cycle of underinvestment. If 7-10% GDP growth rate is to be achieved in the next 20 years, railway capacity will have to be improved. Focus of current policy is doubling of capacity of existing lines and greater electrification of rail.

Japanese experiences in High Speed Rail

Mr. ATSUSHI KOIKE, PROFESSOR, KOBE UNIVERSITY

Japan has a long history in high speed rail (HSR). The first HSR line between Tokyo & Osaka was started in 1964 and has expanded rapidly since then covering the entire country in 2015. HSR in the past has been quite beneficial and there has been high co-relation between expansion of HSR and economic growth in Japan.

Maglev trains are planned in 2029-2045 and now there is a debate whether maglev should be introduced. Maglev is a faster train and can run upto 600 kms/hr on test run and can reduce the current 2.5 hrs Tokyo-Osaka journey to 1 hr. However the high cost are a barrier. The study explores impact of maglev between Tokyo-Osaka. The overall economic benefits from Maglev will be around USD 135 billion and which extends beyond Tokyo-Osaka and are spread over many years. The impact on GNP is mainly due to manufacturing however the service industry will also benefit. Maglev has however high CO2 emissions especially since nuclear is being phased out since 2011 and approximate 10% increase in CO2 emissions. The additional CO2 emissions will happen due to additional economic activities (manufacturing)

Session 4: Plenary Session 2: Finance and Technology for Low Carbon Transport

Chair : Dr. Dipak Dasgupta, ALTERNATE DIRECTOR (INDIA) GLOBAL CLIMATE FUND BOARD & CHAIR INVESTMENT COMMITTEE

Moderator : Prof. P R Shukla

Panelists:

- Dr. Jorge Rogat, UNEP DTU Partnership
- Ms. Anneett Baesler, German Embassy
- Mr. Sudesh Kumar, SUTP Project
- Mr. Peter Hilliges, Kfw

Mr. Subash Dhar introduced the session and invited the chairperson, moderator and the panellists on the dias. Prof. Shukla then introduced the panel members

Opening Remarks GCF

Dr. DIPAK DASGUPTA, ALTERNATE DIRECTOR (INDIA) GLOBAL CLIMATE FUND BOARD & CHAIR INVESTMENT COMMITTEE

Dr. Dasgupta noted that the first thing that strikes about any city is that the challenge of urbanization is just beginning. There are two future pathways and what the world needs is not the BAU. There is need for massive climate finance if we want to build a good and positive future and dramatically alter the pathways from the BAU. To provide a perspective Delhi Metro has already spent close to \$12 billion US. Urban transport sector in India will need \$120 billion over coming 10 years. The Public transport and mobility options in cities are going to be costly and one need to concentrate on the best practices. He also empathized on the South-South collaboration and knowledge sharing which will drive the sustainable development process. It is important to identify the best practices e.g., what has

worked in China to manage the urban transition. The GCF is spending efforts on scaling up the projects and is intended to take up projects worth almost \$12.5 billion in the next year.

Opening Remarks Kfw

Mr. PETER HILLIGES, DIRECTOR (INDIA), KfW DEVELOPMENT BANK

Mr. Hilliges indicated that KfW wants to put the cities on a desirable path of development where there is a large share of transportation happening through the public transport. This becomes important because infrastructures lock ins can make it quite difficult to shift the cities from a high carbon path. He noted that the share of public transport in India is declining and there is a need to bridge the gap. KfW wants to support urban infra financing in Indian cities and have provided more than 1 billion Euro to India cities for metro, BRT, etc. He informed that KfW mainly provides loans and these loans cover both equivalent base case technology costs and also the incremental costs for a cleaner technology. He further discussed the current project portfolio in India related to transportation sector. He highlighted that there is a need for transformation in the governance structures in India. Along with the need for money, there is also a need to have structures that can absorb such money. He further supported this with the example of metro rails, noting that since a workable implementation framework for metros exists, there are so many metro projects coming up now in India. He indicated that states do not have capacity and the situation of urban finances is bad which needs to be solved.

Opening Remarks – Technology Needs for Transport

Dr. JORGE ROGAT, PROJECT MANAGER, UNEP TECHNOLOGY NEEDS ASSESSMENT PROJECT

Dr. Rogat discussed the technology needs assessment program including the phases of the project. He highlighted that the project was participatory and 26 countries are moving forward in the second phase. He discussed that proposals prioritized by the Asian countries in the transport sector contain projects on Non Motorised Transport (NMT), urban mass transit, planning and management, road to rail shift and efficient vehicle technology. These projects would need almost \$13 billion funding. He ended his remarks with the following questions:

Opening Remarks – German Government

Ms. ANNEETT BAESLER, COUNSELLOR OF ECONOMICS AND ENVIRONMENTAL AFFAIRS, GERMAN EMBASSY, NEW DELHI

Ms. Baesler highlighted that climate problem needs global cooperation. Germany has put ambitious target to decarbonise and Chancellor Merkel and PM Modi agree for the need of financing. She informed the audience of the EU commitment of reducing 40% of the GHG emissions by 2030 from 1990 levels and the German objective to completely decarbonize its entire economy by the end of the century. International Climate Initiative (IKI) works on financing for climate action and India and Germany need to work on bilateral levels to

achieve a low carbon future. IKI has a funding of around 1.5 billion Euros and currently finances over 400 projects in both mitigation and adaptation areas. These projects also focus on the co-benefits of improvement in living conditions. IKI has many projects dealing with urban transport issues. These are about shift to eco-friendly and NMT modes and improving the energy efficiency of the modes. She further indicated that they have so far funded 2 projects in India and Promoting Low Carbon Transport in India project of UNEP is one of them. The other project is with ITDP.

Opening Remarks – SUTP Project

Mr. SUDESH KUMAR, EX- MEMBER ELECTRICAL RAILWAY BOARD & EX.OFFICIO SECRETARY, GOVERNMENT OF INDIA

Mr. Kumar indicated that there are challenges to the low carbon transport initiative and the carbon footprint of the urban transport sector is not very significant presently in India but its impacts on the air quality of the cities is huge. He emphasized that the demand and supply mismatch is big in transport, going by the mobility needs, 45000 buses are required in India every year for next 10 years just for the urban public transportation needs but only 10-12% of this is manufactured and as a result there is a huge inflow of 2-wheelers in the cities.

He further highlighted that there was a need for standardization for technologies being used in the urban transport realm. The systems should be replicable across cities and not just a one off solution. He supported this premises by citing the example of metro rail coach procurement where the cars are custom designed for each city's metro system which could be standardized and hence the economies of scale could play a huge role in the procurement process. Such a move would also lead to long term association with the technology partners and enhance technology transfers. He also indicated that there was a need to explore the local capacity for manufacturing the technology.

He further suggested that the alternative technologies should be evaluated on basis of their per km carbon footprint. He finally proposed that to improve implementation contracts should be kept simple and there should be assured payments to contractors.

Roundup by Moderator

Dr. P R SHUKLA, PROFESSOR, INDIAN INSTITUTE OF MANAGEMENT, AHMEDABAD

Prof Shukla summarized that on financing that ambition so far has been low. The question is how do we raise it and lay a path that needs to be covered for a better future. The devil is however in the details and it is a long way to go to improve our contracts and reduce the risks for project developers. He then opened the floor for questions and discussions.

Question and Answer Session

The participants wanted to know from the panel if changing of governments and the officials may be an obstacle in the long term strategy planning. Ms Baseler agreed it is a challenge and therefore there is a need to build capacity e.g., of the Urban Local Bodies (ULBs). The participants raised a question on how gender related concerns are integrated in transportation projects. Ms. Ernest informed that a gender related study has been taken up in India project of UNEP on this issue.

Participants wanted to understand how from small projects we can have a sustainable transformation of transport sector. The panel was of the view that there is a need to work not on the project but an overall sustainable financing model for transport projects.

List of Participants

Participants are listed in alphabetical order of their surnames who were invited by UNEP however since the workshop was attended by a number of other participants that had registered for the UMI they are not mentioned here.

Name	Surname	Organisation	Country
Prasoon	Agarwal	Green Growth Institute, Delhi	India
Mathumathi	Ambigabadi	Ministry of Energy	Malaysia
Anmol	Anand	iTRANS	India
Mohamad	Antoni	Antara News	Indonesia
Anvita	Arora	iTRANS	India
Vidhee	Avashia	IIM Ahmedabad	India
Annette	Baessler	German Embassy	Germany
Jonas	Bleckmann	International Climate Initiative	Germany
Parthaa	Bosu	Clean Air Asia	India
Mahdyeh	Boubehrejeh	National Center of Air and Climate Change	Iran
Deepak	Dasgupta	Global Climate Fund Board	India
Priyanka	Desouza	UNEP	India
Shobhakar	Dhakar	Asian Institute of Technology	Thailand
Subash	Dhar	UNEP DTU Partnership	Denmark
Ranjan	Dutta	Urban Mass Transit Company	India
Kamala	Ernest	UNEP	Kenya
Mahesh	Gaur	TRIPP, IIT Delhi	India
Desh Ratan	Gupta	Railway Board	India
Deepty	Jain	TRIPP, IIT Delhi	India
Rutul	Joshi	CEPT University	India
Atsushi	Koike	Kobe University	Japan
Hemant	Kumar	Railway Board	India
Sudesh	Kumar	Ex-member Railway Board	India
Oliver	Lah	Wuppertal Institute	Germany
Anusha	Vaid	iTRANS	India
Darshini	Mahadevia	CEPT University	India
Leeza	Malik	TRIPP, IIT Delhi	India
D S	Mishra	Ministry of Urban Development,	India
Alpana	Mitra	Rajkot Municipal Corporation	India
Naghmeh	Mobarghaei	Environmental Science Res Instt	Iran
Talat	Munshi	CEPT University	India
Hema	Narang	IITD	India
Belinda	Otoroz	The Manila Times	Philippines
Minal	Pathak	CEPT University	India
Karma	Pemba	Department of Transport	Bhutan
Roselaily Abd	Rahman	Policy, Planning & Research Div.	Malaysia
Jorge	Rogat	UNEP DTU Partnership	Denmark
S.C.	Sharma	Indian Oil Corp Ltd	India

Name	Surname	Organisation	Country
R.P.	Sharma	Urban Improvement Trust, Udaipur	India
P R	Shukla	Indian Institute of Management, Ahmedabad	India
Abu	Siddique	Dhaka Tribune	Bangladesh
Manoj	Singh	Niti Ayog	India
R K	Singh	Ministry of Urban Development,	India
Mukund	Sinha	Ministry of Urban Development,	India
Robert Y.	Siy	Dept of Transportation & Communications	Philippines
K.	Swaminathan	Railway Board	India
John Teo	Teo Hoe Kung	New Straits Times	Malaysia
Sivakumar	Thillaiampalam	University of Moratuwa	Sri Lanka
Geetam	Tiwari	TRIPP, IIT Delhi	India
Dorji	Wangchuk	City Bus Services	Bhutan
Susan	Wothaya	UNEP	Kenya

Pictures



UNEP Stall at the Urban Mobility India Conference and Exhibition



Media Roundtable for the project



Kamala Ernest, UNEP giving the opening remarks



A section of audience



A section of audience



Panelists for the Session on Financing and Technology Transfer



UNEP, BMU and UDP together with panelists for session on financing and technology