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Promoting Low Carbon Transport in India

Project Inception Workshop Report

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Executive Summary

The inception workshop was held in New Delhi on 12th November 2010. It was attended by the three Indian partners, Indian Institute of Management, Ahmedabad, Indian Institute of Technology, Delhi, and CEPT University, Ahmedabad. In addition, around 50 experts, researchers, policy makers and many other stakeholders from the transport sector participated in the workshop. The inaugural address was delivered by H.E. Jairam Ramesh, Minister of State for Environment and Forests, India. Mr. Jan Axel Voss represented the German government which is supporting the project. UNEP and URC core team was also present.

Overall, the workshop was very successful as it generated a lot of interest within India and received extensive coverage by the local and International media. A lot of active discussions took place during the workshop, and a summary of these is given in Section 2 (Workshop Proceedings). The inception workshop was also organized to obtain feedback and suggestions on the project design, objectives and outcomes. A lot of good suggestions were received. These suggestions have been carefully considered against what is already covered in the project document. Suggestions to put into consideration have been provided under Section 3 (Recommendations and Way Forward).

1. Background and Project Objectives

India is currently the fourth largest green house gas (GHG) emitter in the world, but with the second largest population, the per capita emissions are much below the world average. In 2007, 12.9% of carbon dioxide (CO₂) emissions for India were from the transport sector. Besides CO₂ emissions, the transport sector is also responsible for externalities like road congestion, local air pollution, noise and accidents. The burden of externalities has been extremely high in the urban areas and has increased over the last two decades of economic reforms. During this period, rail transport has lost share of both freight and passengers to road transport. In cities, public transport services have deteriorated and have been overtaken by a rapid increase in private vehicles.

Opportunities exist to make India's transport growth more sustainable by solving climate and developmental challenges simultaneously. India's National Action Plan on Climate Change (NAPCC) recognizes that GHG emissions from transport can be reduced by adopting a sustainable approach e.g. increased use of public transport, higher penetration of biofuels, improved energy efficiency of transport vehicles, etc.

This project is designed to contribute to the efforts of the Government of India in realizing a low-carbon transport system. The project has been endorsed by the Ministry of Environment and Forests (MoEF) and will involve working in close consultation with the Ministry of Urban Development (MoUD), for the cities component.

Project Objectives

The project has the following objectives:

1. An enabling environment for coordinating policies at national level to achieve a sustainable transport system.
2. Increased capacity of cities to improve mobility with lower CO₂ emissions.

The first objective would be achieved by developing a "Transport Action Plan" in cooperation with multiple stakeholders. The second objective will be realized by helping cities to develop "Low-carbon Mobility Plans".

2. Workshop Proceedings

This section summarises presentations / speeches made by different speakers during the workshop.

2.1. Inaugural Session

2.1.1. Low Carbon Transport for India

Summarised from presentation made by Prof P.R. Shukla

Prof P. R. Shukla introduced the concept of Low Carbon Transport. Low Carbon within climate negotiation arena (e.g., Copenhagen Accord to which India is a signatory) is defined as a 2 degree stabilization scenario. However, there are divergences where some countries think that this is not low enough (e.g., small island states), whereas others believe that this is too difficult to achieve, given the current realities.

India's has responded to the challenge and submitted to the UN Framework Convention on Climate Change (UNFCCC) its National Climate Change Action Plan which has eight missions, especially related to sustainable habitats, energy efficiency, and other connected missions related to low carbon transport. The challenge is how to weave low carbon transport within the framework of these missions.

The transport sector is important as emissions especially from developing countries are increasing rapidly. This is however both a challenge and an opportunity. There is possibility of reducing these emissions through various technologies, infrastructure and changes in behavior. The challenge is mainly the growing levels of motorization and declining share of rail transport, an environmental friendly and more sustainable mode, as compared to road transport. India is making some investments to promote rail (e.g., dedicated rail freight corridors), however the question here is - what are the levels of investments in such infrastructure?

Updated figures for CO₂ emissions from the Ministry of Environment and Forests show that around two thirds of emissions are from energy use, of which transport accounts for about 14%. However for developed countries this number is quite high (e.g., for US transport accounts for around 40% of emissions). This means that as incomes increase, the share of transport may continue to rise, hence the need to focus on this sector.

2.1.2. Germany's International Climate Initiative

Summarised from speech made by Mr. Jan-Axel Voss

International Climate Initiative (ICI) promotes climate protection projects in developing countries, emerging economies, and countries in transition. The money for this comes from the auction of tradable emissions certificates. ICI's objective is to demonstrate that low carbon economy is achievable and economically viable. ICI currently has transport related activities in China and Ukraine, besides the current project in India. Activities include pilot projects, technical cooperation, transfer of knowledge, access to technology, policy support, capacity development and increased awareness.

In Germany, the trend of rising CO₂ emissions from transport has been decreasing since 2000. However, the challenge is enormous and a robust climate deal will require decrease in emissions from industrialized countries and at the same time, a decrease in current emission trends in developing countries. A three part mantra for doing this is avoid – shift – improve. In Germany, transport policies at the national level for reducing CO₂ emissions include:

1. A National Sustainability Strategy;
2. A Freight Transport and Logistics Master Plan;
3. Vehicle tax based on CO₂ emissions (from 2009);
4. Toll tax for lorries above 12 tons (from 2009);
5. National Cycling Plan for improving cycling infrastructures;
6. National Development Plan for electric mobility.

The German Government is looking forward to fruitful outcomes from the project.

2.1.3. UNEP's Programme on Climate Change and Transport

[Summarised from presentation made by Mr. Rob de Jong](#)

Mr. Rob de Jong discussed the global activities of UNEP in the area of transport. In terms of CO₂ emissions, transport contributes to around 25%, and IPCC projections indicate that this could increase to around 33% by 2050. 75% of these emissions come from the road transport sector. The growth in emissions is as a result of a large increase in vehicles. Currently, there are 750 million vehicles and IEA projections show that this figure could increase to around 3 billion vehicles by 2015. A larger share of these vehicles will be found in developing countries. This major increase in vehicles in developing countries will become a nightmare for safety, air pollution and climate change. However, action can be taken to address these issues, and there are solutions.

UNEP's Transport Unit strategy is "avoid, shift and clean". Avoid – minimizing the need to travel through sustainable city planning; Shift - move from energy intensive to less energy intensive modes of transport and Clean - shift to more efficient or cleaner vehicles. All three strategies need to be implemented at the same time. On that basis, UNEP's work is organized into two broad programmes – Green Economy and Climate Mitigation. What we do in transport fits in two areas – Cleaner Vehicles and Investment in Infrastructure. For Cleaner Vehicles, UNEP is advocating for cleaner fuels and cleaner vehicles.

For investment in infrastructure, UNEP collaborates with funding agencies to promote a share of investments that is earmarked for sustainable infrastructure e.g., footpaths, cycling tracks, etc. UNEP has been working with GEF to promote public transport systems such as BRT systems. Further, on cleaner vehicles, the fuel economy of an average vehicle in India is better than the world average, and we should not lose sight of this. However, India faces challenges in the future e.g., the share for public transport is dropping, pedestrian facilities are being encroached, quality of transport services needs improving e.t.c.

2.1.4. Introduction to the Project “Promoting Low Carbon Transport”

Summarised from presentation made by Dr. Subash Dhar

The project has two interventions i) Development of a Transport Action Plan at the national level and ii) Development of Low Carbon Mobility Plans at the city level. The project is designed to contribute to the efforts of the Government of India in realizing a low-carbon transport system by aligning them with existing policies like the National Action Plan on Climate Change at national level, and the JawaharLal National Urban Renewal mission.

The project is spread over three years and divided into 11 work packages, and will be implemented by UNEP and UNEP Risoe Centre along with the Indian Institute of Management, Ahmedabad, Indian Institute of Technology, Delhi and CEPT University, Ahmedabad. The project involves a number of case studies to address information gaps. The project will develop sustainability indicators at national and city level to support the achievement of policies, and a methodology for developing low carbon mobility plans. This methodology will be implemented in upto 4 cities within India.

2.1.5. Summary of Keynote Address by H.E. Jairam Ramesh

The transport sector accounts for about 7.5%¹ of green house gas emissions. However, this could rise to around 15% by 2025. Urgent action for reducing emissions from transport is required. Activities under the project need to be implemented promptly and where possible, ahead of schedule. A number of measures being implemented by the Government of India and those that can support the achievement of low carbon transport are as follows:

1. **Fuel Economy standards** – There have been a lot of barriers faced in implementing these standards, and by mid 2011, voluntary fuel economy standards would come into force. These will be implemented by Bureau of Energy Efficiency. The standards are kilometre per litre (kmpl) standards, and not CO₂ emission standards.
2. **Fuel Quality** – The quality of fuels has been improved via a road map contained in the Auto Fuel Policy, 2002. Vehicle manufacturers can no longer give the excuse of poor fuel quality to stall improvements in vehicle technologies.
3. **Fiscal Policies** – Current policies are distorted, e.g., the subsidy on diesel which instead of assisting farmers, benefits large cars and SUV’s. In India, operating large cars and SUV’s is not ethical. This issue can however be addressed through appropriate fiscal policies and not by imposing bans.
4. **Electric cars** – There needs to be a life cycle analysis for electric cars, given that in India a large share of electricity is generated from coal.

¹ This figure indicates the % of emissions from the transport sector with respect to gross CO₂ equivalent emissions (1904.73 million tons of CO₂ eq) from all sectors (electricity, transport, residential, other energy, cement, iron and steel, other industry, agriculture and waste).

5. **Ethanol** – Given India’s land scarcity and large population, bio fuels like ethanol are not a feasible option.
6. **Technologies** – Breakthrough technologies are not expected within the next 15-20 years, therefore many changes will occur with existing technologies and appropriate policies.

2.1.6. Discussion

Summarised from discussions at the end of first session

1. **Non motorized modes:** Dr. K.T. Ravindran, from School of Planning and Architecture, raised the point that cycle rickshaws and NMT modes were not adequately highlighted as options for transport. It was clarified that these are included. Prof. Geetam later requested the Minister to make a strong statement for non motorised modes of transport as they are zero carbon and have to be a part of any low carbon strategy. Mr. de Jong also highlighted that most of the money for transport projects is used only for building roads, and there should be a shift to also allocate money for building cycle tracks.

Dr. Rogat shared his experience from South Chile where construction of cycle tracks had not had a great impact in the beginning. The shift to cycling will also require changing mindsets of people through awareness raising and other non technical interventions. The Minister concurred with the importance of cycling infrastructure, and emphasised that people have aspirations to move from owning bicycles to vehicles e.t.c. Therefore, though some portion of the population may choose to cycle, the rest might not, as their standards of living improve.

2. **National transport development policy committee:** Prof. K.L. Thapar (Asian Institute of Transport) concurred with the Minister about compressing the time which he thought would help the project in plugging into the National Transport Development Policy Committee. The committee was set up with Mr. Rakesh Mohan as the Chairman and Prof. K.L. Thapar as one of its members. The committee is also expected to look into the issue of low carbon transport.
3. **Roadmap for emissions:** Ms. Anumita Roychoudhry (Centre for Science and Environment) highlighted the importance of a time table for emission standards, as that of the Auto Fuel Policy winds up in 2010. The time table should be developed in parallel with fuel economy standards. If we only have fuel economy standards there may be a risk of shifting towards diesel vehicles which are more fuel efficient.² In developing a

² This point emphasizes the need for simultaneous development of emission and fuel economy standards, to holistically address improvements that would include cleaner fuels and vehicles (catalytic converters, hybrid, electric vehicles, 4-stroke motorcycles e.t.c); improvements in fuel economy; public transport (Bus Rapid Transit, Bus Regulation and Planning and integration of environmental considerations into the transport decision-making process); and non-motorised transport (advocate for the setting aside of a certain percentage of all road investment projects for NMT infrastructure – pedestrian walkways and cycling lanes, while promoting environmental sustainability, safety and accessibility).

new road map for emission standards, the Ministry could utilize source apportionment studies that have already been completed.

2.2. Promoting Low Carbon Transport

2.2.1. Sustainability Indicators for Transport

Summarised from presentation made by Dr. Jorge Rogat

The presentation focussed on the definition of sustainable transportation, the importance of developing sustainability indicators for transportation, selection of indicators/set of indicators and the importance of data ability and reliability. A definition developed by the European Council of Ministries of Transport (ECMT) in 2004 was highlighted (see presentation), which reinforced the fact that the main objectives of the project are in line with the sustainability definition. Emphasis was made of the importance of developing sustainability indicators for the transport sector, namely, to progress towards objectives/goals, to understand the long-term economic, social and environmental impacts of short-term decisions, and to measure performance of the transport system thus allowing for comparison between systems.

The need of taking into consideration local aspects when developing the indicators was also highlighted. The rationale behind this is that while a system may be sustainable at the national level, it may not necessarily be sustainable at the city level. Some of the indicators that could be included should contain economic, social and environmental aspects such as transport cost efficiency (economic), equity and affordability (social) and pollution emissions (environmental).

Work distribution for development of indicators will be as follows: development of long-term sustainability indicators at the national level (IIMA), development of sustainability indicators at city level (IITD) and development of indicators to measure inclusiveness of transport systems (CEPT).

Conclusions made included the following:

1. A set of sustainability indicators are a useful tool for improved transportation planning, particularly for transport planning which incorporates various dimensions and long-term impacts;
2. There is no predefined or standard set of indicators;
3. It is important to spend time developing a set of indicators that best reflect local perceptions of sustainability; and
4. It is important to spend time identifying and collecting appropriate data for indicators.

2.2.2. Transport and Inclusiveness

Summarised from presentation made by Prof. Darshini Mahadevia

The presentation focussed on the issue of inclusiveness of the urban poor and disempowered population. 72 percent of the urban population in India consists of informal

workers, many of who earn a living off the streets, hence creating conflicting demands on urban public space. It has been observed generally that when large-scale transport projects are initiated, including low-cost options such as Bus Rapid Transit (BRT), they result in marginalization of the urban poor. This has been well documented in the case of the Delhi Metro, as well as the BRT line in Ahmedabad. National Sample Survey data reveals that expenditure on transport for the bottom 50% income earners, while being relatively low, has increased from 2% to 3.28%, while for the top 50%, it has increased from 5.58% to 7.6% (a lesser relative increase than the bottom 50%).

Interestingly, the expenditure on health shows little appreciation with the bottom 50% spending 3.53% in 1993-94 as compared to 3.87% in 2004-05. The latest Global Human Development Report from UNDP underlines that Life Expectancy at Birth (LEB) in India has declined to 64 years from 65 years during the previous year. It can be inferred from the above statistic that transport expenses in urban India are crowding out the would-be expenses for medicine. Further, the GDP growth rate is 6% (average 1994-2004), while per capita GDP growth is about 4%. However, consumption expenditure growth rate for the bottom 50% income earners in India is about 0.6%; which indicates that growth is not trickling down to the poor. It is clear that economic growth in India is currently very inequitable.

It is well documented that when populations increase in cities, the price of centrally located land increases, thereby pushing prices up and poor people out. Metropolitan cities in India have increased in size 2-3 fold in the last five years, and average travel distance has increased. For example, hawkers in Mumbai commute for about 2 hours one way, to vend in the central business district (CBD). When travel distances increase, transport planners and policy makers are requested to develop low-carbon transport solutions. This is akin to a fox running around in a circle trying to grab its tail (which he will never be able to grab).

Preambles and introductions of all City Development Plans (CDP) contain adjectives such as equitability, sustainability, affordability, etc. However, actions that radiate from the CDPs are in contrast to these principles. If we are to truly humanize society and live sustainably, we need to look at the urban planning paradigm from the welfare state perspective. Some planning ideas for inclusive transport include the following:

1. Linkages with the land use plan, based on the concept of compactness, heterogeneity and mixed land use;
2. Compactness in terms of high density and not high FSI (floor space index);
3. Facilitating informal economies within cities, non-metros and infrastructure investment in non-motorized transport modes.

The onus lies with urban planning, to ensure social sustainability that results in a win-win situation for all.

2.2.3. Low Carbon Mobility Plans for Cities

Summarised from presentation made by Prof. Geetam Tiwari

Prof Tiwari presented information on current trends in mobility and also scenarios for the future. The mobility trend in cities manifests dominance in walking, cycling and rickshaw trips. These three modes combined have a share of about 30% in megacities which increases to nearly 60% in smaller cities. Share of public transport is more than 40% in megacities (mostly organised bus systems) and about 10-20% in smaller cities (primarily informal route taxis). Personalized transport is dominated by motorized two wheelers, while cars comprise of 7-9% of total trips in megacities. This is in sharp contrast to so called sustainable cities in Europe, which have a higher share of cars.

The challenge for a sustainable future is to retain the modal share of non motorized modes (walking, cycling, and rickshaw) and public transport. With growing incomes and availability of small inexpensive cars, our policies will determine whether the current share of personalized vehicles decreases or increases.

CO₂ emissions from cities in India reveal a large variation. Large cities (population > 8 million) which have around 15% of urban population contribute to 64% of CO₂ emissions from cities, whereas smaller cities which account for the rest of the population contribute to only 36% of CO₂ emissions. Therefore, low carbon transport interventions should be based on city size.

For low carbon mobility, preference should be given to non motorised transport modes and public transport through:

1. Better integration of public transport and non motorised transport, as these two systems complement each other;
2. Development of direct, safe and pleasant pedestrian and cyclist routes;
3. Restriction for private motor vehicles e.g. through speed limits, road space restrictions, etc.

Challenges to achieving the above could include the following:

1. Non motorised transport is not associated with technology (like fuel, vehicles, metros), and technology is synonymous to development and modernity;
2. Non motorised transport is perceived as taking up space meant for cars, hence has not yet been fully embraced by society;
3. Non motorised transport infrastructure is assumed as having no market value, therefore cannot be financed through land development;
4. External donors are interested in large construction projects.

2.2.4. Discussion

Summarised from discussions at the end of session two

1. **Barriers in implementing policies** – Mr Ashok Srinivas (Prayas) pointed out that there is no dearth of plans, but that the main problem is in implementing policies. It was

suggested that the project look into institutional structures and capacity support required for implementing policies.

2. **Prominence for railways** – Mr. Mukul Mathur (International Union of Railways) pointed out that the project is mainly focusing on urban transport. Railway lines, a very carbon friendly mode, should be given due consideration within the National Action Plan on Transport.
3. **Financing NMT projects** – Ms Chhavi Dhingra (GTZ) stressed that financing of NMT projects is a major challenge for cities and suggested that the project should look more closely at this aspect and implement some pilot projects.
4. **Integrating NMT projects with larger projects** – Mr. Piyush Raut (City Managers Association) felt that major problems for cycling are the railway lines that divide the city. Railway lines are not sensitive to concerns of cyclists / pedestrians. Prof. Geetam added that even the Metro Line in Delhi has not incorporated good pedestrian infrastructure around the stations. Therefore, policies need to be formulated where smaller projects on NMT can be embedded within larger projects.

3. Recommendations and Way Forward

The project inception workshop generated a lot of discussion between key experts and stakeholders, and some of the recommendations that would be taken up during implementation of the project are summarised below. Recommendations are presented based on key interventions within the project namely: i) National Transport Action Plan, and ii) Low Carbon Mobility Plans.

3.1. National Transport Action Plan

1. Minimizing the timeframe for development of the National Transport Action Plan, so that the project can meaningfully contribute to the efforts of the Indian Government in development of low carbon development plans. The National Transport Development Policy Committee, whose Chairman is Mr. Rakesh Mohan, will be provided with inputs from the project;
2. Analyse fuel economy standards and emissions standards, while appreciating the implications of pursuing these two policies in an integrated manner;
3. Undertake a life cycle analysis for electric cars;
4. Analyse the role of railway lines for freight; and
5. Policy Analysis of fossil fuel subsidies.

3.2. Low Carbon Mobility Plan

1. Low carbon mobility plans will be expanded to include barriers and development of an enabling framework for different sustainable transport modes;
2. Pilot projects may be difficult to implement within the project timeline and resources; However, proposals for funding will be developed for sustainable transport modes;
3. Development of a policy paper that would act as a guide on how NMT projects can be incorporated into larger projects such as Metro Lines, National Highways e.t.c.

4. Appendixes

Appendix 1: Agenda for Project Inception Workshop

Inaugural Session (Chair : Dr. Jorge Rogat)

09:30 - 9:55	Registration
10.00 – 10:05	Welcome speech by the Chair
10:05 – 10:20	Low Carbon Transport: The Context (<i>Prof. P. R. Shukla, IIMA</i>)
10:20 – 10:35	Germany’s "International Climate Initiative" and the challenge of transport (<i>Mr. Jan-Axel Voss, Environment and Climate Change Counsellor, German Embassy New Delhi</i>)
10:35 – 10.50	UNEP’s Programme on Climate Change and Transport (<i>Mr. Rob de Jong, Head of Transport Unit, UNEP</i>)
10.50 – 11:05	Introduction to the project “Promoting Low Carbon Transport” (<i>Dr. Subash Dhar, URC</i>)
11:05 – 11.20	Inaugural speech (<i>Sh. Jairam Ramesh, Hon. Minister of Environment and Forests, GoI</i>)

Tea Break

Promoting Low Carbon Transport in India (Chair : Ms. Kamala Ernest, UNEP)

11:45 – 12:00	Sustainability Indicators for transport (<i>Dr. Jorge Rogat, URC</i>)
12:00 – 12:15	Transport and Inclusiveness (<i>Prof. Darshini Mahadevia, CEPT</i>)
12:15 – 12:30	Low Carbon Mobility Plans for cities (<i>Prof Geetam Tiwari, IITD</i>)
12:30 – 13:00	Discussion

Appendix 2: Transcripts /Presentation

Transcript of speech by H.E Mr. Jairam Ramesh, Minister of State for Environment and Forests

The project is timely and it is an important subject but only when you would have completed the study horses would have bolted the stables. Therefore compress your time horizon if you want the project to make substantial difference to the emissions from the transport sector.

Green house gas inventory for year 2007 – reveals roughly 38% emissions are from electricity, transport sector accounts for 7½% emissions, 23% is industry and 7½ from agriculture. But the rate of growth from transport sector is going to be the most significant. In other words stocks may be only 7½% but the rate at which it is growing by the year 2025 transport sector my own estimates are could well account for anywhere of between 14% to 15% of GHG emissions, therefore an almost doubling in the contribution of transport sector in the next 15 years which no other sector is going to witness.

So we have to do something immediately otherwise we are going to have an unbridled growth in the transportation sector adding to mobility for individuals but adding to social cost for individuals at the same time. So what can be done:

1. The first immediate task ahead of us is to have mandatory fuel economy standards. We are one of the few countries which do not have these standards. We have spent a good part of last two years whether the standards should be notified under the Energy Conservation Act or under the Motor Vehicles Act. We have now decided that it would be notified under the Energy Conservation Act. The standards are all ready, technical work has been done and I have said earlier by the end of this year we should have voluntary mandatory standard by middle of 2011 and perhaps by the middle of 2012 we should have mandatory fuel economy standards.

There has been a lot of resistance to this and we need to be very serious about implementing fuel economy standards. Now these are kmpl (kilometers per litres) standards and not CO₂ emission standards. This is a graded standard according to the weight of the car. We should set a time frame and I hope by middle of 2011 we should have a regime of fuel economy standard. Even the United States has recently promulgated fuel economy standards.

2. Critically linked to the fuel economy is the quality of fuel. We have made very substantial improvements in the quality of our fuels particularly petrol and diesel. In terms of sulphur content huge investment has taken in our refineries, almost 40,000 crores of rupees. We are moving into Bharat Stage IV as far as Auto Fuel Policy is concerned we seem to be on track. So no longer can the vehicle manufacturers use the argument of poor quality of fuels to avoid fuel economy standards.

3. Third thing we need to give a thought is to encourage a fiscal policy regime that discourages the use of heavy cars and SUV's. It is criminal in India with the type of society we are in, the type of challenges we face. The luxurious growth of large size vehicles and SUV's is a cause for great concern. I get very angry when I see them on the road and I see the best way of dealing with them is to have a fiscal policy regime which imposes a penalty duty as far as these cars are concerned. I would include diesel cars by the way into this. We should not administratively prohibit them but we should use the fiscal system creatively and innovatively to ensure that we discourage the use of these vehicles.

In fact what is happening today is that we are subsidizing the upper middle class diesel cars because of our subsidy that we are providing on diesel. Our fossil fuel pricing policy we have of course reformed this policy as far as petrol is concerned however we have yet to reform it as far as diesel is concerned. The net effect of the subsidy we are giving on diesel is that farmers are not benefiting

so much as the BMW's, Benzes and the Audis and Hondas. This I think is a gross perversion of the subsidy. The subsidy on fossil fuel should be really on LPG and Kerosene and certainly not for diesel.

The third part of this strategy to control emissions is to manage emissions is to have a fiscal policy regime which differentiates according to the size of the car and put a penalty on the cars which you do not want to see on the roads i.e. diesel driven cars, SUV's, etc. Unless you do this, you may be having more fuel efficient cars but definitely you won't have any major impact on the emission profile given the increase in number of cars. Remember it took India from 1950 to 2009 i.e., 59 years to reach 1 million cars per year sale and in 2010 1 million cars were sold. This is amazing. This is the rate at which we are growing.

I hope we do not match Chinese in this regard because they are doing a million vehicles a month. Your intervention, study is very timely. We need to look not only at the technology end but also at the policy end. The technology end will take time but I think the policy end can be addressed immediately. We need these policy interventions on fuel efficiency fiscal policy, and that is what we need to focus in the short term. In the long run of course there are technology choices to be made. There is some discussion about the Brazilian model of using ethanol but I don't this is relevant for Indian context because we are land deficient country.

4. People are talking of electric cars as if electricity is going to come from heaven. The more electricity you generate the more coal you would require. The more coal you produce the more forests you would destroy. We need to do a full cycle analysis for electric cars as I am not convinced that electric cars are the panacea as they have been made out to be.

5. On the technology issue in the short run (next 5-10 years) we don't have much flexibility. There is no major break through that appears on the horizon baring battery technology. It is therefore the policy framework we need to address in the short term.

6. The policy framework is not right. It discriminates against public transport, it encourages SUV's and diesel cars, and there are no mandatory fuel economy standards. If you do not get your policy framework right you can not stop the rate of growth of CO₂ emissions. I saw in one of your slides mention about Jawahar Lal National Urban Renewal Mission. It is a good intervention and as a result of which you see better quality buses and that is an example of an innovation of how public transport can be promoted. I think we have underestimated the role of railways. The railways have been grossly neglected and if you are talking about reducing emissions from transport you will definitely have to look at railways. The rail has suffered in the last 15-20 years and a lack of investment. We will pay a price for this. We can not have a heavy dependence on the road sector.

Your study is very timely and if you can churn out ideas on a regular basis they would have more impact rather than wait for 3 years and submit a report and put on the website which someone reads and then it is business as usual. If you want to intervene decisively in what I see is a dangerous increase rate of growth of emissions from transport sector then you have to take up the challenge and address the policy issues and show us the way forward.

Project Inception Workshop on “Promoting Low Carbon Transport in India”,
Hotel Lalit, New Delhi, 12 November 2010

Address by Mr. Jan-Axel Voss,
Counsellor with the German Embassy, New Delhi

Esteemed workshop participants,

I am pleased to be here and to speak to you on behalf of the German Federal Government, in particular its Environment Ministry.

My address will have two parts: The first one addressing the question of where the money for this project comes from, the second one taking a look at Germany’s own steps in the transport sector in view of the climate challenge.

D) First, the money question. For this purpose, let me give you a short overview over the German International Climate Initiative.

- Started when ? The ICI has been promoting climate protection projects in developing countries, emerging economies and countries in transition since 2008;
- Financed how ? It is financed through the auctioning of 8.8% of German emission trading certificates; that means that the revenue from auctioning tradable emission certificates is incorporated into the budget of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), from where it is disbursed to finance climate protection measures.
- Spent how much ? From 2008 to 2010: 181 projects in 61 partner countries with a total volume of 357 mill. €, of which 194 mill. € were disbursed.

The ICI objectives are to:

- First, in mitigation of climate change, provide an example for the implementation of the Bali Action Plan focusing on the implementation of measurable, reportable and verifiable (MRV), demonstrating that the transition to a Low Carbon Economy is doable and economically viable,
- Second, to promote REDD+, and
- Third, to contribute to climate change adaptation.

Types of projects ?

- development and implementation of (national) emission reduction strategies
- renewable energies, energy efficiency
- emissions reduction in the transport sector
- support and further enhancement of the carbon market

- monitoring and accounting systems for mitigation actions
- substitution / mitigation of non CO₂-GHG

Activities include:

- Investment support through grants and concessional loans for pilot projects
- Technical cooperation, transfer of know-how, access to technology
- Policy support (regulation, implementation)
- Capacity development and awareness-raising

Role of German Environment Ministry in the projects ?

- Close monitoring
- Up-scaling of innovative approaches where feasible
- Supporting the visibility of projects.

II) Let me now come to part II, the transport challenge.

Transport is

- a fast growing sector in most developing countries and
- the largest end-user of energy in many developed countries.
- And no matter if we look to Europe, Asia or elsewhere: Transport is highly dependent on fossil fuels and hence a significant contributor to climate change.

While after 1990 emissions from passenger transport in Germany rose quickly, Germany finally managed to break this trend in 2000. Since then, greenhouse gas emissions from transport are slightly declining.

This is a first success – however, the challenge remains huge: A robust climate deal will definitely require a decrease of transport related emissions in industrialized countries and, at the same time, a slow-down of current emission trends in the developing world.

Given that transport is responsible for about 1/4 of the energy-related CO₂ emissions and that this share is still going to increase, the sector is one of the main contributors to climate change.

Particularly worrying are the freight transport and the international transport modes since they reveal a very strong growth in emissions. In addition, it needs to be considered that 95% of the transport sector is dependent on oil.

Hence, the German Environment ministry subscribes to the approach of decarbonising transport, as only a cross-sector approach including a significant emission reduction from transport would be reasonable.

How? In principle, a broad mix of instruments and incentives is needed so that the transport sector contributes its share to climate protection. Technical measures alone would not deliver the efforts to achieve the reduction goals. You may call it a three-part mantra:

avoid – shift – improve.

As some of you may recall, Germany committed itself back in December 2007 to reduce its CO₂ emissions by 30% by 2020 compared to 1990. This was part of the German Integrated Energy and Climate Program, which includes market incentives on renewable energy and measures to support sustainable transport.

In transport, major policies at the national level include:

- The National Sustainability Strategy: The German government strives for sustainable development in terms of the economy, ecology, and social issues. Its policy is based on a long-term, global perspective that spans the generations.
- The Freight Transport and Logistics Master Plan: in July 2008 the German government approved a systematic and intermodal transport policy approach. One of the predominant objectives of this integrated approach is to cope with the drastic rise of freight traffic due to increasing globalisation and therefore make the transport system as a whole more efficient and to further reduce CO₂ emissions.
- An eco-tax which was introduced in 1999 (electricity consumption tax with exemptions for RE). It allows external effects to be internalised, on the one hand, while on the other hand tax revenue can also be generated. It currently asks 20 EUR per Mwh and generated 6 billion EUR in 2009.
- The vehicle tax for new passenger cars in a revised form: It has been based on CO₂ emissions since mid 2009.
- A toll scheme for lorries above 12 t GVW, from 1 January 2009, with further differentiation according to emission category and particulate matters reducing systems has been in effect
- The National Cycling Plan 2002-2012, which covers, amongst other things, the development and extension of cycling infrastructure, which is vital in enabling cycling to become an attractive alternative to car journeys for short trips and, in addition, improves health.

The German Ministry for Environment's projects in transport strongly reflect the idea of efficiency. Let me highlight just one initiative: The National Development Plan for Electric Mobility.

Here, we are trying to put existing – and sometimes unavoidable – transport needs on a more sustainable base. For us, this implies the smart integration of renewable energies as well as full recyclability for instance.

It is also crucial that we integrate the use of electric vehicles into sustainable transport concepts. In Germany, with its rather comprehensive rail network, long-distance journeys can easily be taken by train. E-vehicles could then be used for short trips and as city cars.

As well as considering technical developments, meaning the hardware, improved mobility services are needed, especially by public and private collective transport systems. Discussion on this has only just begun.

III) Let me finally allude to a – from our point of view – important process going on at the global level: the current two-year cycle of the UN Commission for Sustainable Development.

Transport is one of the key topics in 2010 and 2011 and this is the first opportunity since 2001 to discuss the transport challenge within this important framework.

The German Environment Ministry therefore includes transport projects that target sustainable mobility also in the framework of the International Climate Initiative.

India will have the third transport project out of this programme – after China and Ukraine.

We are looking forward to an ambitious and fruitful project.

Thank you for your attention.

Low Carbon Transport for India

P.R. Shukla
Indian Institute of Management
Ahmedabad, India

Presented at
Workshop on "Developing Low Carbon Transport in India"
New Delhi, November 12, 2010

Indian Institute of Management, Ahmedabad, India



Agenda

1. Low Carbon Transport: Trends and Projections
2. Low Carbon Transport: Options and Policies
3. Conclusions: Sustainable Low Carbon Transport

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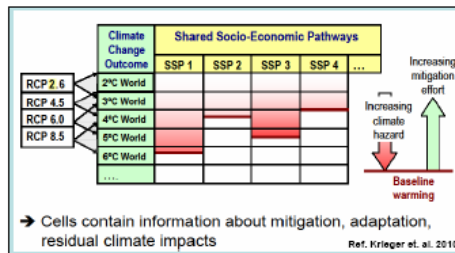


Climate Stabilization Target and Scenarios

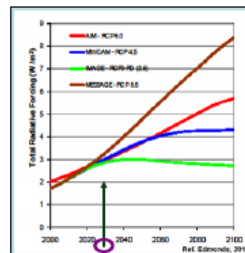
Copenhagen Accord

2°C Temperature Stabilization Target

IPCC Representative Concentration Pathways (RCPs)



Emission Paths for RCPs



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INDIA: National Climate Change Action Plan

8 National Missions:

1. **Solar Energy** (20 GW by 2022; 2 GW off-grid; 20 m sq. m collectors)
2. **Enhanced energy efficiency** (Avoided capacity of 19000 MW by 2014-15)
3. **Sustainable habitat**
4. **Water Sector** (20% water use efficiency improvement)
5. **Sustaining the Himalayan eco-system**
6. **A "Green India"** (20 Mil. Hectare afforestation by 2020; Forest cover from 23 to 33%)
7. **Sustainable agriculture** (micro irrigation promotion in 40 m ha)
8. **Strategic knowledge for climate change**

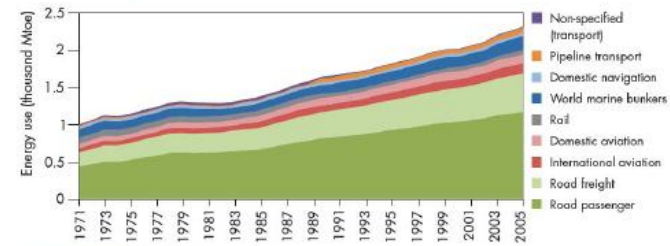
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Low Carbon Transport: Trends and Projections

Global Transport Energy Use

Figure 1.1 World transport energy use by mode, 1971-2006

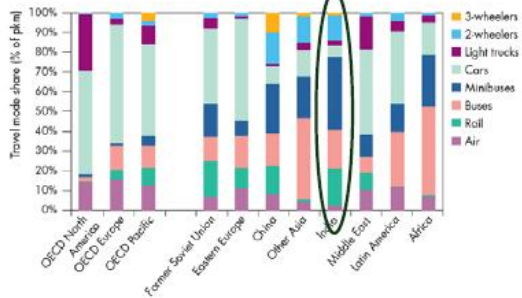


Key point

Transport energy use has more than doubled since 1971, and has been dominated by road transport. (IEA, 2009)

Motorized Passenger Transport Split

Figure 1.4 Motorised passenger travel split by mode, 2005



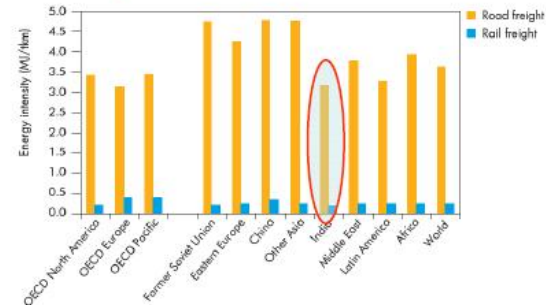
Source: IEA Mobility Model database estimates.

Key point

Passenger travel shares on a passenger-kilometre basis in OECD regions are primarily met by passenger LDVs, while in non-OECD regions buses provide a majority of passenger travel. (IEA, 2009)

Freight Energy Intensity: Truck vs. Rail

Figure 6.4 Energy intensity, truck and rail, by region, 2005

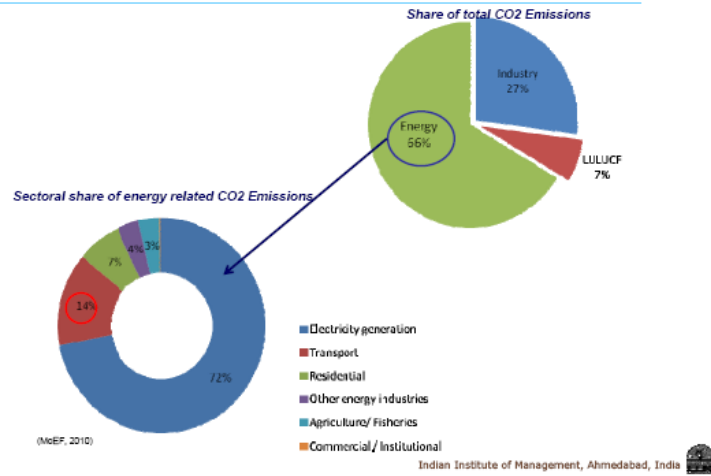


Source: IEA MoMo data and estimates.

Key point

Energy intensity (expressed in units of energy required per ton) of rail freight transport is just a fraction of the energy intensity for road freight. (IEA, 2009)

Transport in India's Carbon Emissions



Low Carbon Transport: Options and Policies

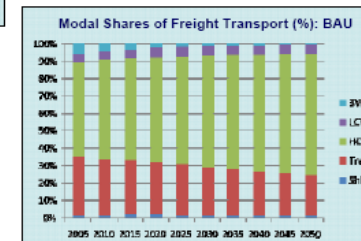
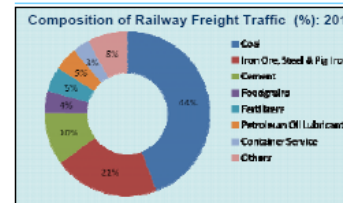
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Low Carbon Transport: Technology Choices

- **Infrastructures**
 - Surface Modes: Rail, Road, Pipelines (Oil, Gas)
 - Air (Aviation)
 - Water (Ports, Dams, Canals)
 - Wires (Electricity T&D, Communication)
- **Energy-use Technologies**
 - Conservation (Bicycles, Walkways)
 - Efficiency (Vehicles)
 - Fuel Switch (Ethanol, Electric Car)
- **Soft Solutions**
 - Planning: Urban design (Compact Cities); Industry locations (DMIC)
 - Information Technologies (Telecommuting)
- **End-of-Pipe CO₂ Removal: CO₂ Transport Pipelines for CCS**

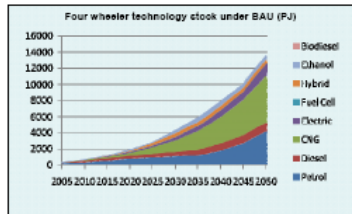
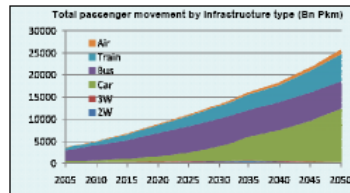
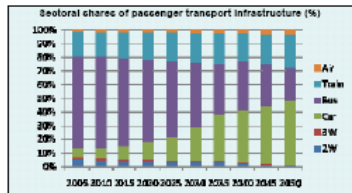
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BAU: Freight Transport Infrastructure



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BAU: Passenger Transport Trends

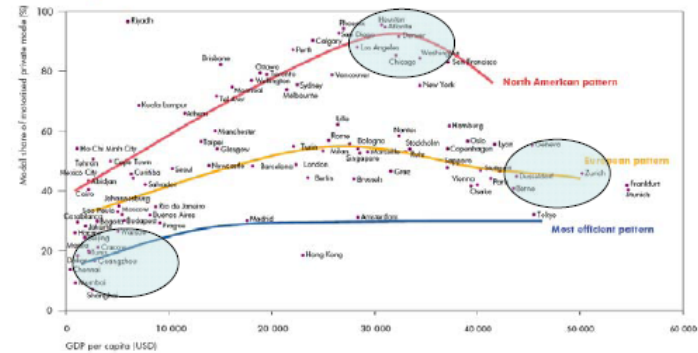


- Substantial rise in transport demand
- Rapid increase in personal vehicles (4W)
- Unsustainable shifts
 - 2W to Car (income effect)
 - Bus to Car (supply constraint)
- Technology Penetration
 - CNG vehicles
 - Some advance technologies

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Income and Motorization: Alternate Patterns

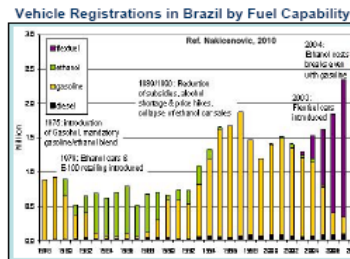
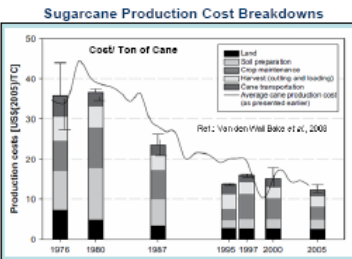
Figure 15.11 Relationship between GDP per capita and motorised modal share



Source: UITP, 2006 (Courtesy of STRA); IEA, 2009

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Ethanol in Transport: Brazil



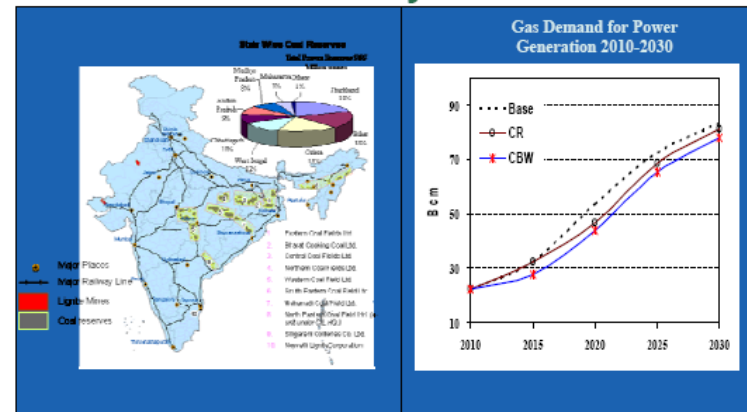
Ethanol for Low Carbon Transport: Issues

- CO₂ Mitigation (+++)
- Food (-) Vs. Energy Security (+)?
- Water Stress (-)
- Deforestation (-)

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Infrastructures to Overcome Lock-ins - 1

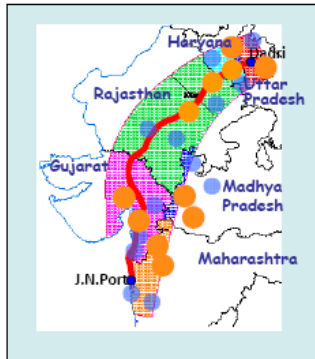
Coal by Wire



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Infrastructures to Overcome Lock-ins - 2

Train Corridors

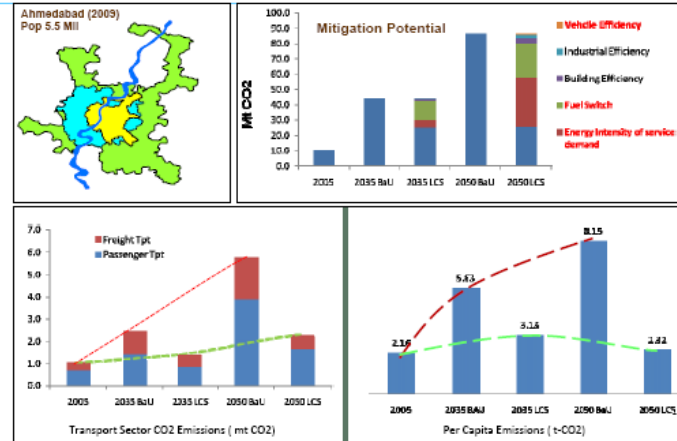


- Sustainable modal shift
- Efficient logistics
- Infrastructures investments
- Associated development



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Co-benefits in City Planning: Ahmedabad



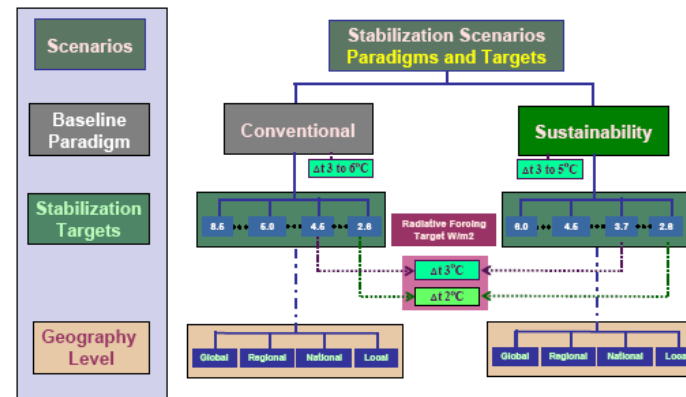
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Conclusions:

Sustainable Low Carbon Transport

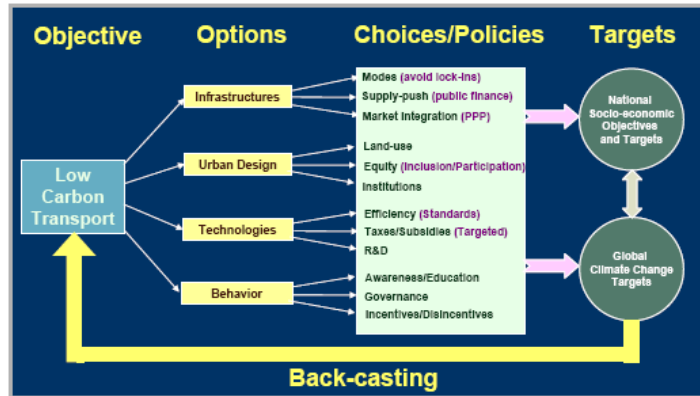
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Climate Stabilization and Sustainability



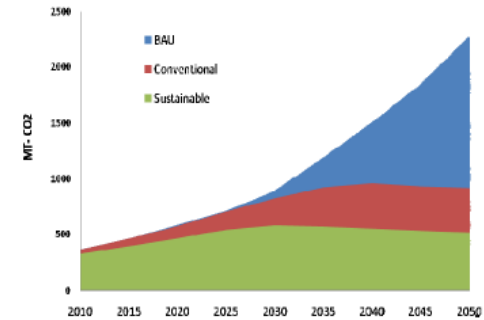
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Sustainable Low Carbon Mobility Framework



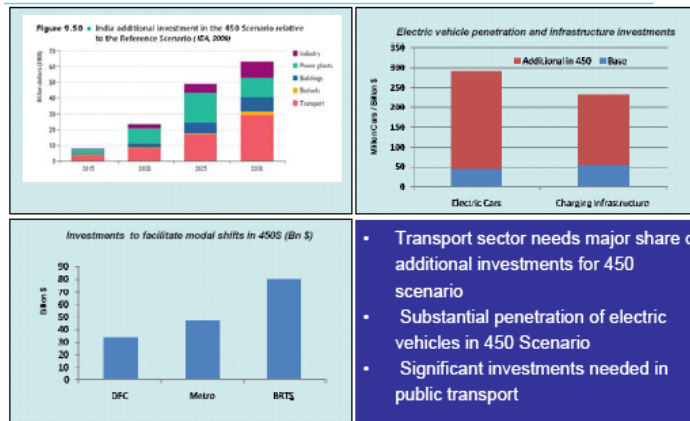
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Transport Emissions (2010-2050): India



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Transport Investments 2010-2050: India



- Transport sector needs major share of additional investments for 450 scenario
- Substantial penetration of electric vehicles in 450 Scenario
- Significant investments needed in public transport


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Thank You

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UNEP's Transport Programme

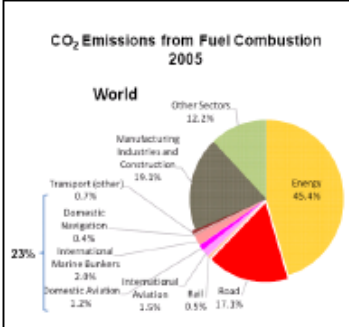
Rob de Jong
Head
Transport Unit
United Nations Environment Programme



Transport contribution global GHG emissions

CO₂ Emissions from Fuel Combustion 2005

World




Sector	Percentage
Energy	45.4%
Other Sectors	12.2%
Manufacturing Industries and Construction	10.2%
Road	17.3%
Transport (other)	0.7%
Domestic Navigation	0.4%
International Maritime bunkers	2.8%
Domestic Aviation	1.2%
International Aviation	1.5%
Rail	0.5%

23%

By 2050 – one third? More?

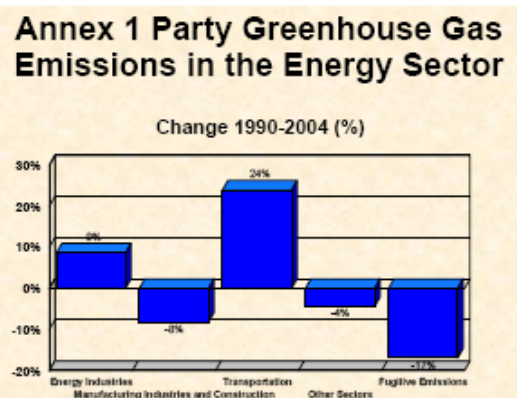
Source: OECD, 2005




Transportation GHG Emissions Growth (IPCC, 2005)

Annex 1 Party Greenhouse Gas Emissions in the Energy Sector

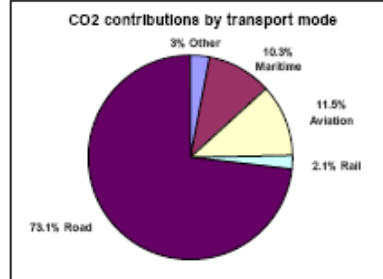
Change 1990-2004 (%)




Sector	Change 1990-2004 (%)
Energy Industries	9%
Manufacturing Industries and Construction	-8%
Transportation	24%
Other Sectors	-4%
Fugitive Emissions	-13%



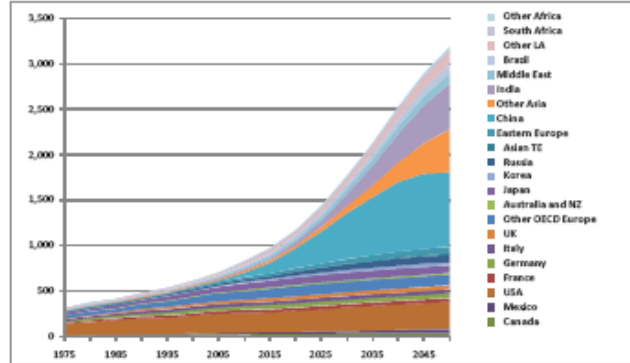
CO₂ Emissions Road Transport



Mode	Percentage
Road	78.1%
Aviation	11.5%
Maritime	10.3%
Other	9%
Rail	2.1%

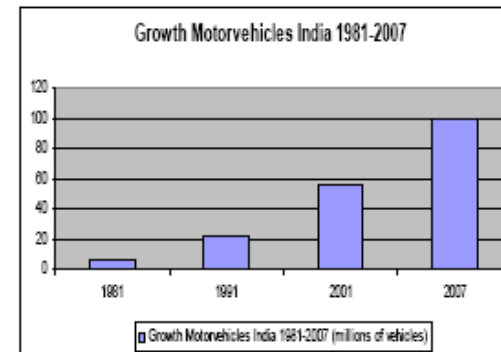


Growth Global Motor Vehicle Fleet

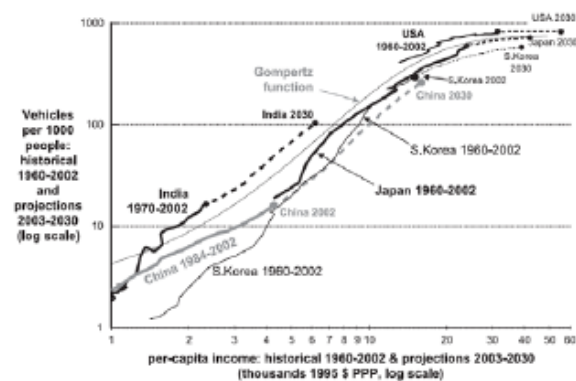


Source: IEA, 2009

India's Motor Vehicle Fleet



India's Motor Vehicle Fleet - 2



Adapted from : Dargatzis, Jayne, Dermot Gately, and Martin Sommer (2007), "Vehicle Ownership and Income Growth, Worldwide: 1960-2000," *The Energy Journal*, 28 (4), 143-70.

UNEP's Strategy

- AVOID** – interventions that avoid transport and emissions from transport while still serving to facilitate overall mobility of people, goods and information;
- SHIFT** – shift from more energy intensive and environmentally harmful modes of transport to less polluting and more efficient modes;
- CLEAN (IMPROVE)** – reduce the impact of modes by cleaning up transport modes through technology, policy and planning approaches.

For any strategy to succeed a combination of the above is necessary


UNEP's Main Transport Programs

Overarching:

- UNEP's Green Economy Initiative
- UNEP Climate Mitigation programme

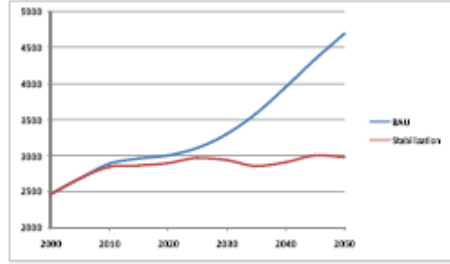

Specific focus areas:

- 1- Cleaner and more efficient fuels and vehicles
 - Partnership for Clean Fuels and Vehicles (PCFV) – promoting cleaner fuels and vehicles to reduce urban air pollution
 - Global Fuel Economy Initiative (GFEI) – vehicles and climate change – national efficient vehicles policies
- 2- Investment in sustainable transport infrastructure
 - Share the Road (StR) – investment for non motorized transport road infrastructure
 - BRT public transport – investment in public transport infrastructure



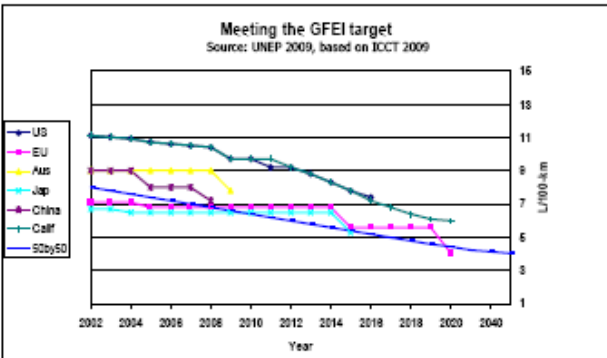

Example: Vehicle Efficiency

World CO2 emissions, business as usual vs GFEI 50by50 intervention (IEA 2009)

Example: Vehicle Efficiency- 2


Meeting the GFEI target
Source: UNEP 2009, based on ICCT 2009

India - Opportunities

Fuels & Vehicles:

- ~6 l/100 km today, can go to below 5 in coming years....
- Voluntary labeling, next year mandatory
- Fuel economy standards in the making..
- Diesalisation increasing – promoted? Fuel quality?
- <4l/100km in coming decades is possible





India – Opportunities

Public and NMT:

- Public transport loosing share
 - Metro/ rail/ BRT systems being introduced – need wide replication
 - NMT also loosing share
 - Need for better infrastructure
-
- Comprehensive plan towards low carbon transport sector



Thank you for your attention

Rob de Jong

rob.jong@unep.org





Promoting Low Carbon Transport in India

Project Inception Workshop
12 November, 2010
New Delhi

Supported by:



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



Key Facts

- **Budget:** € 2.49 million
- **Duration:** 2010 – 2013 (3 years)
- **Implementing Agency:**
 - United Nations Environment Programme (UNEP)
- **Implementing Partners:**
 - UNEP Risoe Centre, Denmark
- **Along with :**
 - IIMA: Indian Institute of Management, Ahmedabad
 - IITD : Indian Institute of Technology, New Delhi
 - CEPT University, Ahmedabad



Context

- **Climate Challenge**
 - How to stabilize at **2 deg C?**
 - Indian GHG Emissions 1727.71 mtCO₂ in 2007 (MoEF, 2010) but **per capita emissions below world average** (1.7 tCO₂)
 - Transport sector – **2nd largest contributor to CO₂ emissions** in India
- **Drivers**
 - **Modal switch** towards road transport
 - Growth in **vehicle population** faster than economic growth (MoRT&H)
 - High share of **two wheelers**
- **Local challenge**
 - **Local air quality** has deteriorated in most of Indian cities (New pollutants like NO_x, Ozone, etc) (CSE)
 - **Road accidents /fatalities** have increased with increasing vehicle populations (MoRT&H)
 - **Informal sector and poor** have ignored in formal transport planning
 - **Congestion**



National Policies

- **National Action Plan on Climate Change**
 - Sustainability approaches, e.g., promotion of **public transport**, greater use of bio-fuels, improvement of **vehicle efficiency**, etc.
- **Jawaharlal Nehru National Urban Renewal Mission**
 - Focused on creating urban **infrastructures** – roads, highways, expressways, MRTS, Metros, etc.
- **Auto fuel policy** – Road map for improving vehicle emissions
- **Fuel economy standards and labelling** -





Project Objectives



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



Scope – National Level



- A Transport Action Plan
 - **Sustainability Indicators** pertinent to 'Sustainable Transport Services' in India.
 - National level **assessment of transport sector**
 - **Case studies** of existing and under implementation projects.
 - A **Road Map** of technology needs, related R&D and technology transfer, finance and pathways for international cooperation.
 - **Policy recommendations** for achieving a sustainable transport system.



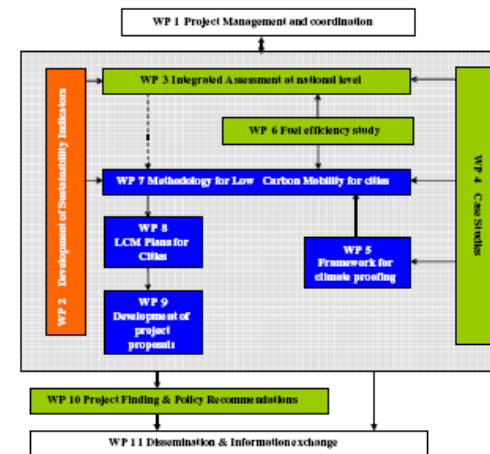
Scope City Level



- Low Carbon Mobility Plans
 - A **methodology** for developing low-carbon mobility plans at city level.
 - Development of **mobility plans (upto 4 cities)** which identify appropriate infrastructures and technologies for reduction of CO₂ emissions and adaptation to climate change impacts
- Project Proposals



Work Packages





Project Partners in India



Indian Institute of Management, Ahmedabad



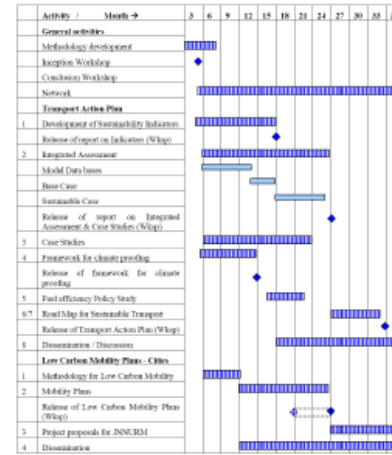
Indian Institute of Technology, Delhi



CEPT University, Ahmedabad



Workplan

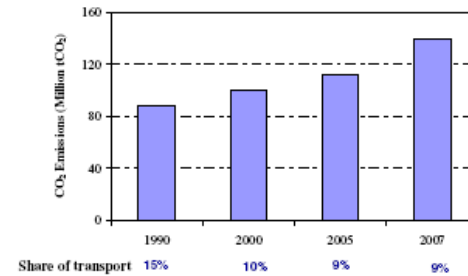


Thank You

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CO2 Emissions from Transport



[Return](#)









PROMOTING LOW CARBON TRANSPORT IN INDIA

Project inception workshop
12 November, 2010
New Delhi

Supported by

 Ministry of Environment, Forest and Climate Change
 Government of India


SUSTAINABILITY INDICATORS FOR TRANSPORTATION

- Definition of sustainable transportation
- Why sustainability indicators for transportation
- Selection of indicators/set of indicators
- Data ability and reliability
- Conclusions









Meets the needs of the present without compromising the ability of future generations to meet their own needs.

World Commission on Environment and Development (WCED),
Brundtland Commission, 1987





A SUSTAINABLE TRANSPORTATION SYSTEM: DEFINITION

Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.

Is affordable, operates fairly and efficiently, offers a choice of transport mode and supports a competitive economy, as well as balanced regional development.

Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.

European Council of Ministers of Transport (ECMT), 2004










GOALS OF THE PROJECT

- ❑ Creating an enabling environment for coordinating policies at national level to achieve a sustainable transport system and building the capacities of cities in improving mobility with lower CO₂ emissions.
- ❑ Deliver co benefits besides reduced CO₂ in the form of improved choices for transport consumers, better local environment, good health, economic growth and social development.




WHY SUSTAINABILITY INDICATORS FOR TRANSPORTATION

The use of sustainability indicators for transportation allows to measure:

- ✓ progress towards objectives/goals
- ✓ long-term economic, social and environmental impacts of short-term decisions
- ✓ performance of the system and comparison between systems

By focusing on:

- social welfare outcomes, such as human health, education, etc. rather than pure economic performance
- economic, social and environmental impacts of transportation








SELECTION OF SUSTAINABILITY INDICATORS FOR TRANSPORTATION

- A system may be sustainable if evaluated by a set of indicators while unsustainable if evaluated by another set of indicators
- A system may be sustainable at the national level but not at the city level
- Indicators should be easy to understand and useful to decision-makers
- Indicators should reflect long-term impacts rather than intermediary impacts

A set of indicators should include major categories such as:


- ✓ transport cost efficiency (economic)
- ✓ equity and affordability (social)
- ✓ pollution emissions (environmental)

Example of impacts to be reflected in a set of sustainability indicators for transportation

Economic	Social	Environmental
Accessibility	Equity	Air pollution
Traffic congestion	Impacts on mobility disadvantaged	Climate change
Infrastructure cost	Affordability	Noise pollution
Consumer costs	Human health impacts	Water pollution
Mobility barriers	Community cohesion	Hydrologic impacts
Accident damages	Community livability	Habitat & ecological degradation
Depletion of non-renewable resources	Aesthetics	DNRR

Utman & Burwell, 2006



Development of indicators by institution:

IIMA: development of sustainability indicators in a long-term context at the national level

IITD: development of sustainability indicators at city level

CEPT: Development of indicators to measure inclusiveness of transport systems

DATA AVAILABILITY AND RELIABILITY

- Important to select indicators for which data collection is feasible and adequate

Collected data should meet minimum requirements like:

- ✓ Accuracy
 - ✓ Transparency
 - ✓ Frequency
 - ✓ Up to date
 - ✓ Availability
- Collected data should be standardised to allow for comparisons
 - Data should allow for disaggregation when needed so it can facilitate various types of analysis

CONCLUSIONS

- ❑ A set of sustainability indicators is a useful tool for improved transportation planning, particularly for transport planning which incorporates the various dimensions and long-term impacts
- ❑ There is no predefined or standard set of indicators
- ❑ Important to spend time developing a set of indicators that best reflects local perceptions of sustainability
- ❑ Important to spend time identifying and collecting the appropriate data for the indicators

Thank you very much

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Inclusive Transport

Darshini Mahadevia

Faculty of Planning & Public Policy & Centre for
Urban Equity

CEPT University, Ahmedabad

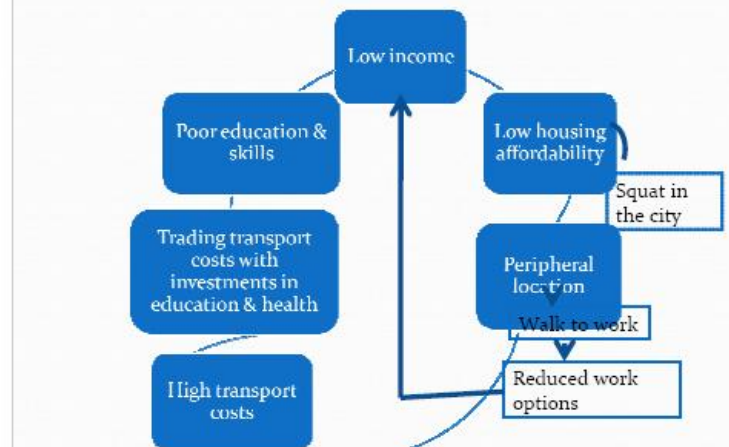
Paper presented at the Workshop on
Promoting Low Carbon Transport in India
organized by UNEP RISO, IIMA, IITD and CEPT University

November 12, 2010

Sustainable Cities

- An 'Inclusive Approach' that is pegged on four pillars:
 - (i) Environmental sustainability,
 - (ii) Social equity,
 - (iii) Economic growth and
 - (iv) Political empowerment (of the disempowered).

Vicious cycle of poverty



Transport & Urban Poor - Metros

- Land market dynamics (speculative land market) have led to urban sprawl.
- Thus, the cost of travel, especially for the poor, has increased considerably (NUTP, 2006).
- Long distances to commute dissuades people from using cheaper non-motorized modes like cycling and walking.
- Increase in private vehicles on one hand and lack of infrastructure has made non-motorized mode of transport risky.
- Thus, poor's access to livelihood have become far more difficult.
- In particular, women from the low income settlements find it difficult to access work
- Spaces for vending are vanishing on account of public transit systems as well besides competing demands of private vehicular traffic and parking

Environmental sustainability vs social sustainability

- Green Agendas have Conflicted with Habitat Agenda – BEAG PILs, middle class environmentalism vs Right to Shelter
- Example of BRTS, Ahmedabad – 2000 vendors displaced
- 72.2 per cent urban workers in all India (NSSO 2007), many of these are working on the street
- Formal vs informal transport modes

Consumption Expenditure change

Item	1993-94		2004-05		Real GR (%)
	Bottom 50%	Top 50%	Bottom 50%	Top 50%	
Conveyance	2.0	5.6	3.3	7.6	5.3
Rent	2.3	4.8	3.0	6.6	3.0
Consumer tax & cess	0.4	0.6	0.7	0.9	6.1
Educational expenses	2.1	5.0	2.8	5.8	3.2
Medical	3.5	5.0	3.9	5.6	1.5
Food	67.0	50.1	56.8	37.8	-0.8
Non-food	33.0	49.9	43.2	62.2	3.2
Total	100.0	100.0	100.0	100.0	0.7

Gender dimension

- Multiple roles – social reproduction + economic production
- Link between the two sectors is very close
- Seek proximity in location – mixed land use and heterogenous neighbourhoods
- Urban planning paradigm is masculine, segregating place of production from place of reproduction
- Women from low income households drop out of labour market in case of displacement
- Downward spiral of poverty
- Culture deters women's freedom to use some certain non-motorized modes
- Lack of affordability forces women to trade money with time

Definitions of Poverty

- Income poverty
- Expenditure poverty
- Lack of capabilities and functionings
- Multidimensional deprivations
- Time Poverty
- Energy Poverty

Poverty and transport linkages

Poverty Definition	Linkage with transport
Income poverty	Lack of accessibility exacerbates income poverty
Expenditure poverty	Transport expenditure crowding out other expenditure
Lack of capabilities	Lack of accessibility to social services deterrent in improving capabilities
Lack of functionings	On account of lack of accessibility to employment opportunities, health care, education, etc.
Multidimensional deprivations	Often caused by lack of accessibility
Time poverty	Caused by inappropriate transport paradigm, which emphasizes mobility but not accessibility & causes fatigue and unfavourable time allocation
Energy poverty	Caused by substituting unaffordable transport options by walking (long distances)

Inclusive transport parameters

- Accessible to all for all activities – age groups and income groups differentiated by gender
- Affordable
- Efficient time-use
- Safe
- Environmentally sustainable

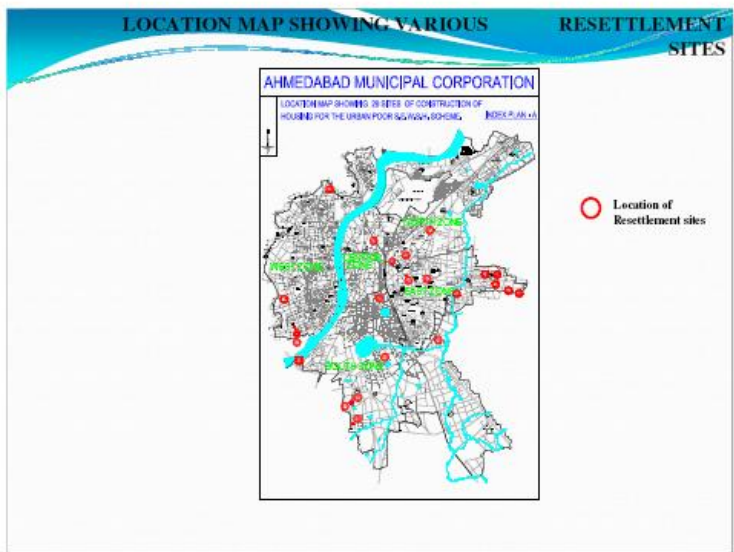
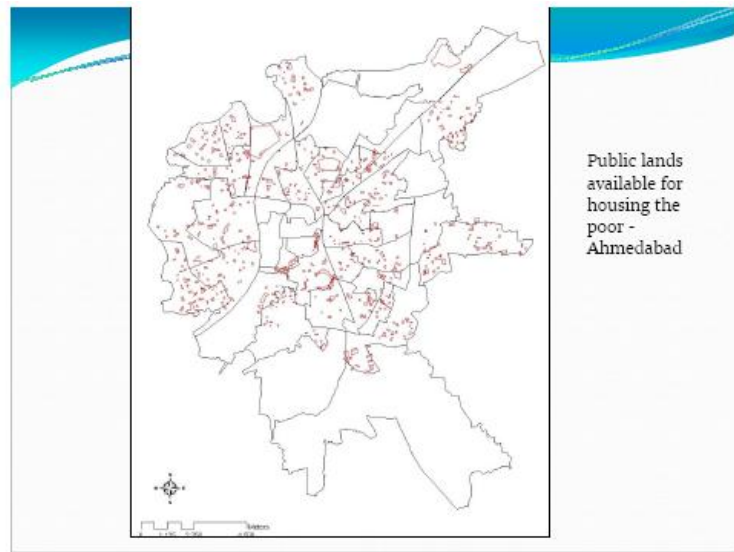
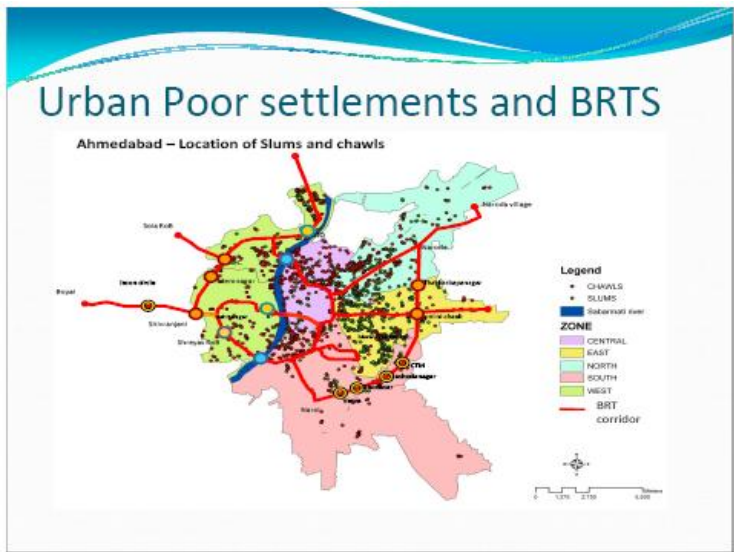
Inclusive transport contingent upon

- Land use planning, density and urban structure
- Land policies and regulations
- Shelter policies (e.g. Rajiv Awaas Yojana proposes 85% slums to be in-situ development minimising dislocations)
- Employment situation and policies
- Most important on macroeconomic development paradigm

Conversely

Inclusive transport policies and options should feed into:

- Land use policies
- Urban form policies including densities
- Urban design
- Shelter policies
- Urban land policies
- Infrastructure decisions





Low Carbon Mobility Plans for Cities

Geetam Tiwari

(TRIPP)/ Civil Engineering Department, Indian Institute of Technology

Workshop Promoting Low Carbon Transport in India, 12 th November, 2010 ,Delhi



Low Carbon Transport Mobility Plans

Reconciling development and GHG agenda

Access to goods and services for all inhabitants of the urban area

Global concern of CO2 and local health concerns

IIT Delhi 2010

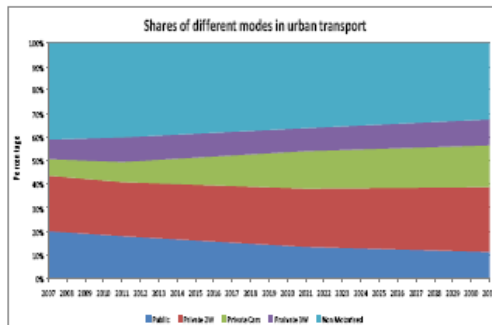


Modal share trends in BAU 2007-2031

BAU: Road expansion in cities investment in rail based public transport

Bus and NMV share expected to decrease (~25% & 30%)

Car and two wheelers expected to increase (~20% and 25%)



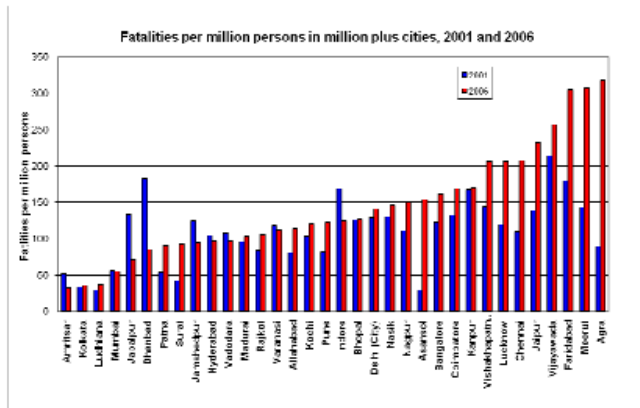
IIT Delhi 2010



Does the modal share trend meet sustainability criteria?

Local Health concerns?

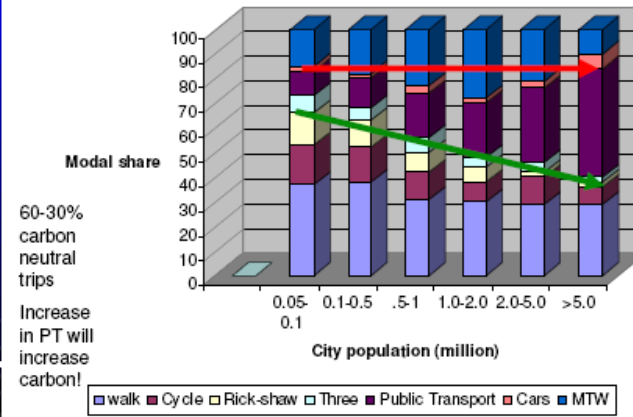
Global CO2 Concerns?



IIT Delhi Oct-09

Urban Mobility

PT and NMV based, MTW majority personal vehicles



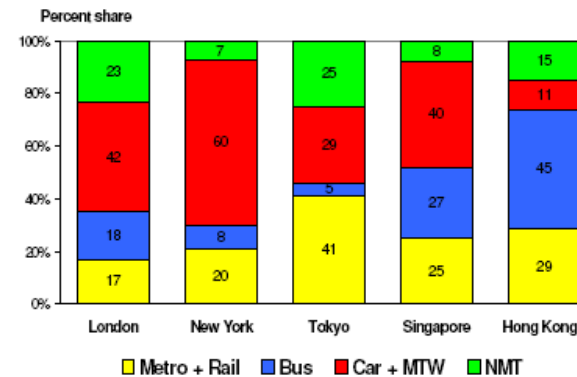
Heterogeneity within Urban Areas

City category (population in million)	CO ₂ tons/person/year	ratio of CO ₂ tons/person/year wrt megacities	Total no. of cities	% of Total population in different cities	CO ₂ tons/year	% of total CO ₂ emission in different cities
1(<5)	0	1073.5	4208	53	3983350	0.2
2(5-1)	0.05	6.5	39	10	1575900	6.4
3(1-2)	0.09	3.5	22	10	2196706	11.7
4(2-4)	0.07	4.6	6	6	1456916	5.2
5(4-8)	0.12	2.8	4	8	2634193	12.3
6(>8)	0.34	1	3	15	11218937	64.2

Large cities(> 8 mill.) have 15% population and contribute 64% of CO₂ emissions, .34 tons/person/year, 1000 times more than the smallest category cities (53% population)
 Medium size cities(2-4 mill.) have 14% population, CO₂ emission 3-4 times less, high growth rate in private motorised trips
 Small cities(.5-2 mill) are dependent on paratransit modes (motorised and non motorised)

IIT Delhi 2010

Travel patterns – old world cities



IIT Delhi 2008



Lessons from International Experience

- “Sustainable” cities in Europe have high car use

City	Modal share, percent		
	Car + MTW	PT	W&C
Bristol, UK	65	12	23
Leeds, UK	61	36	3
Nantes, France	56	14	28
Helsinki, Finland	54	20	26
Marseille, France	53	12	35
Edinburgh, UK	52	29	19
Newcastle, UK	48	19	33
Brussels, Belgium	44	18	38
Frankfurt, Germany	42	21	37
Stuttgart, Germany	36	25	39
Amsterdam, Neth's	32	16	52

NO INDIAN CITY HAS CAR USE MORE THAN 15%

IIT Delhi February 11

Interventions for different cities

- Category 6 requires intervention in PT and NMV systems. Current users are captive users likely to shift to other modes with increase in incomes vehicle ownership.
- Category 5 cities account for low per capita emissions at present, however, these are witnessing fast growth in ownership and use of motorized two wheelers. Modal share of bicycle has been reducing in the last 20 years
- Category 2, 3 and 4 cities are dependent on bicycles, rickshaws and intermediate public transport systems. These cities require improvement in infrastructure for non motorized vehicles and improvement in the technology and operations of intermediate public transport systems.



Possible strategies for Level 6 cities

Large cities (> 8 mill.) have 15% population and contribute 64% of CO2 emissions, .34 tons/person/year, 1000 times more than the smallest category cities (53% population)

Possible Impact on CO2

(Woodcock J et al. Lancet, 2009)

London Population 2006 = 7.5m 2030 = 9.0m Delhi Population 2004 = 14.8m 2030 = 26.0m	London			Delhi		
	Aggregate Transport CO2 Emissions (tonnes)	Transport CO2 Emissions Per Person (tCO2/person)	CO2 Emissions Reduction on 1990 (%)	Aggregate Transport CO2 Emissions	Transport CO2 Emissions Per Person (tCO2/person)	CO2 Emissions Increase on 1990 (%)
2006 London 2004 Delhi	9,647,900	1.3	-2.50%	6,146,651	0.4	97%
2010 BAU	9,935,897	1.3	0%	8,268,298	0.5	165%
2030 Scenario 1 BAU	10,381,318	1.2	-4.80%	19,550,693	0.8	526%
2030 Scenario 2 LCD	6,480,263	0.7	-39%	17,069,668	0.7	447%
2030 Scenario 3 AT	6,120,306	0.7	-43%	10,458,736	0.4	235%
2030 Scenario 4 ST	3,608,228	0.4	-65%	9,327,207	0.4	199%

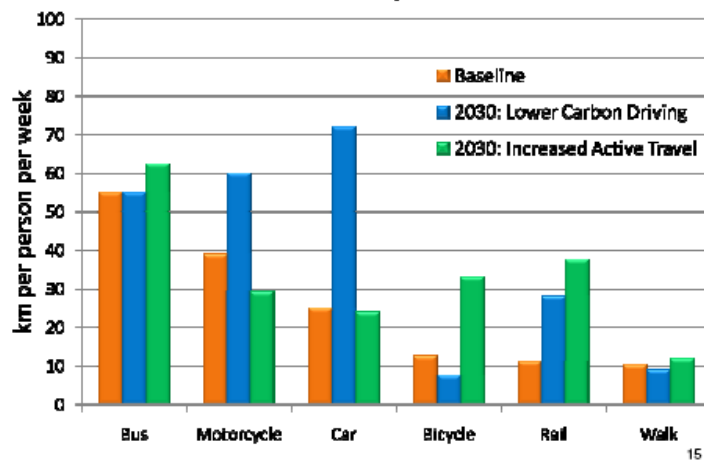
Possible scenarios for Delhi

- **Business as usual scenario:** Projection of existing trends and no coherent strategy to reduce the increase in the use of cars, but *includes an anticipated increase in rail use.*
- **Lower-carbon-emitting vehicle scenario:** relies on implementation of vehicle technologies along with alternative fuel usage and *an anticipated increase in rail use.*
- **Increased active travel scenario (walk and cycle):** a reversal of present trends is assumed with a small increase in the distance walked and more than double increase in distance cycled, *a large increase in rail use* and small increase in bus use. Policy interventions include substantial investment in infrastructure designed for pedestrians and cyclists rather than for cars, carbon rationing, road pricing, traffic demand management, restrictions for car parking and access, reduced speed limits

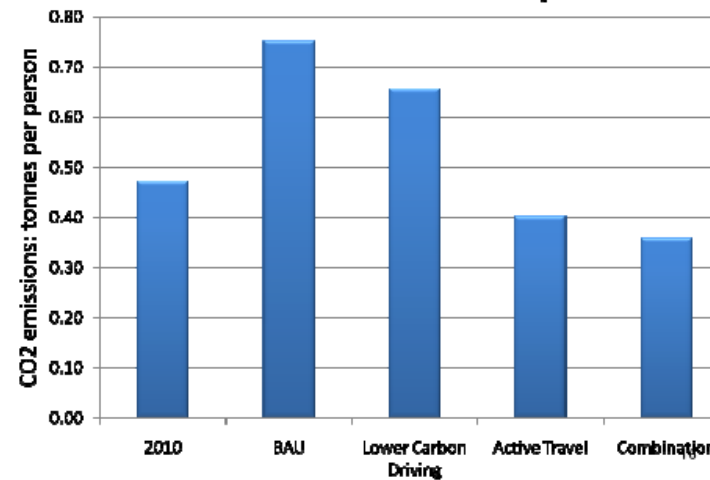
Possible scenario for Delhi cont.

- **Sustainable transport scenario:** lower emissions from motorized vehicle and low car use from active travel scenario. Policy change would require high-intensity implementation and effectiveness of all measures. Further reduction could occur through use of electric vehicles with energy from low-carbon sources; shorter-distance trips; and continued shift from car use to walking or cycling.
- **Short distance active travel scenario:** In this scenario, it is assumed that the same motor vehicle distances are travelled as in the sustainable transport scenario but only half the increase in distances walked and cycled. This scenario represents less travel and shorter travel distances than in the other scenarios.

Delhi travel patterns



Delhi CO2 emissions transport



Lessons for low carbon mobility plans

- Modal shares in favour of NMT and PT is more effective than technology alone:
 - Retain PT and NMT trips
- PT and NMT must be integrated
- Pedestrians and cyclists have the right to direct, pleasant and safe routes
- Restrict private motor vehicles:
 - speed, road space and convenience

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Low Carbon Transport & GHG challenges in Urban India

Development and modernity is associated with technology (fuel, automobile, metro rail)

External financing favours large construction projects (metro vs buses)

Zero emission modes, walking and cycling have no "market value" i.e. financing through land development or loans not possible, hence no takers!

Successful public transport projects are those which do not affect the cars adversely not just benefiting the bus commuters!

Appendix 3: List of participants

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Appendix 4: Workshop photos

