Recent trends in sustainable transportation planning*

The *Homo sapiens* has come a long way in his endeavour to provide himself with an efficient and comfortable means of transport – from the time of relying on his limbs to walk and run to being flown to different continents on the same day. This progress comes with the side-effects of resource consumption and pollution with accompanying mental and physical health hazards. With the growing visible impacts of climate change and traffic congestion, people have been looking into sustainable transport systems especially to cater to the growing population in cities.

In this backdrop, a three-day workshop on ‘Recent trends in sustainable transportation planning’ was organized. The purpose of the workshop was to ‘build capacity of the senior level technical officers; to understand recent trends of sustainable transportation planning and traffic engineering; and arrive at transport solutions which are effective and sustainable’.

The coordinator Ashish Verma (Indian Institute of Science (IISc), Bangalore) and the convener of the workshop T. G. Sitharam (IISc) pointed out the importance of sustainable transport in the light of present congestion levels, accidents, pollution, mobility, safety and the need to address climate change issue, as 20–25% of CO₂ emissions are from road transport alone. For India, focusing on sustainable transport will also address climate change.

The chief guest M. K. Shankaralinge Gowda (Secretary to Government, Transport Department, Bangalore) communicated the outcome of a brainstorming session with The Energy and Resources Institute (TERI) on Karnataka’s transport policy. The objectives for future transport and policy would consider: (a) need for efficient long-term transportation system; (b) meeting basic transportation needs without depleting the economic and natural resource base; (c) need for inventions; (d) increased public transport share; (e) integrated land use and (f) use of clean fuels and technologies. Integrated townships, where people live and work, would reduce travel. A transport policy which is preventive rather than curative is needed.

The workshop brought together experts in the field of transportation. Ashish Verma (IISc) spoke of the problems in achieving sustainable transportation systems for Indian cities. From 1981 to 2001, population increased by 1.9 times in six major metropolises but motor vehicle increased by 7.75 times. Shortage of city bus services brings about a shift to personalized modes leading to growth of congestion, accidents, environmental problems and fuel consumption. Central government initiatives such as National Urban Transport Policy and Jawaharlal Nehru National Urban Renewal Mission, and Karnataka state government initiatives such as state transport policy, pedestrian policy and parking policy do not seem to be enough. There is need for a holistic approach for developing urban transport strategies: a top-down approach (proposed) versus bottom-up (existing).

He explained a goal-oriented methodology for urban transport strategies for Indian metro areas, which uses a top-down approach and a strategic policy framework which was formulated to achieve the vision ‘quality of life’. The method has been implemented on a pilot scale in Guwahati; a proposal has been submitted for full-scale application in Bangalore.

Verma also presented an integrated approach for optimal rail transit corridor identification using geographical information systems. The objective of the proposed model was to identify a new rail corridor which is optimum for both users and operators within the integrated mass transit planning framework. The approach has been applied to Thane city and its success shows possible application to typical Indian cities.

His next talk was on ‘influencing road safety through improved driver education and licensing’. He explained the Goal to Driver Education (GDE) matrix developed by Hatakka et al. which comprises a four-level hierarchy (goals for life and skills for living; goals for, and context of driving; driving in traffic situations; vehicle control) and three training dimensions (knowledge and skill; risk increasing aspects; self-assessment). This matrix is a useful tool to ensure that driver education covers the required goals. The Graduated Driver Licensing (GDL) system is efficient and involves three stages: learner, provisional and fully licensed. Using GDE and GDL as reference, a complete framework for driver education and licensing in India needs to be developed.

Verma also described a proposed study to develop pedestrian policy and facility design guidelines for Bangalore, integrating hawkers and street vendors. He also dealt with performance measures, viz. sidewalk capacity, quality of walking environment and pedestrian’s perception of safety (or comfort) with respect to motor vehicle traffic; and the advantages of using VISSIM (a leading microscopic simulation program for multi-modal traffic flow) for pedestrian modelling.

T. V. Ramanayya (Indian Institute of Management, Bangalore) stressed on three points related to demand and policy analysis of urban mass public transportation: (i) mismatch between demand and supply; analysis and evaluation of public transport operations; broad areas of measurement including physical, financial and quality criteria; (ii) use of Economic Value Added (EVA) framework for road transport and (iii) routing and scheduling at least every 2 years to improve viability, performance and revenue.

S. Velumurugan (Central Road Research Institute, New Delhi) emphasized that in the Latur earthquake (1993), there were 9000 deaths and 20,000 people injured whereas road accidents in India claim 100,000 deaths and 1.25 million injured, every year. He explained the steps involved in road safety audit, which is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes and

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schemes for the improvement and maintenance of existing roads. It minimizes likelihood of crashes occurring; minimizes likelihood of injury in case of crash and ensures that safety-related design criteria have been met.

He also focused on the importance of road user cost (RUC) study in highway economics, whether in the construction of a new facility or maintenance/rehabilitation of an existing facility. He discussed Indian and global RUC studies and RUC parameters such as vehicle operating cost (VOC), time cost, accident cost, VOC equations, updating RUC data and models.

T. V. Ramachandra (IISc) explained the disturbance of global energy balance due to greenhouse gas (GHG) emissions, leading to global warming and climate change. Annual GHG emissions due to transport fuels is 14%. A regional level carbon budget is required to monitor carbon mitigation for mitigation of environmental problems. He described a study conducted to quantify state-wise emissions from the Indian road transport sector which would be useful in the design and implementation of appropriate technologies and policies for GHG mitigation.

Understanding urban mobility needs and measures to modify travel demand and enhance capacity were the focus of Partha Chakraborty’s (Indian Institute of Technology, Kanpur) talk. He spoke of the growth of transport needs with the growth of settlement size; the direct impact of land use planning on transportation demand; and the effectiveness of a multi-modal public transportation system in achieving an efficient and sustainable transportation network. He also presented his work on using genetic algorithms-based methodologies to solve the urban transit network design problem (UTNDP) after explaining the difficulty faced by traditional optimization techniques in solving the UTNDP.

A methodology for Environmental Impact Assessment (EIA) of transportation projects was expounded by Dingra. He showed the application of the methodology in the Mumbai Urban Transport Project (1996), in which six transport options were compared using EIA and the best option identified. He stressed the need for future work on a ‘sustainability index’.

S. L. Dingra (Indian Institute of Technology, Bombay) also highlighted the importance of an integrated mass transit system for sustainable development, stressing on supply-demand matching and parallel-planning of transportation network and land use. He explained the SPARTACUS system (a system for planning and research in towns and cities for urban sustainability) which adds environmental and societal parameters in the old system which incorporated only land use, economy and transport parameters. He also suggested use of the Advanced Traveller Information Systems (ATIS) which show the location and frequency of buses, and Intelligent Transport Systems (ITS) which provide real-time data and traffic information.

Sujaya Rathi (Wilbur Smith Associates, Bangalore) elucidated the Bangalore Mobility Indicators-2008 study wherein mobility indicators (congestion measures, mobility measures, accessibility measures) and the corresponding composite indices on congestion, mobility and accessibility were developed for Bangalore. The indicators help in setting realistic goals, providing trend information, tracking progress of various transportation interventions, and resource allocation by prioritizing funds based on performance indicators. But regular updating is necessary. The limitations of the study are the need for more exhaustive data collection and refinement of benchmarks. Central policy suggestions from this study were to focus on: transport supply in the mass transport domain; non-motorized transport; parking needs; transportation system management/intelligent transportation system; development of transportation plans in conjunction with land use development plans; and strengthening institutional set-up.

The importance of non-motorized transport (NMT) modes in sustainable transportation was highlighted by Rajat Rastogi (Indian Institute of Technology, Roorkee). The benefits of NMT over motorized transport modes are in traffic handling capacity, space requirement, infrastructure cost, material requirement, energy consumption, environmental emission, social and environmental costs, health and accident costs, operational and congestion costs, employment and market benefits. Rastogi then discussed walkable cities, bicycle integration, employment generation, creation of environmental districts, changes in regulations influencing non-motorized vehicle (NMV) use, land-use, investment patterns and NMVs.

He also spoke of the requirement of stated preference (SP) data in addition to revealed preference (RP) data when working with travel choices. He discussed the design of SP surveys, data collection techniques, modelling frameworks and benefits of SP experiments over RP; and suggested using SP data in conjunction with RP data, and also validating it with after-study.

Gérard Hégron (Institute for Research in Urban Sciences and Techniques, France) spoke on the still-to-be invented ‘sustainable city’ and his institute’s focus on cross-disciplinary research issues including urban observatory, urban remote sensing, urban hydro-climatology modelling, urban soundscape, urban GIS and sustainable urban projects (SUP). He described a SUP project on assessment of the environmental impacts of an urban mobility plan (UMP) and their socio-economic consequences. The approach was based on multi-factor numerical simulations of a multi-modal mobility model representing a set of alternative scenarios figuring changes in UMP actions.

In his GISTUP foundation day annual lecture on ‘Urban transport in India - the journey so far and way forward’, held on 15 December 2009 at IISc, M. Ramachandran (Secretary, Ministry of Urban Development (MoUD), New Delhi) indicated that the concentration of MoUD has been on public transport especially non-motorized transport, capacity building, Comprehensive Mobility Plan and setting up of Urban Metropolitan Transport Authority (UMTA). It has supported Bus Rapid Transit System (BRTS) projects and Metro Rail projects. Responding to an audience question ‘Can we restrict cars?’, he said ‘When compelled to use public transport, then changes will come; but it will take time as ours is a society which will start acting only when it is pushed to the wall!’

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