



**ENVIRONMENT DIRECTORATE
ENVIRONMENT POLICY COMMITTEE**

**Working Party on National Environmental Policy
Working Group on Transport**

**Report on the International Conference on Environmentally Sustainable Transport in the Asian Region,
23-25 March, 2003, Nagoya, Japan**

This is the report on the proceedings of the conference, organised by the OECD Environment Directorate and jointly hosted by the Ministry of the Environment and the Ministry of Land, Infrastructure and Transport, Japan. It also includes the Nagoya Statement on Environmentally Sustainable Transport that was endorsed at the conference.

A CD-ROM with all presentations, abstracts, speakers list and background reports, is available on request to the Secretariat.

Peter Wiederkehr, Tel: +33 1 45 24 78 92; Fax: +33 1 45 24 78 76;
Email: peter.wiederkehr@oecd.org

JT00158062

Document complet disponible sur OLIS dans son format d'origine
Complete document available on OLIS in its original format

FOREWORD

The Environment Policy Committee of the Organisation for Economic Co-operation and Development (OECD) completed a multi-year project on Environmentally Sustainable Transport (EST) in 2001 and developed a set of guidelines (the EST Guidelines) for addressing the challenges of moving people and freight in an environmentally sustainable manner. In May 2001, OECD Environment Ministers endorsed the EST Guidelines and called upon the OECD to assist in the further development of strategies and processes for the implementation of the EST Guidelines and dissemination of the EST concept.

In response to this, the OECD has been holding regional workshops and conferences as a sequel to the OECD EST project in order to address critical issues for implementation of the EST Guidelines. This conference was part of these efforts and the first one for the Asian region. The lessons learned from the project and the resulting EST Guidelines served as background for this conference.

Also, the Japanese organisers had set up an expert team that prepared three background reports for the conference. The first report, “Asian Perspectives: focusing on Mega-Cities: trends, challenges and priorities for transport and environment”, showed that transport trends in the region are unsustainable. The second report was the “Environmentally Sustainable Transport Case Study for Japan” which explored the feasibility of EST in Japan through scenarios. The third report entitled “Transport related Environmental Practices in Asian Countries: detailed description of practices in Asian countries” was a compilation of a number of practical and promising policies and examples in the region.

Over 660 participants from many countries of the Asian region, Europe, and North America attended the conference including senior officials from Asian countries, representatives and experts from the transport industry, transport researchers, local governments, NGOs and international organisations, and the media. In addition to the conference, in-door and out-door exhibitions were organised to display many technical solutions such as pollution control systems and on-board information and vehicle navigation systems. Low-emission vehicles, including fuel cell cars, hybrid cars, and electric cars from a number of vehicle manufacturers were shown. In the margins of the conference and as a side event, the World Business Council for Sustainable Development (WBCSD) hosted a workshop on the sustainable mobility project.

At the end of the conference, the “*Nagoya Statement on Environmentally Sustainable Transport in the Asian Region*” was presented, reviewed and endorsed by the conference (see Annex 1). The statement summarised the main findings and conclusions drawn from the presentations and discussions of the conference.

This report was drafted by Masako Kuwata of the National Policies Division of the Environment Directorate, under the supervision of Peter Wiederkehr of the National Policies Division of the Environment Directorate. The Working Group on Transport of the Environment Policy Committee reviewed and approved this report.

This report is published on the responsibility of the Secretary-General of the OECD.

ACKNOWLEDGEMENTS

The OECD would like to acknowledge the important support and contributions provided by participating countries, institutions, speakers and moderators. Particular thanks are due to the steering committee of the conference, in particular its chairman Yoshitsugu Hayashi (Nagoya University, Japan), vice-chairman, Masaharu Yagishita (Nagoya University, Japan), and the members, Primitivo C. Cal (President of Eastern Asia Society for Transportation Studies, the Philippines), Chun-kyoo Park (Ministry of the Environment, Korea), Hitoshi Ieda (University of Tokyo, Japan), Robert Thaler (Chair of Working Group on Transport of OECD Environment Policy Committee, Austria), and Gloria Visconti (Vice-Chair of Working Group on Transport of OECD Environment Policy Committee, Italy). The acknowledgement also goes to Kenji Doi (Kagawa University, Japan), Yuichi Moriguchi (National Institute for Environmental Studies, Japan), Katsunori Suzuki (University of the United Nations), and Richard Gilbert (OECD consultant, Canada) for the dedicated roles in developing a draft Nagoya Statement. The substantial contribution to the background reports by the Japanese EST study team, including Yoshitsugu Hayashi, Masaharu Yagishita, Kenji Doi, Yuichi Moriguchi, Hirokazu Kato (Nagoya University), and Tsutomu Suzuki (Nagoya University), is also greatly acknowledged.

Special thanks go to the Ministry of the Environment and the Ministry of Land, Infrastructure and Transport, Japan which served as hosts to the conference and made this extraordinary event happen. The help and efforts of the staff of these organisations, in particular, Kazuo Katao, Toshihiko Kasai, Yuki Tanaka, Katsunori Kadoyu, Takuji Ito, and Kazuma Noda from the Ministry of the Environment as well as Yoshikiyo Ono, Ryousei Akazawa and Keiichi Takakuwa from the Ministry of Land, Infrastructure and Transport are greatly acknowledged. Also, many thanks to Aichi Prefecture and Nagoya city for their logistics support.

TABLE OF CONTENTS

FOREWORD	2
ACKNOWLEDGEMENTS	3
EXECUTIVE SUMMARY	5
1. CONTEXT	6
2. CONFERENCE	7
3. CONFERENCE SESSIONS	8
3.1 Opening and welcome remarks	8
3.2 Keynote speech.....	10
3.3 Current Situations, Trends, Challenges and Priorities for Environment and Transport in the Asian Region	11
Conclusions from Session 1.....	23
3.4 Approaches to EST.....	24
Session 2: EST Initiative – Concept, Approach – and EST Guidelines	24
Session 3: Presentation of the National EST Case Studies in OECD Countries and Implications for the Asian Region	28
Conclusions from Session 2 and 3.....	36
3.5 Regional measures and approaches to EST.....	36
Session 4: How to Make Measures Work towards EST	36
Conclusions from Session 4.....	46
3.6 Ways and Means for Achieving EST	46
Session 5: Ways and Means for Achieving EST (Panel discussion)	46
Conclusions from Session 5.....	49
3.7 Closing Session	49
4. CONCLUSIONS.....	49
Annex 1 Nagoya Statement on Environmentally Sustainable Transport in the Asian Region	51
Annex 2 Conference Programme.....	53
Steering Committee of the Conference	55
REFERENCES	56

EXECUTIVE SUMMARY

This is a report on the proceedings of a conference on “*Environmentally Sustainable Transport in the Asian Region*”, held in Nagoya, Japan, from 23 to 25 March, 2003. The conference was a sequel to OECD’s Environmentally Sustainable Transport (EST) project. This project has articulated comprehensive and positive visions of sustainable transport to be achieved by the year 2030 and has explored detailed policy pathways for implementing the necessary changes. The lessons learned from the project and the resulting EST Guidelines served as background for this conference.

The major objective of this conference was to discuss how to move people and goods in an environmentally sustainable way in the Asian region, focusing on regional priorities, barriers to implementation and policies to overcome them. The conference also provided a first opportunity in Asia to present and discuss the EST concept and approach.

Chapter 1 of this report briefly overviews the context of the conference. Chapter 2 outlines the conference its scope and purpose and the individual sessions.

Chapter 3 is the main section of this report and includes summaries of all of the presentations and discussions. Session 1 of the conference addressed transport trends, challenges and priorities for the region, focusing on land transport in major cities. Session 2 presented the concept and approaches of the OECD’s EST project. Session 3 included the presentations of the recently developed EST case study for Japan as well as other existing national/regional EST case studies. Session 4 presented practical measures and initiatives in the fields of technology, demand management, and comprehensive packages of measures. Session 5 was a panel discussion with a view to finding ways and means for achieving EST in the region. A selection of the several hundred slides presented at the conference is reproduced in this section to illustrate the text and discussions of issues.

Chapter 4 draws conclusions from the conference discussions. A summary of the conclusions reached and lessons learned from the discussions were reflected in the “*Nagoya Statement on Environmentally Sustainable Transport in the Asian Region*” which was presented to, reviewed and endorsed by conference participants (see Annex 1).

All presentations, abstracts, the list of speakers and presentations, as well as background reports are available on CD-Rom. This can be obtained by request to the Secretariat.

Report on the International Conference on Environmentally Sustainable Transport in the Asian Region

23-25 March, 2003, Nagoya, Japan

Organised by the OECD Environment Directorate and hosted by the Japanese Ministry of the Environment and the Ministry of Land, Infrastructure and Transport

1. CONTEXT

Achieving environmentally sustainable transport is one of the major challenges that countries around the world, especially OECD countries, are facing. Transport is a particularly challenging sector. It is indispensable to the economic and social fabric of all countries, but has many adverse effects on health and environment. Some important transport trends, regarding pollution, congestion, noise, land-take, and resource use, are moving away from, rather than towards, environmental sustainability.

In the East Asian, car ownership has grown much faster than the OECD average, ranging from 3% to 16% annually since 1980. An increase in motor vehicle ownership is a direct result of income growth due to economic development. Although the rate of vehicle ownership in Asian cities is not high compared to that of the OECD countries, its growth is striking. For example, while GDP per capita in Tokyo in 1999 was approximately US\$ 77,000 and car ownership per capita was some 250 vehicles per 1000 inhabitants, GDP in Bangkok was approximately US\$ 12,000 and car ownership already exceeded Tokyo. Also, transport volume by vehicle (passenger vehicle-km/vehicle) is disproportionate to GDP growth in many Asian large cities. In addition, motorcycle ownership rate is much higher than that of the OECD countries. Rapid urbanisation and insufficient transport public transport infrastructure also reinforce this trend. It is true that many Asian cities have well-developed transport systems and initiated promising systems; however, rapid and tremendous growth in transport volume supported by strong economic growth is likely to off-set them. If this trend continues without any adequate controls, it will lead to dramatic increases in pollution from transport and resulting other environmental damages in the region. Rapid population growth and industrialisation will put further pressure on the environment.

The OECD has completed a multi-year project on Environmentally Sustainable Transport (EST) and developed a set of guidelines (the EST Guidelines) for addressing challenges to development and implementation of strategies towards environmentally sustainable transport. In May 2001, OECD Environment Ministers endorsed the EST Guidelines and called upon the OECD to assist in the further development of strategies and processes for the implementation of the EST Guidelines in Member countries as well as non-OECD countries. The "OECD Environmental Strategy for the First Decade of the 21st Century," was also adopted by Ministers. It identifies transport as one of the sectors that urgently needs to be put on a sustainable path.

2. CONFERENCE

This conference was held as a sequel to OECD's EST project and in line with the Ministerial mandate to foster the EST concept and approach through regional conferences. This project has articulated clear, comprehensive, and positive visions of sustainable transport to be achieved by the year 2030 and has explored detailed policy pathways for implementing the necessary changes. Fourteen countries undertook specific scenario studies demonstrating the feasibility of EST. The lessons learned from the project and the resulting EST Guidelines served as background for this conference.

Over 660 people from many countries of the Asian region, Europe, and North America participated in the conference. Environment Minister **Shunichi SUZUKI**, from Japan, opened the conference. Also, Mr. **Shoichiro TOYODA** (vice-chair of World Business Council for Sustainable Development (WBCSD)), many senior officials from Asian countries, representatives and experts from the transport industry, transport researchers, local governments, NGOs and international organisations, and the media participated.

The principal objective of the conference was to discuss how to move people and freight in the Asian region in an environmentally sustainable manner, focusing on regional priorities, barriers to implementation and policies to overcome them. The conference also provided a first opportunity in Asia to present and discuss the EST concept and approach, as well as the possible implications of the EST Guidelines for the region.

The conference addressed transport trends, challenges and priorities for the region, focusing on land transport. Traffic congestion and pollution were recognised as urgent transport-related problems in Asia. The conference also included the presentation of the EST case study for Japan which offers a long-term view for achieving EST for the country. Regional approaches, measures and initiatives, including practical examples of EST in the Asian region, were highlighted. The role of technology and transport demand management, as well as comprehensive packages of measures to ensure moving towards EST, were also discussed.

The Japanese organisers set up a study team and developed three background reports for the conference. The first report, "Asian Perspectives: focusing on Mega-Cities," showed that transport trends in the region are unsustainable, in particular in the large metropolitan areas and mega-cities. It identified common driving forces supporting these trends. The second report, the "EST Case Study for Japan," included a national and a regional case study (Aichi prefecture, including the greater-Nagoya area), exploring the feasibility of EST in Japan through scenarios. The third report, "Transport Related Environmental Practices in Asian Countries: Detailed description of practices in Asian countries," was a compilation of a number of practical and promising examples in the region, including the Sky Train system in Bangkok, electronic road pricing in Singapore, and joint shipping and delivery services in Japan. These reports provided the basis for discussion, together with the OECD's EST Guidelines, and the EST synthesis reports and publications.

In addition to the conference, in-door and out-door exhibitions were organised to display many technical solutions such as pollution control systems and on-board navigation systems. Low-emission vehicles, including fuel cell cars, hybrid cars, and electric cars from a number of car manufacturers were shown.

The WBCSD also hosted a workshop on the sustainable mobility project as a side event of the conference. The workshop outlined the WBCSD's Sustainable Mobility Project, which involves several

global car manufacturers and oil companies. The main findings of the project were presented and the participants exchanged views on how sustainable mobility in Asia could be achieved.

At the end of the conference, the participants reviewed and endorsed the "*Nagoya Statement on Environmentally Sustainable Transport in the Asian Region*," attached hereto as Annex 1. The statement summarises the main findings and conclusions of the conference and includes specific recommendations for Asian countries to take further steps towards EST through regional cooperation.

3. CONFERENCE SESSIONS

3.1 Opening and welcome remarks

The conference was opened with keynote addresses from **Shunichi SUZUKI**, Minister of the Environment in Japan, **Mitsuo NAKAMOTO**, Assistant Vice-Minister, the Minister's Secretariat of the Ministry of Land, Infrastructure and Transport in Japan, **Ken RUFFING**, Acting Director of the OECD Environment Directorate, **Shoichiro Toyoda**, Vice-Chairman of World Business Council for Sustainable Development (WBCSD), **Primitivo C. CAL**, President of the Eastern Asia Society for Transportation Studies (EASTS), and **Kazunobu ONOGAWA**, Director of the United Nations Centre for Regional Development (UNCRD). Welcome remarks by **Masaaki Kanda**, Governor of Aichi prefecture and **Takehisa MATSUBARA**, Mayor of Nagoya followed.

Minister Shunichi SUZUKI extended a welcome to participants as a host and one of the organisers of the conference. He stressed the significance of the conference, expecting tangible steps to be taken to establish a cooperative framework for solutions to transport-related environmental problems in Asia. He expressed great concerns about automobile pollution and highlighted Japanese efforts to address environmental problems stemming from motor vehicles, including introduction of stringent emission standards, encouraging the usage of low-emission vehicles through taxation, and promoting the proliferation of fuel cell cars through subsidies and incentives. Finally, he underlined the importance of the efforts towards EST, which contributes to the integration of environmental protection and economic development and enhances competitiveness of industry, as environmental problems also create business opportunities for companies to differentiate themselves by contributing to solutions to the problems. To this end, he believed that the conference could offer a first step in exchanging information, drawing on the experience of participants, and promoting policy dialogue with a view to promoting an "Asian EST."

On behalf of **Minister Chikage OOGI**, who could not attend, **Mr. Mitsuo NAKAMOTO** read out her message, which noted that a Ministerial Conference on Transport in January 2002, organised by the ministry, had already recognised the fact that, while transport is critical to most socio-economic activities, it has negative impacts on the environment, including maritime pollution, energy consumption, climate change and air pollution. It was hoped that the present conference would inspire the world's stakeholders to join in efforts to better address global transport and environmental issues. Her statement stressed that EST as a new approach to transport and environment policy integration should be promoted the understanding of its concept and that benefits of EST enhanced in the Asian region through this conference.

On behalf of **Mr. Donald JOHNSTON**, Secretary-General of the OECD, **Mr. Ken RUFFING** expressed gratitude to the government of Japan, the municipality of Nagoya, and Aichi prefecture, and underscored the timeliness and significance of the conference. **Mr. Ruffing** also introduced the OECD's

efforts towards EST, referring to the outcomes of the OECD Environment Ministerial meeting in 2001, i.e., the OECD Environmental Outlook to 2020, the OECD Environmental Strategy for the First Decade of the 21st Century, and the EST Guidelines. He stressed that EST will involve not only technological advances but also innovative transport demand management strategies. In conclusion, he said that international cooperation within the OECD framework can assist countries in the development of innovative methods and policy approaches towards sustainable transport and can help them in their transition towards a pattern of economic development that is environmentally and socially sustainable, both domestically and globally.

Mr. Shoichiro TOYODA introduced the mission of WBCSD and its sustainable mobility project which aims to develop a vision towards sustainable mobility by 2030 and possible pathways for getting there. The first project deliverable, the "Mobility 2001" report, was published in October 2001 which analysed the global transport system and revealed its worrying state. Nine challenges were formulated for action in order to move safely, freely and sustainably. The project is scheduled to be completed in December 2003.

Professor Primitive C. CAL underlined the worsening environmental situation in major Asian cities that are growing and expanding at a tremendous rate. He called on member countries to engage in joint transport research efforts. He also stressed the need to take relevant measures; e.g. ban of car access to city centres according to number plates to ease congestion. Many cities in the region experience high growth of motorisation associated with increasing pollution, congestion, noise and urbanisation. He regarded the conference as an opportunity to be more aware of the nature and extent of the problems and the possible solutions that are available for tackling them.

Mr. Kazunobu ONOGAWA stated the urgent need to share best practices among countries. He reminded participants that while, usually, technology transfer is made from the north to the south (i.e., from developed to developing countries), some innovative initiatives have been first introduced in the south (developing countries) and transferred from there to the north, such as Electronic Road Pricing (ERP) in Singapore. He said that the UNCRD welcomes this initiative for EST in the Asian region and is willing to cooperate further.

Mr. Masaaki KANDA extended a warm welcome to the participants and stressed that given the current problem, the 21st century would have to be the era of the environment. He talked about the transport situation of Aichi prefecture, which is highly road dependent and a global hub for vehicle manufacturing. He informed participants that the Aichi Prefectural Government developed the "Aichi Traffic Pollution Control Strategy in the New Century" in October 2002, which is a comprehensive strategy to realise an automobile environment where people can live in comfort and safety. He also announced that the prefecture will host EXPO 2005, with the theme of "Nature's Wisdom." He expressed the hope of his long-term vision that by 2025 Aichi Prefecture should be the "green" prefecture would come true.

Mr. Takehisa MATSUBARA welcomed the participants and expressed appreciation to the organisers. He noted several features of Nagoya's transport system, including a vast and efficient network for road transport, newly-introduced designated bus lanes, and elevated bus lanes (Guideway bus system). The well-developed road network generates a high road dependency: the ratio of private cars to public transport standing at 70 to 30 per cent. He announced that he aims to change the ratio to 60 to 40 by promoting bicycling and public transport by 2010. The main challenge for the region is to control pollution from car use. He also stressed the need to establish goals and targets to be met.

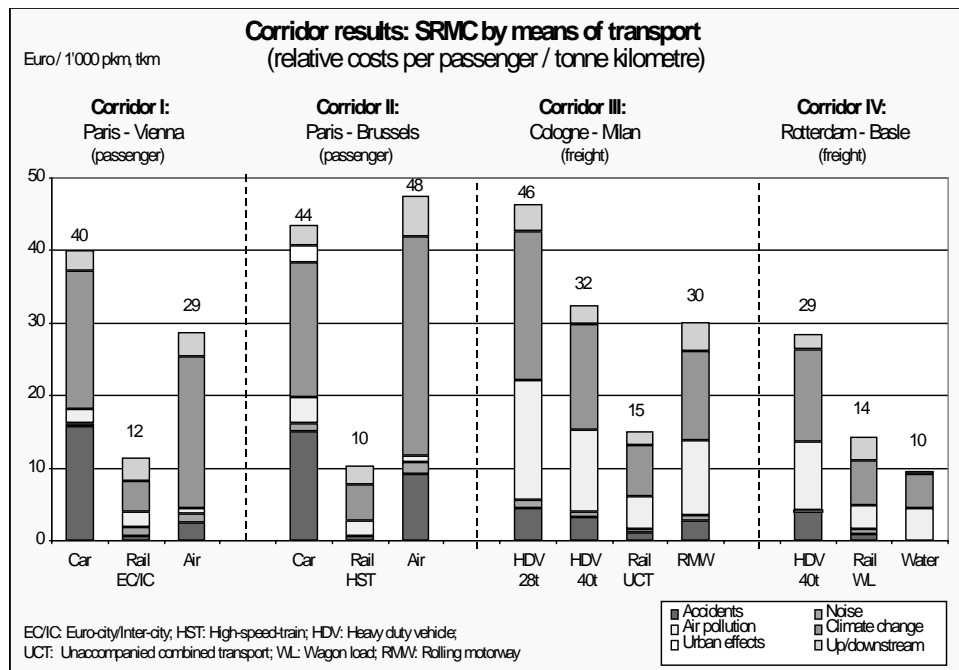
3.2 Keynote speech

An Evaluation Concept for Designing an Environmentally Sustainable Transport Sector

Werner ROTHENGATTER, President of the World Conference on Transport Research Society, gave the keynote speech, entitled "An Evaluation Concept for Designing an Environmentally Sustainable Transport Sector". He pointed out that the traditional economic approach, i.e., cost-benefit analysis, can result in misleading evaluations of the ecological risk. Since cost-benefit analysis uses uniform average cost values and assumes a trade-off between environmental impacts and other benefits/costs, it can lead to positive evaluations for different transport projects in the same region although the environmental quality of the region will actually decrease. This is because environmental impacts vary over space. Figure 1 shows that the structure of the external costs for the transport sector, based on short-run marginal cost, differs from region to region.

Figure 1. External costs for specific corridors in Europe

(Short-run Marginal Costs: SRMC)



Source: Werner ROTHENGATTER

As an alternative approach, he introduced the concept of safe minimum values for environmental quality based on environmentally sound economy which observes the following principles: i) complementarity, ii) irreversibility, iii) holistic system's view, and iv) dynamic feedbacks among sub-systems. This approach is based on the idea that nature can never be traded-off with economic wealth and that environmental sustainability can be achieved only when safe minimum values are ensured. He pointed out that the safe minimum values approach was reconciled with the economic approach using the concept of shadow pricing, yet, the use of shadow pricing can lead to different prices for regions, affected groups, and producers of the harm.

Referring to a case study of Baden-Württemberg (Germany), he concluded that in order to design an environmentally sustainable transport sector, it is crucial to start with safe minimum values for environmental quality and then set up integrated transport policy to ensure achieving those values. Shadow pricing will be a useful evaluation concept for that. Also, he stressed the importance of the Kyoto Protocol in the sense that it provides an international negotiation process to establish acceptable and effective incentive schemes for the reduction of greenhouse gases.

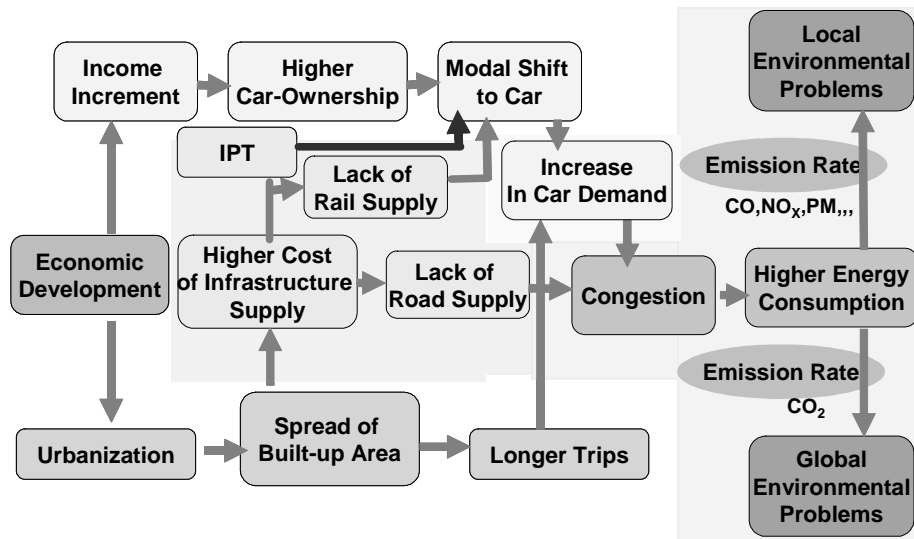
3.3 Current Situations, Trends, Challenges and Priorities for Environment and Transport in the Asian Region

Before discussing how to achieve EST, it is necessary to understand the current situation and driving forces behind this trend as well as identify the challenges and priorities in the region. **Session 1** provided an overview of the regional situation and trends in the fields of environment and transport.

Keynote Presentation: Asian Perspectives – focusing on Mega-cities

Yoshitsugu HAYASHI, chair of the conference steering committee, Professor of Nagoya University, Japan, presented the Asian perspective report. He highlighted the current pattern of rapid urbanisation in the region and resulting congestion and air pollution problems. He analysed the interrelated links among economic growth, rapid motorisation, and urban sprawl that lead to pressing environmental problems. Figure 2 outlines the mechanism behind those links. Economic growth brings about income increases and urbanisation. Income increases give rise to car ownership and road transport demand, reinforced by lack of alternative transport modes such as railway. At the same time, the more urbanisation advances, the longer trip-length becomes. As a result, car ownership increases and so does road demand. Increase in road transport demand, together with lack of adequate infrastructure and public transport causes severe congestion as well as pollution problems.

Figure 2. Motorisation, Urban Sprawl and Environmental Problems

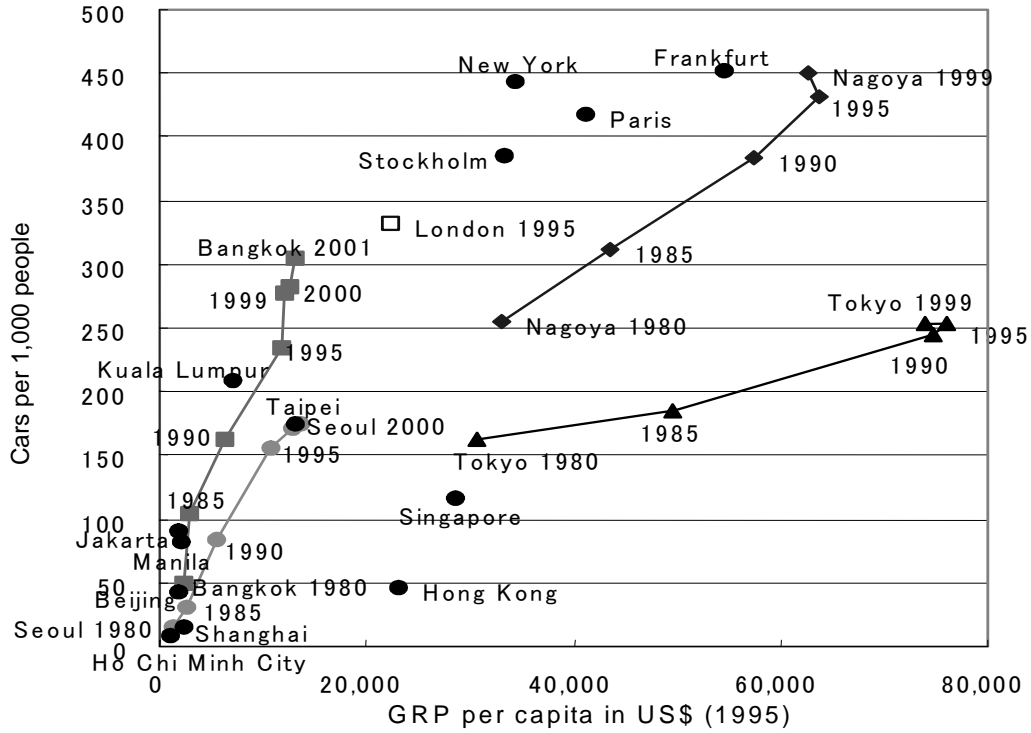


Source: Yoshitsugu HAYASHI

He showed that the pace of growth of car ownership in major Asian cities, such as Bangkok and Jakarta, outpaces that of Tokyo and cities in other OECD countries (e.g. London) in terms of car ownership per capita at the same level of Gross Regional Product (GRP) per capita (Figure 3). Major Asian cities have shorter cycles of economic growth and urbanisation. While it took 40 years for London

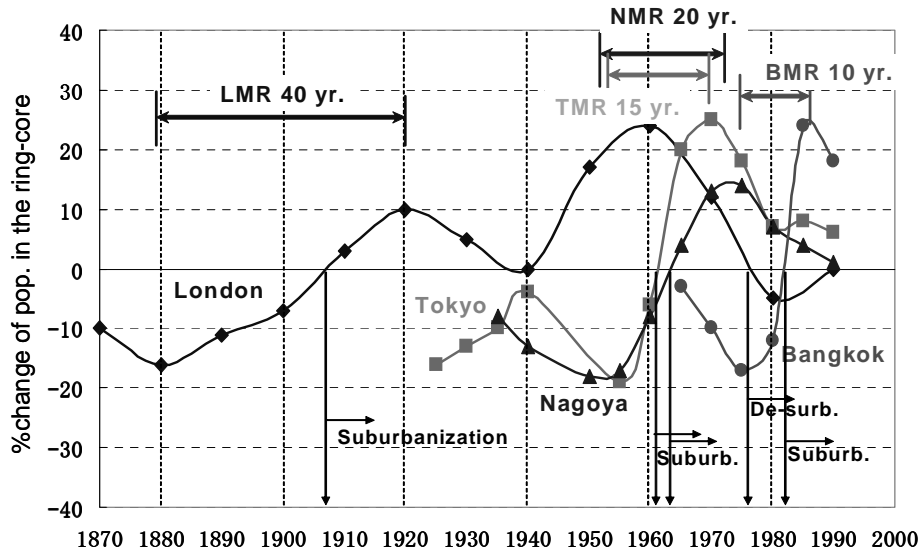
Metropolitan region (LMR), 20 years for Nagoya Metropolitan region (NMR), and 15 years for Tokyo Metropolitan region (TMR) to finish the first phase of urbanisation, it took only ten years for Bangkok Metropolitan region (BMR) (Figure 4). Taking this development into account requires timely and speedy implementation of effective measures.

Figure 3. Car ownership per capita in selected cities



Source: Yoshitsugu HAYASHI, based on the report of "Asian Perspectives", prepared by the Japanese EST study team

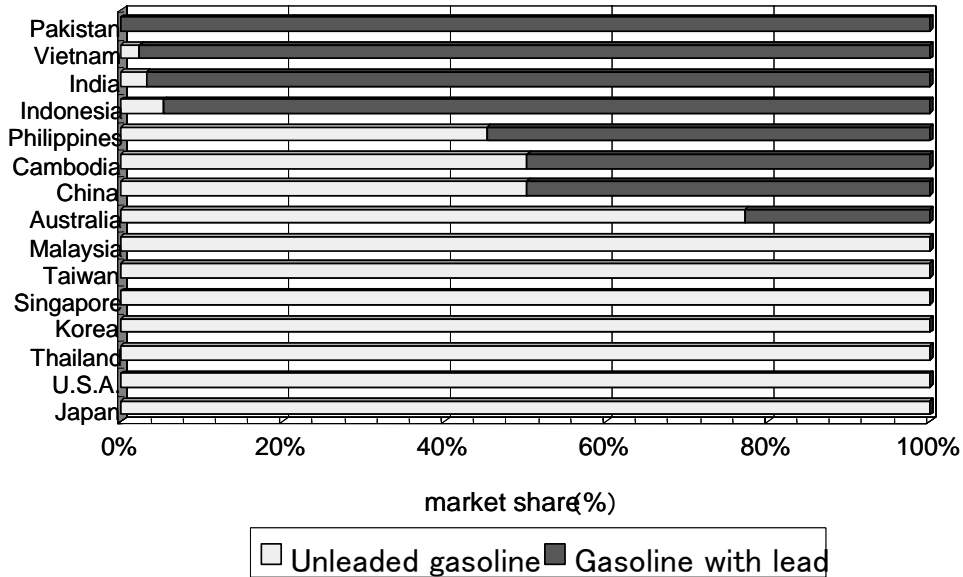
Figure 4. Urbanisation Cycle of London, Tokyo, Nagoya, and Bangkok



Source: Yoshitsugu HAYASHI

Poor environmental performance and low maintenance level of road vehicles have been identified as the main causes of the transport-related pollution problems in the region. The usage of low quality fuel was also pointed out as a major cause of air pollution. In general, the demand for diesel fuel is greater than gasoline. In addition, leaded gasoline is still largely being used in some countries, such as Pakistan, Vietnam, India, Indonesia, the Philippines, and China (Figure 5). However, major countries like India and China have recently decided to introduce unleaded gasoline, and gradually phase-out leaded gasoline.

Figure 5. Transition to Unleaded Fuel in APEC member economies



Source: Yoshitsugu HAYASHI, based on the report of "Asian Perspectives", prepared by the Japanese EST study team

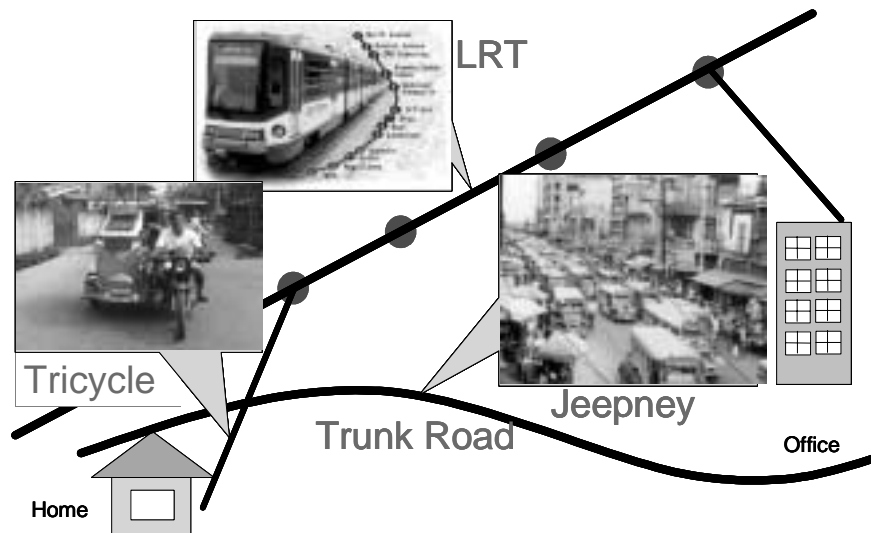
His presentation also showed unique features of transport systems in the region, i.e., Intermediate Public Transportation (IPT), depending largely on numerous small public vehicles like jeepneys, tuktuks and rickshaws (Figure 6). IPT makes it possible to provide almost door-to-door public transport services. For example, a combination of tricycle, LRT (light rail transport) and jeepney enables a user to move from home to office without a private car (Figure 7). He stressed the advantages of Asian transport systems while recognising the need to overcome the barriers, including lack of understanding of the advantages of railway, poor control of vehicular emissions, and use of low-quality fuels. As a way to promote the advantages, with regard to ways to attract or re-attract people to public transport, especially railway systems, he stated that to provide high-quality public transport services is a possible solution. Once people have experienced them, they would learn and understand the advantages of using public transport.

Figure 6. Transport modes in Asia

Category			Transport mode	
Infrastructure	Public/ Private	Transport Volume	Asian Cities	Ref. Paris
Rail	Public	Mass Transit	Subway , LRT	Subway,LRT
			Airconditioned bus Non-airconditioned bus	Bus
Road	Public	Middle Size Transit	Mini bus Jeepney , Remodeled bus	— IPT
			Taxi Tuktuk Bike Taxi	Taxi
		Individual Transport	Non-motorised mode (rickshaw , carriage)	—
	Private	Individual Transport	Passenger Car	Passenger Car
			Motorcycle	Motorcycle
Bicycle			Bicycle	

Source: Yoshitsugu HAYASHI, based on the report of "Asian Perspectives", prepared by the Japanese EST study team

Figure 7. Intermediate Public Transport System in Manila: Home to office by public transport



Source: Yoshitsugu HAYASHI

Development of ferry transport with the environmentally sustainable conditions in Indonesia

Iskandar ABUBAKAR, Director-General of Land Transportation, Ministry of Communication, Indonesia, described the unique situation of the transport sector in Indonesia that has to serve transport needs to some 17,000 islands. A network of ferry transport spreads nationwide and plays a pivotal role in the transport system in the country (Figure 8). In 2001, ferry carried 34.2 million passengers and 14.37 million tonnes of cargo through 102 ferry routes and 16 ferry ports. It was estimated that ferry services saved 54 million tonnes of fuel and reduced 4,300 tonnes of NO_x and 5,700 tonnes of CO_2 emissions from 6.1 million motor vehicles which they carried in 2001. Environmental considerations are taken into account in developing ferry transport systems, not only for operational aspects but also for construction of infrastructure. Improvements in energy efficiency and right selection of terminal sites are encouraged. Given its entry into AFTA (ASEAN Free Trade Area) in 2004, Indonesia is now facing a big challenge to develop an efficient and clean ferry transport system while coping with growing international competition. To meet this challenge, Indonesia has developed a promising strategy. It includes the development of a nationwide long-haul ferry service which connects the east and west ends of the country so that forwarders can offer reliable door-to-door service, as well as the development of national trunk lines which connect main islands in the north-east region and those in the south-west region.

Figure 8. Indonesian Ferry Network

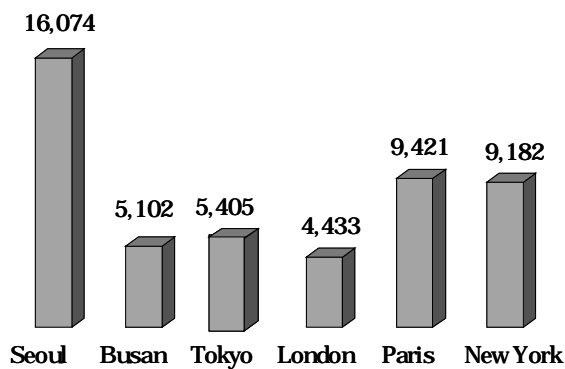


Source: Iskandar ABUBAKAR

Korea’s situation and effort for Environmentally Sustainable Transport

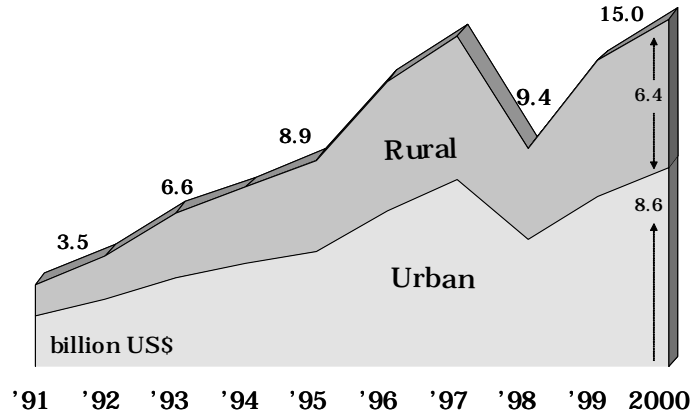
HONG Soonman, Director of Surface Transport Planning Division, Ministry of Construction and Transportation, Korea, stressed that Korea has been facing congestion and air pollution problems, especially in large cities, with the advances of urbanisation. As a result of urbanisation, the population density of Seoul is now 16,074 person/km², which is way beyond New York (9,182 persons/km²) and Tokyo (5,405 persons/km²) (Figure 9). Meanwhile, motor vehicle stock has reached 14 million vehicles for 48.3 million people in 2003. Urbanisation and motorisation have led to a severe congestion problem and the congestion cost was an estimated US\$ 6.4 billion in rural areas and US\$ 8.6 billion in urban areas in 2000 (Figure 10). With regard to air pollution levels in cities, although some air pollutants have decreased, other pollutants, such as CO₂, NO_x, and PM, are on the rise resulting from growing motorisation and economic growth and insufficient emission controls. (Figure 11).

Figure 9. Population density of world large cities (person/km²)



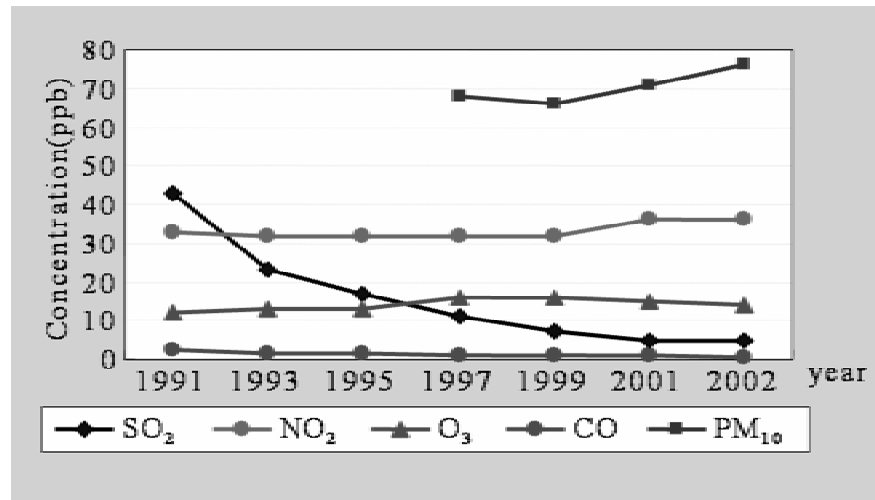
Source: Soonman HONG

Figure 10. Increase in congestion costs in Korea



Source: Soonman HONG

Figure 11. Air quality in Seoul

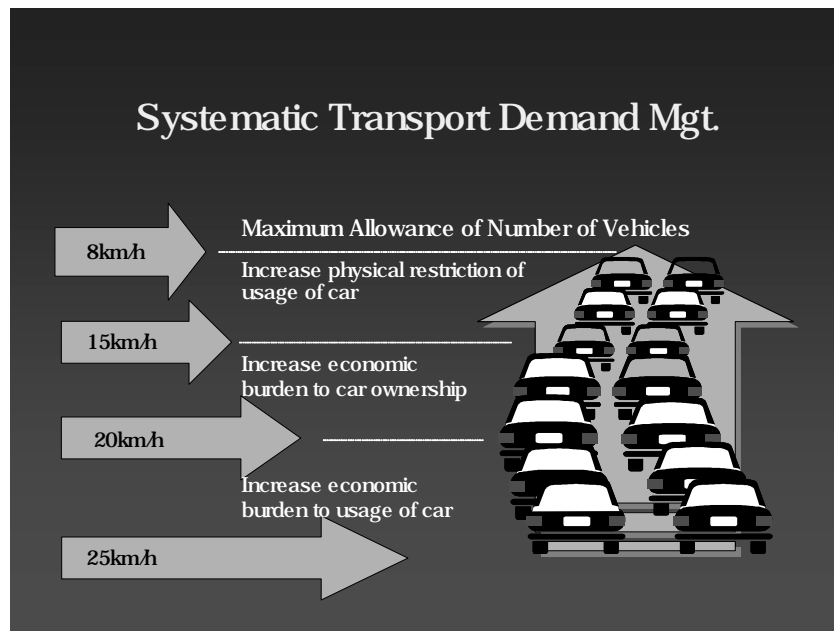


Source: Soonman HONG

To address these problems, the Korean government has been taking a variety of measures. In order to promote public transport, Korea plans to extend its subway system by 135km in 6 metropolitan areas by 2007. This plan is mainly financed by the special account for transport facilities, which was established in 1990 to allow the government to subsidise 50% of the construction cost of subways. Buses and a light rail transit (LRT) system are also promoted. The Korean government subsidises 200 billion won (US\$ 150 million) annually and has introduced 510 km of designated bus lanes in 127 sites. In order to facilitate a park-and-ride system, 73 parking spaces with a capacity of 15,000 vehicles were constructed close to railway stations in the Seoul metropolitan area. The second phase of the high-speed train project from Seoul to Busan (412km), linking the two cities in 2 hours, will be completed by 2008. Introduction of congestion pricing at Namsan Tunnels resulted in an increase in the average vehicle speed from 21.6km/hr in 1996 to 43.5km/hr in 2001 and an increase in occupancy of buses and subways in the area. Besides these measures, Korea is considering a number of new instruments including introduction of ITS (Intelligent Transport System) and systematic transport demand management that applies different traffic control measures according to the average speed of cars (Figure 12). Also,

construction of multimodal freight terminals, promotion of cycling, and development of low-emission and fuel-cell cars are being considered.

Figure 12. Systematic transport demand management in Korea

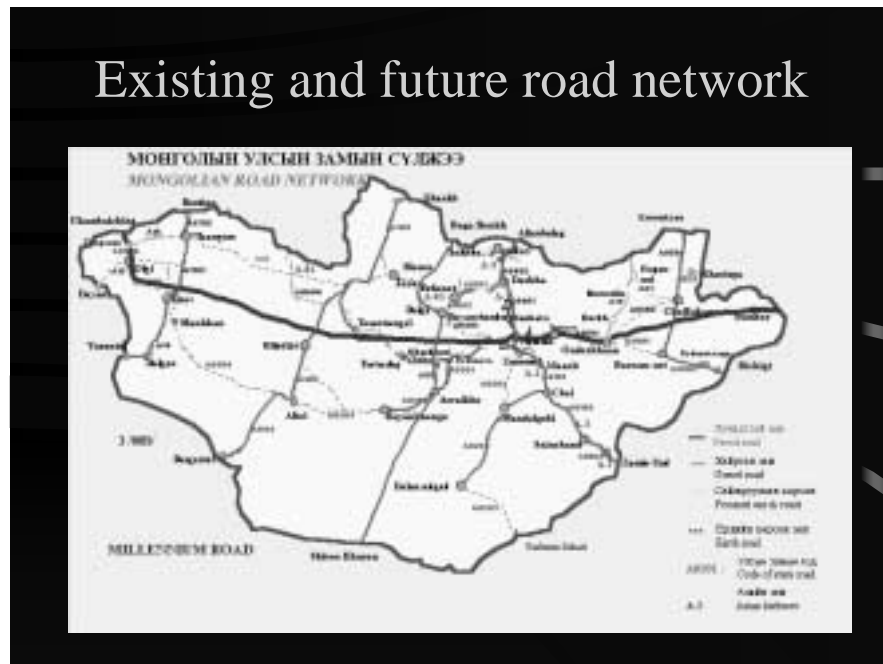


Source: Soonman HONG

Current situation of transport and environment in Mongolia

Davaakhuu NARANPUREV, Deputy Director of the State Administration Department, Head of the Cooperation Division, Ministry of Infrastructure, Mongolia, talked about the current transport situation in the country, which recently shifted to the market economy. Mongolia's main challenge is insufficient modern network in transport infrastructure, especially road. The total length of road infrastructure is 200,000 km and state and provincial roads are 49,247 km. Of these, only 1711.6 km are paved, 1,877 km are gravel roads and the rest are earth roads (Figure 13). Currently, there are 142,500 motor vehicles in Mongolia and private cars account for about 90%. Use of older cars also aggravates the problems. 32% of private cars are over 11 years old and only less than 20% are below 3 years old. Although several technical standards and inspection guidelines are in place, there is an urgent need to establish an emission control system and introduce cleaner fuels. With regard to rail transport, electrification of railroads, which presently uses either diesel locomotives or coal, is needed. In civil aviation, restoration of fleets and improvements of security are required. In conclusion, the speaker called on other countries to help share their experience and exchange human resources in a cooperative manner.

Figure 13. Road network in Mongolia



Source: Davaakhuu NARANPUREV

Environmentally Sustainable Transportation – A Singapore case study

Joseph HUI, Head of the Strategic Planning and Research Department, National Environment Agency, Singapore, introduced the present state of air quality and strategies for reducing emissions in Singapore. Singapore is a highly urbanised city-state with 650 km² surface area and over 700,000 vehicles, an increase of 26% since 1992. In spite of rapid urbanisation and economic growth, it continues to meet the stringent ambient air quality standards based on US EPA and WHO criteria. In 2002, the Pollutant Standards Index (PSI) indicated that 82% of days were in the good range and the remaining 18% were in the moderate range. Singapore is now in the process of introducing EURO3 standards and will then introduce EURO4. However, there is no urgent need for introduction of EURO4, considering the fact that the current air quality level in Singapore is high and that the transition would require considerable costs.

In addition to the strong regulations on emission standards and regular inspection, various innovative measures, including a vehicle quota system and the Electronic Road Pricing (ERP) system, were undertaken. The vehicle quota system was implemented in 1990 to regulate the growth of the vehicle population. The number of new vehicles allowed for registration is pre-determined annually, whereas the price of owning a vehicle is determined by the market through competitive bidding. The ERP system is another effective measure to mitigate traffic congestion. The first phase of the system was implemented in 1998, replacing the manually operated Area Licensing Scheme. Under the ERP system, every vehicle is equipped with an in-vehicle unit and is charged when it passes under overhead gantries located along major roads during peak hours (Figure 14).

Figure 14. Electronic Road Pricing (ERP) in Singapore



Source: Joseph HUI

Meanwhile, public transport in Singapore is well developed so that citizens who don't own cars are still able to move around the country quickly and comfortably. A comprehensive network of bus routes, a train-based mass rapid transit system (MRT), and a light rail transport system (LRT) provide sufficient mobility to citizens (Figure 15 and 16). In principle, public transport is operated by private companies though bus fares are regulated. Regarding MRT, the infrastructure was built by the public sector and then passed onto a private company to operate.

Figure 15. MRT system in Singapore

MRT System

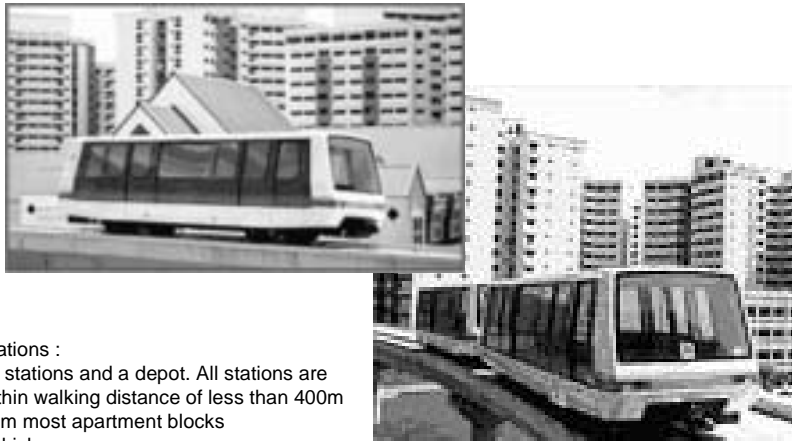


Lines :
 Two main lines, 51 existing operating stations.
 An additional 14 new stations would be opened
 when the North-East Line is operational.
 Trains :
 106 operational trains, made up of six cars each.
 Daily trips :
 1.08 million

Source: Joseph HUI

Figure 16. LRT system in Singapore

LRT System



Stations :
14 stations and a depot. All stations are within walking distance of less than 400m from most apartment blocks

Vehicles :
19 vehicles. Each vehicle is 12.8m long, 2.8m wide and 3.4m high, weighs 15,000kg and can carry 105 passengers - 22 seated & 83 standing.

Source: Joseph HUI

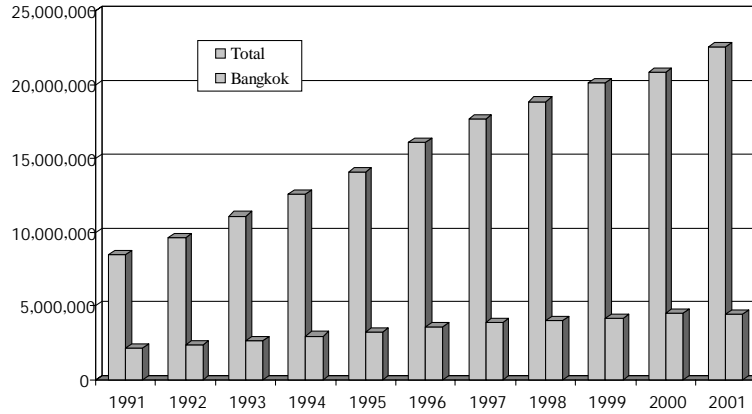
As for future plans and strategies, Singapore is to promote alternative fuel technology by providing financial incentives for green vehicles such as electric, hybrid and CNG (compressed natural gas) vehicles. Two pilot studies involving the operation of natural gas buses and taxis were started in 2002 to evaluate the commercial potential. Twelve CNG buses have already been built and registered under this pilot study. Another study to test fuel cell vehicles in Singapore is scheduled to be launched in 2004. One of the reasons for Singapore's current focus on CNG, instead of ultra-low diesel, is that it is relatively easy to carry out the maintenance required to keep emissions low on CNG engines, compared to ultra-low diesel engines. In the long run, Singapore envisages shifting to fuel cell cars.

Mr. Hui concluded that Singapore's main strategy for environmentally sustainable transport is not only to continue the current measures but also to promote the use of low-emission vehicles such as natural gas, electric, hybrid and fuel cell vehicles, and implement even more innovative transportation policies.

Current situation of transport and environment in Thailand

Silpachai JARUKASEMRATANA, Director of the Engineering and Safety Bureau, Department of Land Transport, Thailand, talked about the current transport and environment situation in Thailand. Thailand has experienced rapid growth in motor vehicle demand and is highly dependent on road transport. The number of registered vehicles has been increasing at the rate of 4% annually and reached 22.6 million in 2002 (Figure 17). In terms of modal share, 94% of passengers and 87.5% of goods are carried by road transport.

Figure 17. Motor vehicle registration in Thailand



Source: Silpachai JARUKASEMRATANA

High dependency on road transport causes environmental problems, in particular in Bangkok and other major cities. While the emission levels of NO_x and SO₂ are below the air quality standard, particulate matter (PM) and dust are still major problems, especially in crowded communities with traffic congestion. Noise is also a big challenge. A study showed that non-fixed route buses were a major noise source and, generating 76% of the noise that exceeded standards. To address this, the government has introduced more stringent emission, noise, and fuel quality standards and emission inspection systems. Meanwhile, Thailand introduced the Bangkok Mass Transit System (BTS), the so-called Sky Train, in 1999, which is an elevated electric train running in Bangkok downtown areas (Figure 18). As a result, the number of vehicles in business districts has been reduced and so has air pollution. Thailand continues to promote public transport by extending BTS route and constructing the first subway system while improving the inspection system and considering ways to regulate vehicle maintenance. He concluded his presentation with an emphasis on the importance of cooperation among experienced agencies.

Figure 18. BTS system (Sky Train) in Bangkok



Source: Silpachai JARUKASEMRATANA

Environmental issues relating to transportation development in Vietnam

MAI Thanh Dung, Senior Officer of the Ministry of Natural Resources and Environment, Vietnam, described the transport-related environmental situation in Vietnam. The country also faces serious congestion, air pollution, and noise problems resulting from rapid industrialisation and motorisation as well as insufficient transport infrastructure and public transport services. CO₂ emissions are high in Hanoi and Ho-Chi-Minh City and dust concentration is ten times higher than the standards. Serious noise problems are caused by the large number of motor vehicles which do not comply with the noise standards and by lack of noise protection systems in urban areas. In addition, 7,000 people died or were injured by transportation accidents annually. This situation was caused by the following: i) rapid population growth in large cities, ii) insufficient capacity of transport infrastructure, iii) limited public transport network, iv) absence of consideration for environment in developing economic policies, and v) lack of awareness and knowledge.

Conclusions from Session 1

The current transport situation in the Asian region differs considerably from country to country based on geographical differences and level of economic development. While there are advantages and successful examples in the region, most Asian countries are alike in facing severe traffic congestion, air pollution, and noise as transport-related environmental problems. Behind these problems, a similar pattern can be found, which is: income increases, rapid urbanisation, development of motorisation, lack of adequate regulations, and resulting environmental pressures.

An Asian EST can be achieved by recognising the differences and identifying appropriate ways and means for each country. In doing so, sharing and learning from other countries' experience will be helpful.

3.4 Approaches to EST

Having reviewed the current situation and identified major transport-related problems in the region, we should turn our attention to possible solutions. Session 2 and Session 3 aimed at deepening understanding of the concept and lessons learned from the OECD's EST project, with a view to presenting a possible approach to achieve EST in the Asian region.

Session 2: EST Initiative – Concept, Approach – and EST Guidelines


The OECD presented the conclusions of the project focusing on the implications of the EST Guidelines. Environmentally sustainable transport would have to observe the following sustainability principles that follow the broad definition of sustainable development (Earth Summit, 1992): i) regeneration of renewable resources, ii) substitutability of non-renewable resources, iii) assimilation of releases to the environment, and iv) avoiding irreversibility of effects. The backcasting (goal-oriented) approach, a core concept of the EST project that observed these principles, was also presented. The presentation outlined the definition, context, and methodology of backcasting and its implications for transport-policy making by describing how it was applied to the EST project.

The EST project – Results and Guidelines towards EST

Peter Wiederkehr, OECD Secretariat, presented the OECD's EST project, focusing on the overall concept, approach and results including the EST Guidelines. First, he described the economic and vehicle emission trends in OECD countries which show that CO₂ emissions have kept growing, while conventional pollutants, such as CO, NO_x, and VOCs, have been decreasing. However, long-term global environmental impacts from the transport sector were on an unsustainable path if no further measures are taken and as transport-related impacts, especially in non-OECD countries, are projected to increase much in the coming years due to high economic growth and little pollution control (Figure 19). He stressed the importance of developing a long-term view to solve the problems and stressed the need for putting environmental and health criteria at the forefront of the policy action. This would require a goal-oriented approach to achieve environmentally sustainable transport, and would involve basically three main policy steps: i) to develop a vision of what EST should be to meet long-term sustainability goals, ii) to characterise EST in terms of quantifiable targets for environmental impacts of each unit of transport activity, for modal split, etc., and iii) to use backcasting (i.e., working from the targets back to present conditions), rather than forecasting, to determine the actions required to achieve the targets (Figure 20).

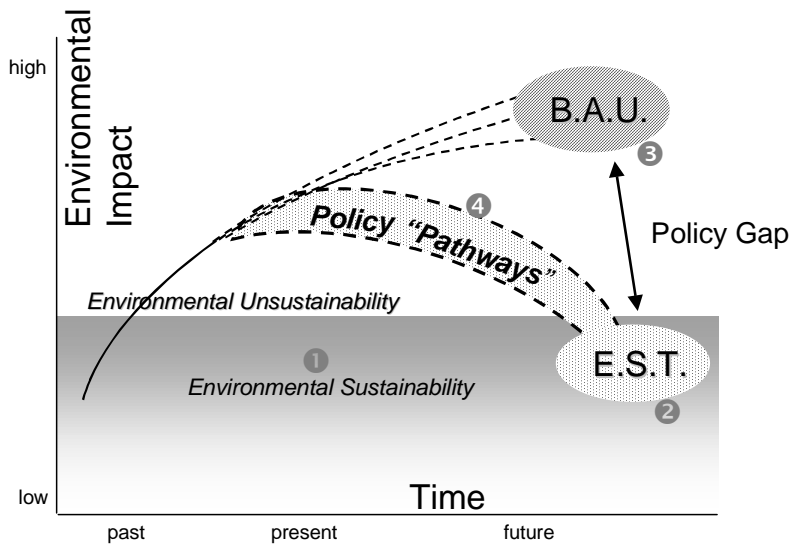
Figure 19. Long-term environmental impacts of the transport sector in OECD and non-OECD countries

	OECD	Non-OECD	Sources
urban:			
- noise	+ -	↗↗	HGV, airplanes
- NO ₂ , PM _{2.5}	↘	↗↗	HGV / trucks
regional:			
- O ₃ , acidif.;	↘	↗↗	Cars, trucks
- water / sea	↗	↗↗	Ships
global:			
- CO ₂ , CFCs	↗↗	↗↗↗	Cars, trucks, airplanes
- POP, waste	↗↗↗	↗↗↗	cars, airplanes


Global trends are unsustainable !

Source: OECD. 2000. Environmentally Sustainable Transport (EST), Synthesis report: futures, strategies and best practices

Figure 20. Backcasting approach to attaining EST – The three steps for policy development



Source: OECD. 2002. Policy Instruments for Achieving Environmentally Sustainable Transport

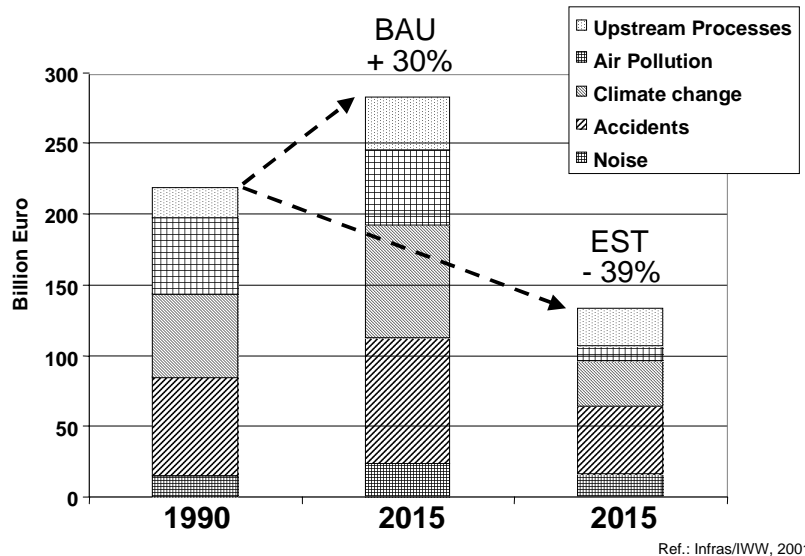
Key features of measures highlighted to meet the long-term goals include: integrated mobility services for passenger transport and multi-modal freight logistics, more balanced modal share both for passenger and freight transport, and a comprehensive package of measures, including both technology and demand management approaches.

The analysis for the EST project concluded that EST will have considerably lower environmental and social costs (external costs) compared to the projected business-as-usual (BAU) trends. Estimated externalities in 2015 (excluding congestion costs) will have increased in the case of BAU by almost 30% above 1990 levels, whereas there will have been a decrease in the case of EST by more than 39% in 2015 (Figure 21). Two thirds of these costs are attributable to passenger transport and one third to freight movements in the base year 1990. Accidents were the most important cost category, contributing 31% of

the external costs from car use. The second most important cost category was air pollution, representing 27% of the external costs from car use. Climate change impacts were estimated to be of a similar order, but those for noise and upstream processes (indirect effects) were of less importance, yet relevant cost categories.

The overall economic effects on the Member country's economies as a result of proceeding towards EST rather than BAU are estimated to be slight. On average across the countries, GDP growth would hardly change. Employment would be slightly less compared to the BAU scenario, but much higher than today's levels. The significant reduction of externalities under EST would mean that some direct and indirect taxes and charges could be significantly reduced with the implementation of EST. The net benefit could be transferred to key areas of the economy in ways that would enhance overall well-being and quality of life.

Figure 21. External costs



Source: OECD. 2002. Policy Instruments for Achieving Environmentally Sustainable Transport

Finally, he presented the EST guidelines, which were based on the conclusions of the EST project and endorsed by the OECD Environment Ministers in May 2001. The guidelines were developed to assist governments at all levels in the development and implementation of strategies towards EST (Figure 22).

Figure 22. EST Guidelines

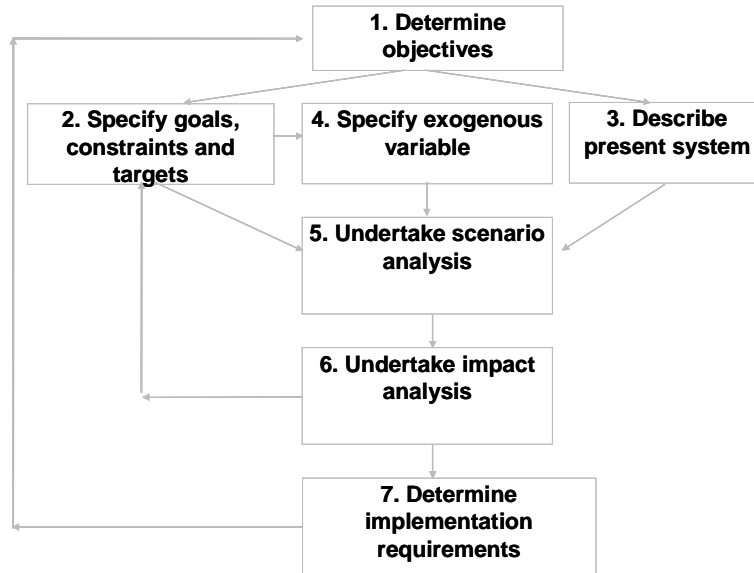
<i>The EST Guidelines</i>	
Guideline 1.	<i>Develop a long-term vision of a desirable transport future that is sustainable for environment and health and provides the benefits of mobility and access.</i>
Guideline 2.	<i>Assess long-term transport trends, considering all aspects of transport, their health and environmental impacts, and the economic and social implications of continuing with 'business as usual'.</i>
Guideline 3.	<i>Define health and environmental quality objectives based on health and environmental criteria, standards, and sustainability requirements.</i>
Guideline 4.	<i>Set quantified, sector-specific targets derived from the environmental and health quality objectives, and set target dates and milestones.</i>
Guideline 5.	<i>Identify strategies to achieve EST and combinations of measures to ensure technological enhancement and changes in transport activity.</i>
Guideline 6.	<i>Assess the social and economic implications of the vision, and ensure they are consistent with social and economic sustainability.</i>
Guideline 7.	<i>Construct packages of measures and instruments for reaching the milestones and targets of EST. Highlight 'win-win' strategies incorporating, in particular, technology policy, infrastructure investment, pricing, transport demand and traffic management, improvement of public transport, and encouragement of walking and cycling; capture synergies (e.g., those contributing to improved road safety) and avoid counteracting effects among instruments.</i>
Guideline 8.	<i>Develop an implementation plan that involves the well-phased application of packages of instruments capable of achieving EST taking into account local, regional, and national circumstances. Set a clear timetable and assign responsibilities for implementation. Assess whether proposed policies, plans, and programmes contribute to or counteract EST in transport and associated sectors using tools such as Strategic Environmental Assessment (SEA).</i>
Guideline 9.	<i>Set provisions for monitoring implementation and for public reporting on the EST strategy; use consistent, well-defined sustainable transport indicators to communicate the results; ensure follow-up action to adapt the strategy according to inputs received and new scientific evidence.</i>
Guideline 10.	<i>Build broad support and co-operation for implementing EST; involve concerned parties, ensure their active support and commitment, and enable broad public participation; raise public awareness and provide education programmes. Ensure that all actions are consistent with global responsibility for sustainable development.</i>

Source OECD. 2002. OECD Guidelines towards Environmentally Sustainable Transport

Implications of backcasting approach for transport policy-making

Karst GEURS, National Institute for Public Health and the Environment (RIVM), the Netherlands, talked about backcasting, which was a key concept of the OECD's EST project. He described the background and general outline of the backcasting approach and stressed the characteristics of the OECD's EST project, i.e., development of a broad range of ambitious environmental criteria, explicit attention to phasing, description of policy packages, and economic and social impacts analysis. He presented the EST case study for the Netherlands to show the necessary steps to take to develop policies using the backcasting approach. Those steps include: i) determining clear objectives, ii) specifying goals and targets, iii) identifying the business-as-usual scenario, v) developing a more desirable scenario by using backcasting in an iterative manner, vi) conducting impact analysis, and vii) creating a package of instruments, e.g., regulations, land-use planning, tradable permits system, infrastructure development, etc. (Figure 23).

Figure 23. Outline of the backcasting approach



Source: Karst GEURS

He said that the backcasting approach can be seen as an innovative tool for policymaking without any special models. The policy implications drawn from the case study exercise are that measures have to be taken and instruments implemented in the short-term because they require a warm-up period for public acceptance and adjustment before the actual implementation, and that some measures, such as technical improvements, land-use planning, and infrastructure development require a long time to implement. He concluded that EST would only result in slightly less macro-economic growth, but still much above current levels, while social benefits would be significant.

Session 3: Presentation of the National EST Case Studies in OECD Countries and Implications for the Asian Region

The OECD's project on EST was undertaken to help make transport sustainable. Nine countries contributed case studies to determine how EST might be achieved. They involved the entire countries of Sweden, The Netherlands, and Germany, respectively, as well as the Quebec-Windsor corridor in Canada, the greater Oslo region, and the Alpine region comprising parts of Austria, France, Italy, and Switzerland. EST was defined, envisioned, and then quantified in terms of internationally-agreed standards for ecosystem and human health. Six EST criteria for noise, land use, and emissions of carbon dioxide, nitrogen oxides, VOCs (volatile organic compounds), and PM (particulate matter) were set for the year 2030 in relation to conditions in 1990. The teams developed EST scenarios consistent with the criteria and also "business-as-usual" (BAU) projections for 2030. Related to the EST project, the CEI (Central European Initiatives) project, entitled "EST goes EAST," was conducted jointly by UNEP, OECD, and the CEI. A part of this project, an EST Case Study for the CEI region was developed, involving 14 countries in transition in the CEI region.

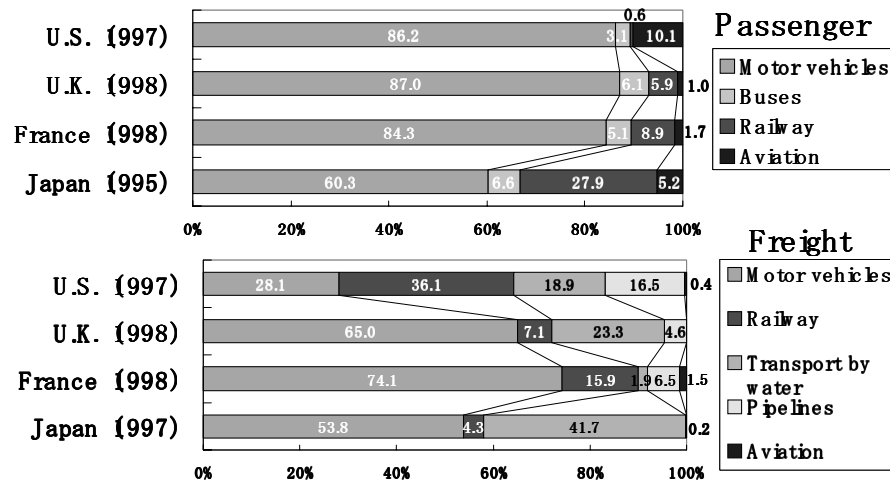
This session included the presentation of the results from the EST Case Study for Japan, which had been recently developed by the Japanese study team, as well as the existing EST Case Studies for the Alpine region, the CEI region, and Canada.

Case study for Japan

Yuichi MORIGUCHI, Japanese EST Study Team, National Institute for Environmental Studies, Japan, presented the Japanese case study. The study consisted of two parts: a nationwide case study and a regional (Aichi prefecture) case study.

The national case study dealt with CO₂ alone as an environmental criterion and a reduction target of 80 per cent to be achieved by 2030; i.e., to gradually decarbonise the transport fuels. First, an overview of transport and environment trends in Japan showed that although railway accounts for 27.9% of passenger transport in Japan – which is exceptionally high – it accounts for only 4.3% of freight transport (Figure 24).

Figure 24. Modal shares of passenger and freight transport in Japan



Source: Yuichi MORIGUCHI, based on the report of "Case Study for Japan" prepared by the Japanese EST study team

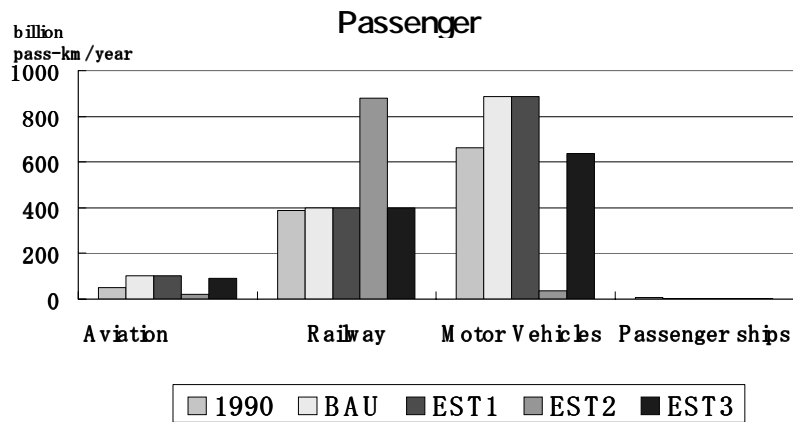
Transport demand, mainly from road transport, is expected to grow continuously. In developing the national case study, three scenarios to meet EST criteria were constructed. For EST1, transport activity was set at the BAU (business-as-usual) level and the criteria were met through improvements in technology. For EST2, technology was set at the BAU level and the criteria were met through reductions in transport activity. For EST3, the criteria were achieved through a combination of improvements in vehicle technology (hybrid and fuel cell vehicles), clean fuels and maintaining transport activity at today's levels with slight reductions in road transport but increases in rail. Table 1 summarises main assumptions for EST3 scenario. The results showed that EST1 and EST2 would require radical changes, while EST3 could achieve the target by more feasible and moderate changes. Figure 25 and Figure 26 show that EST scenarios for passenger and freight transport required a slightly larger share of rail but a somewhat smaller share of road, particularly road freight, transport, compared to the BAU scenario – yet still above current levels.

Table 1. Main assumptions for EST3 scenario for Japan

		Technological improvements	Mobility changes
All transport modes			- 10% reduction in passenger traffic volumes
Motor vehicles	Passenger	- 70% of 22 million passenger vehicles conversion to fuel cell vehicles - 30% conversion to hybrid and CNG	- 5% shift to railways - 15% shift to bicycles and walking - Doubling of average occupancy of passenger car (from 1.46 to 2.92 persons/vehicle)
	Freight	- 65% of 9.9 million freight vehicles conversion to fuel cell vehicles - 30% conversion to CNG	- Decrease of traffic volume of light duty vehicles (LDVs) by 10% - Increase of traffic volume of heavy duty vehicles (HDVs) by 10% - 1.5 times higher average loading rate of LDVs (from 17.8% to 26.7%) - 1.5 times higher average loading rate of HDVs (from 50% to 75%)
Railways	Passenger	- 60% reduction in emission factor compared to 1999	- Increased by the amount shifted from motor vehicles
	Freight	- 60% reduction in emission factor compared to 1999	
Aviation	Passenger	- 50% reduction in emission factor compared to 1999	
	Freight		
Maritime	Passenger	- 30% reduction in emission factor compared to 1999	
	Freight		

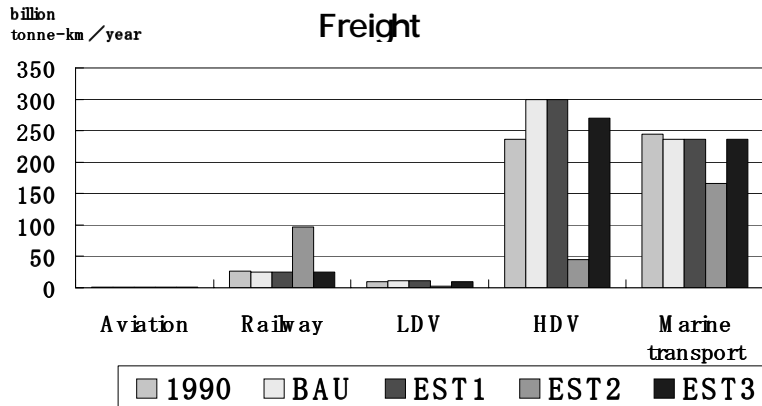
Source: Japanese EST study team, "Case Study for Japan"

Figure 25. Transport activities in each scenario (passenger)



Source: Yuichi MORIGUCHI, based on the report of "Case Study for Japan" prepared by the Japanese EST study team

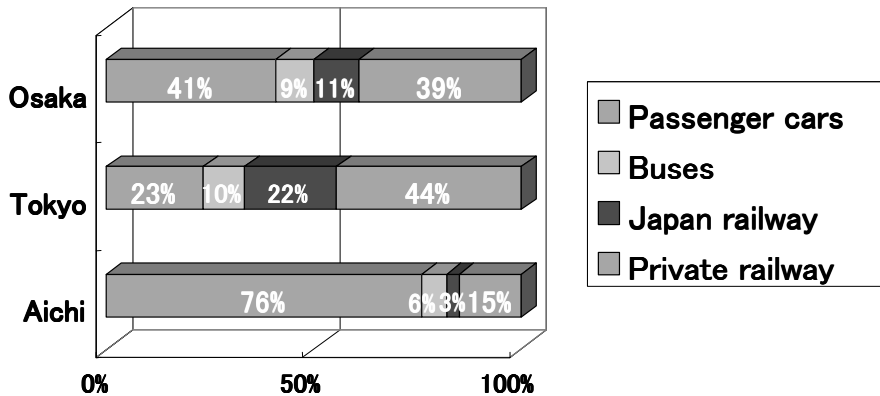
Figure 26. Transport activities in each scenario (freight)



Source: Yuichi MORIGUCHI, based on the report of "Case Study for Japan" prepared by the Japanese EST study team

The regional case study for Aichi prefecture addressed CO₂, NO_x, PM, and VOCs criteria. Nagoya is the capital of Aichi prefecture, and the Nagoya metropolitan area is the third largest in Japan after Tokyo and Osaka. The prefecture highly depends on road transport, which accounts for 76% of passenger transport (Figure 27). This is mainly due to its well-developed road network and the presence of the headquarters of Toyota Motor Corporation.

Figure 27. Modal split of passenger transport in Aichi Prefecture



Source: Yuichi MORIGUCHI, based on the report of "Case Study for Japan" prepared by the Japanese EST study team

In the case of Aichi prefecture, the target of NO_x reduction was a key to achieving the EST criteria which were used in the other existing EST case studies. Meanwhile, it should be noted that Japan will introduce the most stringent emission standards in the world by the end of 2005 which require 0.027g/kWh for PM and 2.0g/kWh for NO_x. Table 2 shows main assumptions for EST3 scenario which involved both technological improvements and mobility changes. Like the national case study and other existing EST case studies, the analysis revealed that the EST3 scenario was the most feasible to achieve the targets.

Table 2. Main assumptions for EST3 scenario for Aichi Prefecture

		Technological improvements	Mobility changes
All transport modes			- 10% reduction in passenger traffic volumes
Motor vehicles	Passenger	- New short and long-term regulations - 65% conversion to fuel cell vehicles	- Doubling the average occupancy of passenger car (from current 1.46 to 2.92 persons/vehicle) - Shifting 10% of traffic volume within Nagoya to railways and 10% to buses
	Buses	- New short and long-term regulations - 30% conversion to fuel cell vehicles	- Doubling the number of bus passengers (from current 13.4 to 26.9 persons/vehicle) - Traffic volume increased by the amount shifted from passenger cars
	LDVs	- 75% conversion to fuel cell vehicles and 25% to CNG vehicles	- Doubling the average loading rate (from current 17.8% to 35.6%) - 20% reduction in freight volume departing from or arriving in Aichi Prefecture - 20% reduction in freight volume passing through Aichi Prefecture
	HDVs	- Same as for LDVs	- Increasing average loading rate 1.5 times (from current 50% to 75%) - 10% reduction in freight volume within Aichi Prefecture - 20% reduction in freight volume passing through, departing from, or arriving in Aichi Prefecture - 20% reduction in freight volume passing through Aichi Prefecture
Railways	Passenger	- 60% reduction in emission factor of CO ₂ and NO _x	- Traffic volume increased by the amount shifted from passenger cars
	Freight	- 60% reduction in emission factor of CO ₂ and NO _x	

Source: Japanese EST study team, "Case Study for Japan"

Finally, it was emphasised that the results of the case study may be subject to change if country-specific reduction targets for each pollutant are applied. For the sake of comparability, the EST criteria¹ which were used in the existing case studies were applied to the Japanese Case Study; however, in practice, reduction targets should be carefully set according to each country's current situation and priority.

The Japanese case study examined the possibility of EST in Japan, while stressing the need to assess possible alternative scenarios and further discussions for developing them.

Austrian contributions to EST Case Studies of the Alpine region and Central and Eastern Europe

On behalf of Robert THALER (Austria), **Peter WIEDERKEHR**, OECD Secretariat, presented the Austrian contribution to EST case studies, i.e., the existing EST Case Studies for Austria, the Alpine

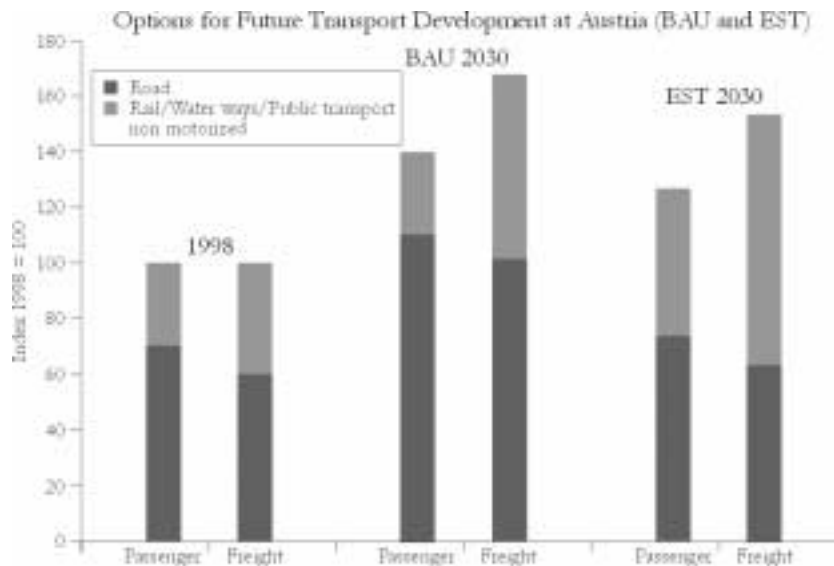
¹ EST criteria were set for six areas: CO₂, NO_x, VOCs, Particulates (PM), Noise, and Land-use. They include 80% or 50% reduction in CO₂ emissions, 90% reduction in NO_x, 90% reduction in VOCs, and 45% to 99% reduction in PM relative to 1990 levels.

region, and the CEI region. For the case study for the Alpine region, attention was given to how to deal with the severe environmental and health impacts of transport in such a sensitive area while coping with rapidly growing transport demands. The Case Study for Austria was included in this regional study. The environmental and health quality objectives for three case studies are as follows:

- CO₂ : 80% reduction for Alpine and Austria, 50% for CEI
- NO_x: 90% reduction for all
- PM: 55% to 99% for Alpine and CEI
- Noise: maximum of 55 db(A) during the day and 45 db(A) at night and outdoors for Austria
- Land-take: Austria only

The Austrian case study showed that a combination of technological improvements and mobility management measures in the EST3 scenario realises a 51% rise in freight traffic while achieving the EST criteria. Significant modal shifts from road transport to rail should be made together with somewhat slower overall growth of transport (Figure 28).

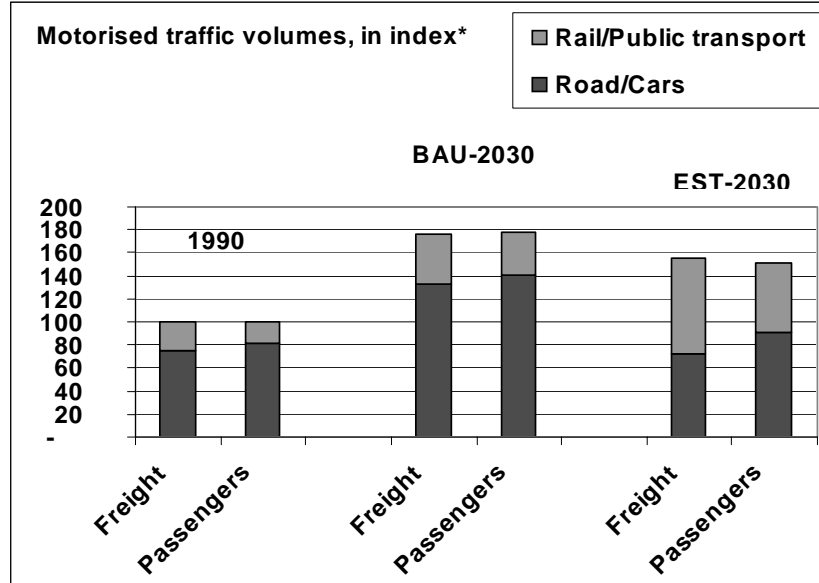
Figure 28. Results of the Austrian Case Study



Source: Robert Thaler

The Case Study for the Alpine Region concluded that road freight transport would have to be stabilised at the level of 1990, while rail freight and rail passenger traffic have to be doubled, in particular, on the transalpine transport corridor (Figure 29).

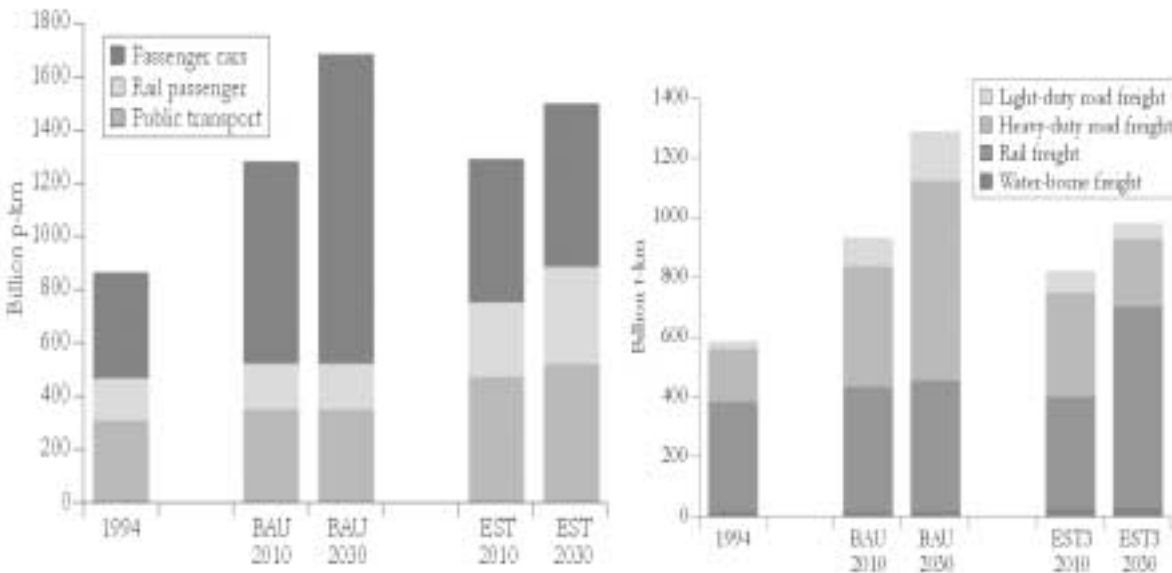
Figure 29. Results of the Alpine Case Study



Source: Robert Thaler

The Case Study for the CEI countries showed that achieving an appropriate EST criterion for the region would require a significant increase in public transport for passenger transport to attain EST (Figure 30). However, it should be noted that the use of passenger cars could increase by more than 50% by 2030 without compromising the EST criteria, due to the relatively low share of road transport in most CEI countries. For freight transport, rail and inland shipping would have to double from 1995 to 2030, assuming a 50% increase in road transport, as well as technological improvements.

Figure 30. Results of the CEI Case Study

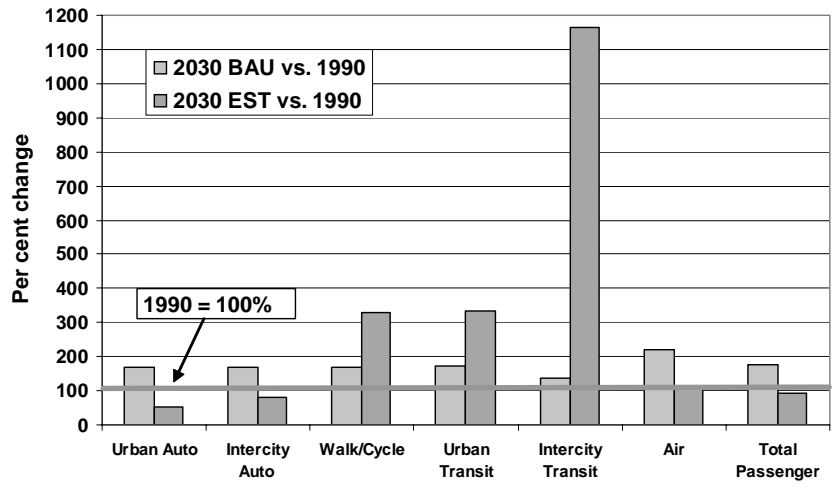


Source: Robert Thaler

Canada's Case Study: EST in the Quebec-Windsor Corridor

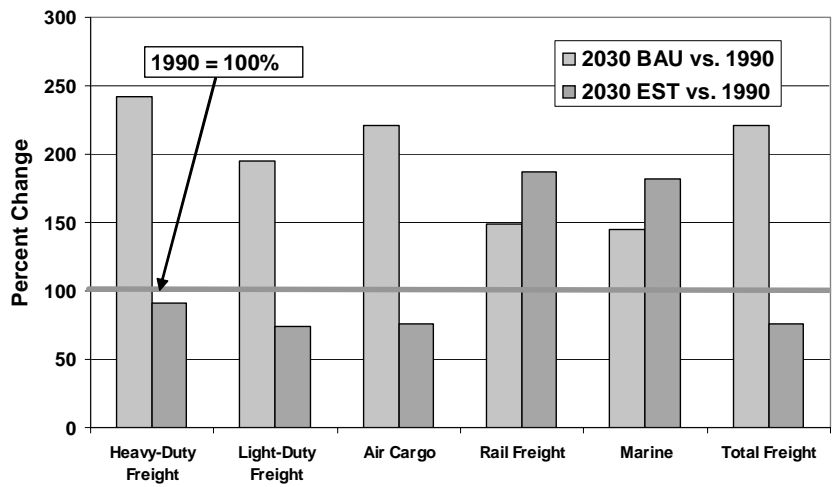
Richard GILBERT, Centre for Sustainable Transportation, OECD consultant, presented the EST Case Study for the Quebec-Windsor Corridor (QWC) in Canada. This corridor is the location of roughly half of the motorised movement of people in Canada and somewhat less than half of the movement of freight. The case study assessed numerous instruments in terms of their ability to achieve the EST criteria and several other objectives. The Canadian Case Study also reveals that changes in activity are regarded as important as changes in technology and that a significant shift from environmentally-less-friendly modes (aviation and road) to environmentally-friendly modes (rail and marine transport) used to take place (Figure 31 and 32).

Figure 31. Movement of people in the QWC, EST vs. BAU in 2030 vs. 1990



Source: Richard GILBERT based on IBI Group, Making Transport Sustainable; A Case Study of the Quebec City-Windsor Corridor, Prepared for Environment Canada, March 2002

Figure 32. Movement of freight in the QWC: EST vs. BAU in 2030, vs. 1990



Source: Richard GILBERT based on IBI Group, Making Transport Sustainable; A Case Study of the Quebec City-Windsor Corridor, Prepared for Environment Canada, March 2002

The instruments which had the most promise for securing EST in the area included fuel pricing/taxation, tradable CO₂ permits (in the long term), parking pricing/management, designated funds for transit expansion, new CAFÉ (corporate average fuel-efficiency) standards/feebates, and so on. However, the conclusion was reached that just about all of the instruments considered in the assessment would have to be deployed to attain EST and that dependence on a wide range of instruments is one of the main characteristics of the Canadian case study. Also, emphasis on fiscal instruments and on educational instruments were other differences between the Canadian instrument package and other EST case studies. A general conclusion drawn from the Canadian Case Study was that "achieving EST would require an enormous and coordinated effort on behalf of all members of society. Moreover, the changes would have to start immediately in order to take effect by 2030."

Conclusions from Session 2 and 3

OECD's EST project demonstrates that EST is attainable and desirable. Currently high level of mobility and goods movements could be kept, but a different modal split with less harmful modes would be needed. Although there are many pathways to achieve EST, essential elements of the EST project, i.e., having a vision, setting concrete goals, and taking a goal-oriented (backcasting) approach, should provide very useful insights in pursuing EST in the Asian region. Also, the numerous policy instruments analysed and the experience gained in the EST Case Studies should provide good references for many other countries.

3.5 Regional measures and approaches to EST

Session 4: How to Make Measures Work towards EST

This session included a number of national and local policies and practical examples in the areas of transport technology, transport demand management, and comprehensive packages of measures to ensure moving towards EST. Many promising examples were presented by representatives and experts from national and local governments, an NGO, international organisations, and the business sector.

Overview presentation

Kenji DOI, Kagawa University and member of the Japanese EST study team, Japan, reviewed one of the background reports, "Transport Related Environmental Practices in Asian countries," highlighting the main findings. The presentation showed that Asian countries use a variety of approaches and measures to cope with increased traffic and resulting environmental problems (Table 3).

Table 3. Summary of various practices in Asia

Category	Measures	Practices	
		Asia	Japan
Provision of transport infrastructure	Building mass transit systems	LRT, MRT, Subways	Widely ranged rail transport systems Guide-way bus
	Upgrading the existing public transport systems	Introduction of air-conditioned bus Easy transit between IPTs	Improvement sin transit convenience Environmentally friendly pass
Transport management policies	Control on automobile ownership	Bidding for obtaining COE	
	Control on the use of automobiles	Park-and-ride Number-plate restriction Electronic road pricing	Park-and-ride Smart parking by ITS HOV practices Joint use of electric vehicles
Emission control	Maintenance measures	Vehicle inspection system Inspection system on emission gas	Inspection system on vehicles and emission gas Engine cleaning
	Emission control	Emission control	Promotion of integrated anti-vehicular emission gas (NO _x and PM)
	Promotion of low emission vehicles (LEVs)	Conversion to low emission IPTs	Promotion of LEVs Green taxation
	Conversion to cleaner fuels	Conversion to cleaner fuels on bus and IPTs	
Urban activity related factors	More efficient distribution	Truck ban	Joint shipping delivery
	Modal shift (from truck to other modes)	Modal shift to shipping	Rail transport of domestic garbage
Land use related factors	Unified practices of transport and land-use development	T.O.D.	Integration of rail construction and residential development
	Traffic impact assessment on land-use development	T.I.A.	Guideline for the large-scale retail store location law
	Campaign and incentives to raise environmental awareness	Partnership for clean air No my-car day	Stop Idling No my-car day

Source: Kenji DOI, based on the report of "Transport related Environmental practices in Asian countries", prepared by the Japanese EST study team

In response to the shortage in transport infrastructure, mass transit systems such as the LRT in Bangkok, Kuala Lumpur, and Manila were constructed. In order to control the number of motor vehicles in cities, Singapore introduced a bidding system for vehicle purchasing rights (certificate of entitlement, COE) and Electronic Road Pricing (ERP). Improvements in emission control are among the most important challenges to mitigate air pollution in most Asian countries. Although automobile emission

control measures in Asian countries adopt European methods, they are still 5 to 10 years behind Europe (Figure 33). So far, Thailand and Malaysia have taken the lead in the introduction of restriction measures. A number of measures to strengthen vehicle inspection programs are in place in a number of cities. On the other hand, public transport largely relies on buses using low-quality fuels in many Asian cities and this leads to further air pollution problems. From this point of view, promotion of cleaner fuel for buses and motor vehicles has been undertaken in Shanghai and Bangkok.

Figure 33. Timetable for introduction of new emission control standards in Asia

Country/Region	1994	95	96	97	98	99	2000	01	02	03	04	05	06
EU	Euro 1		Euro 2			Euro 3			Euro 4				
Bangladesh													
Cambodia													
Hong Kong	Euro 1		Euro 2			Euro 3							
Korea							Euro 2						
India(New Deli)							Euro 1						
Indonesia							Euro 1(proposed)						
Malaysia				Euro 1			Euro 2						
Nepal							Euro 1						
Philippines										Euro 1			
China							Euro 1		Euro 2				
Singapore	Euro 1			Euro 2									
Sri Lanka													
Taiwan							US Tier 1						
Thailand				Euro 1		Euro 2		Euro 3					
Vietnam				Euro 1									

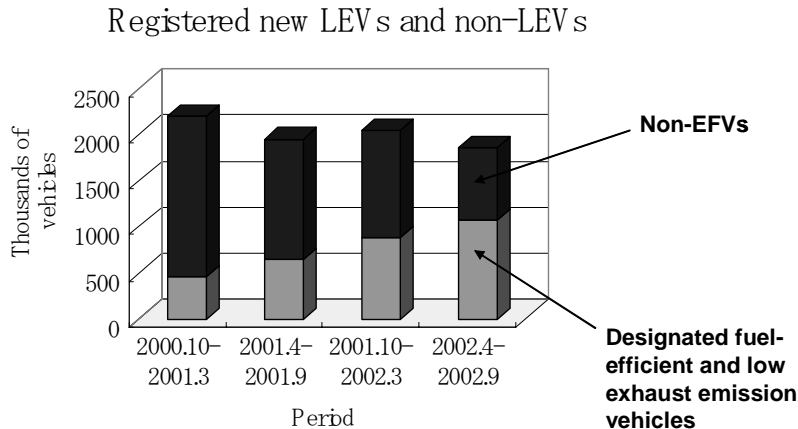
Source: JARI

Source: Kenji DOI, based on the report of "Transport related Environmental practices in Asian countries", prepared by the Japanese EST study team

In conclusion, the need for a comprehensive approach which brings transportation, urban activities, and land-use considerations together was stressed. The exchange of information on good practices is also needed.

Environmentally Friendly Vehicles (EFVs) promotion in Japan

Yoshikiyo ONO, Japanese Ministry of Land, Infrastructure and Transport, talked about the promotion of Environmentally Friendly Vehicles (EFVs) in Japan. In order to facilitate the dissemination of existing EFVs, the government aims to introduce over 10 million EFVs by 2010 through planned introduction of EFVs in the public and private sector, tax incentives, subsidies, and preferential parking privileges for EFVs. As a result, the number of registered EFVs has been increasing rapidly (Figure 34). For promotion of the development and practical use of next-generation EFVs, the government has initiated a project to develop prototype heavy-duty EFVs in cooperation with several automobile manufactures. Most importantly, the Ministry of Land, Infrastructure and Transport organised an international meeting on EFVs in January 2003, as a follow-up to the Ministerial conference on transport which was held in 2001 in Tokyo. Nineteen countries and many international organisations participated in the meeting. Conclusions of the meeting called for international cooperation in order to facilitate the introduction of clean fuels and vehicles in developing countries and the exchange of information among governments. The second meeting is scheduled to take place in 2005.

Figure 34. Market penetration of EFVs in Japan

Source: Yoshikiyo ONO

Inspection of emission from in-use vehicle

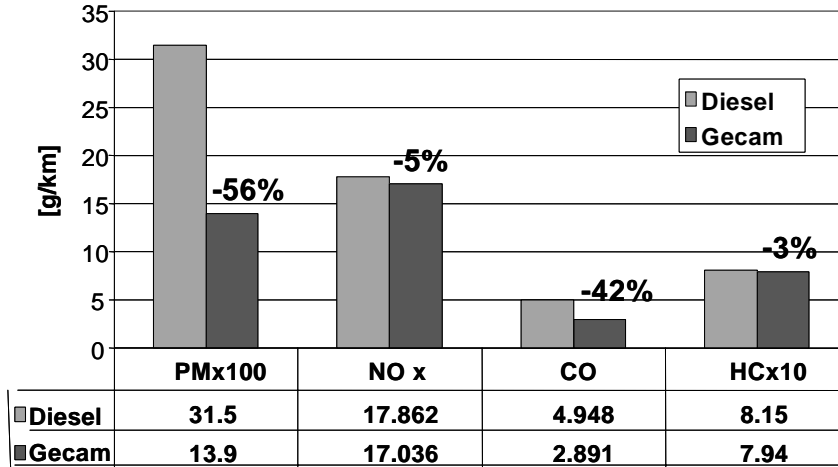
Katsumori YAMAMURA, ECOS Club, a Japanese NGO, presented its mission and a project on vehicle inspection in the Philippines. He warned that the scheduled introduction of tighter emission regulations on diesel-powered vehicles in Japan would result in massive exports of used-vehicles to other Asian countries which do not comply with the new stricter standards. Also, he pointed out that automobile manufactures and car dealers should be responsible for advising owners on maintenance regarding an environmental perspective. He called for further government efforts to improve the quality of vehicle inspection measures and for education to deepen understanding of emission control measures for all levels of citizens.

In relation to the previous presentation, **Roberto T. LASTIMOSO**, Assistant Secretary, Land Transportation Office in the Philippines, described the government's air pollution control measures. He emphasised that a serious problem stems from imported motor vehicles which do not comply with emission standards. He concluded that the Philippines would support the initiatives of other Asian countries to develop an Asian standard for EST, taking into account that situations in developing countries are different from developed countries.

Shanghai project (co-planning of China and Italy)

Gloria VISCONTI, Italian Ministry for the Environment and Territory, introduced a Sino-Italian cooperation programme for environmental protection. One of the projects is the Shanghai GECAM (white diesel) project which started from April 2003. Its main objective is to improve air quality in major Chinese cities by using GECAM, which is a water diesel emulsion stabilised with additives and which produces many fewer emissions of PM, NO_x, CO, and HC compared with ordinary diesel fuels (Figure 35). As a pilot project, 500 buses with GECAM were introduced in Shanghai. Also, the municipality of Beijing agreed to consider launching several cooperation programmes on mobility, notably, i) provision of 300 CNG-fuelled engines manufactured by FIAT IVECO, and ii) development of an advanced test station for the analysis of car emissions.

Figure 35. Performance comparison between Diesel vs. GECAM

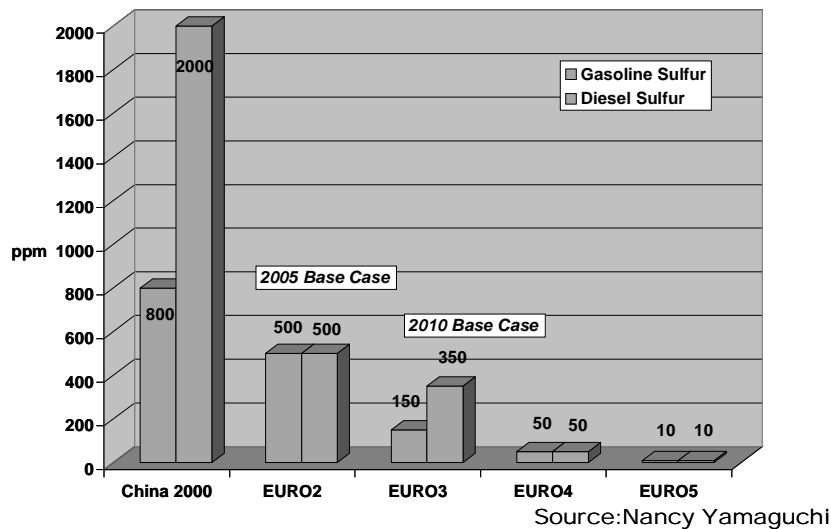


Source: Gloria VISCONTI

Experience from cooperative programs in the Asian region

Axel FRIEDRICH, German Federal Environmental Agency, presented the lessons learned from cooperative programmes with Asian countries, including China, Malaysia, and Indonesia. While many Asian countries have adopted European emission standards for cars and trucks, they do not adopt similar standards for fuels. For example, Beijing is scheduled to introduce EURO2 in 2003; however, fuel quality is way behind European standards (Figure 36). The projects with Malaysia and Indonesia revealed a similar situation. He stressed the need to develop and deploy different policy instruments according to each country's social and economic situation. In conclusion, a centralised and computerised inspection and maintenance system with an attached diagnosis centre was proposed as one promising solution. Also, he proposed to develop modelling tools to monitor and to project environmental conditions. This would assist countries in making action plans with clear goals for sustainable transport.

Figure 36. Maximum sulphur by fuel type

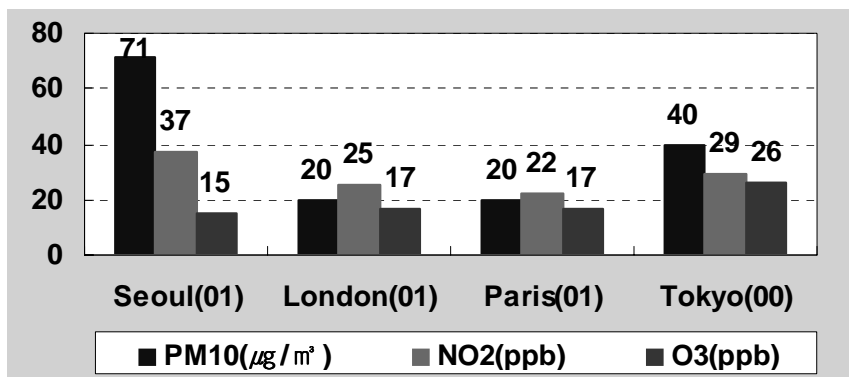


Source: Axel FRIEDRICH

The major policies and measures for obtaining EST in Korea

Chunkyoo PARK, Korean Ministry of Environment, presented their current policies to address emission reduction from motor vehicles. He showed that the emission level of nitrogen dioxide (NO_x) and particulate matters (PM) in Seoul are still problematic compared to other major cities in the world. On the other hand, the emission of sulphur dioxide (SO₂) and carbon monoxide (CO) have decreased due to a variety of air pollution reduction policies (Figure 37).

Figure 37. Comparison of air quality in world major cities

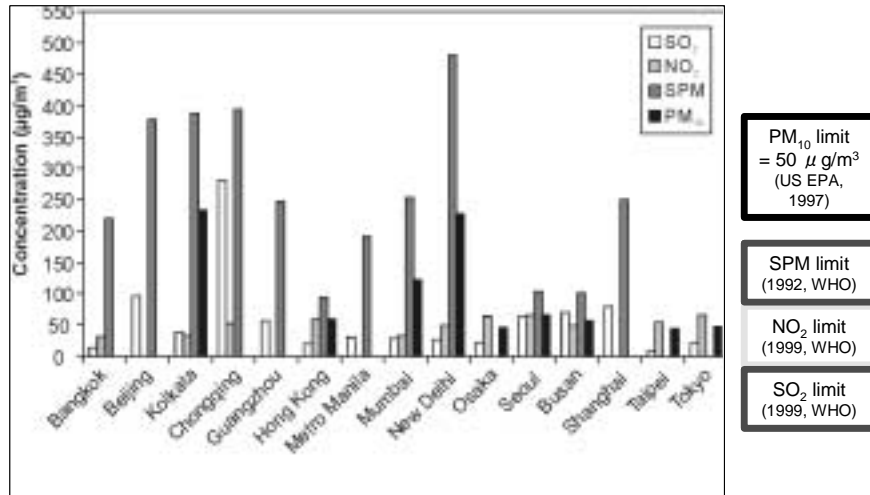


Source: Chun-kyoo PARK

Since the transport sector is a major source of those emissions, various measures have been taken in the areas of transport demand management and vehicle emission control. As for transport demand management, tax incentives, congestion pricing in Seoul, promotion of public transport, parking control, and Intelligent Traffic System (ITS) have been introduced. Regarding vehicle emission control, tighter standards for fuels and emissions were introduced. Currently, Korea adopts US LEV standards for cars and EURO3 for diesel-powered vehicles. These standards will be upgraded to ULEV and EURO4 in 2006. For in-use automobiles, regular emission inspections are conducted and a ban on long-idling operations will take effect in 2003. Replacement by natural gas buses is also promoted. In the Seoul metropolitan area, special measures to improve air quality, in particular the emissions of PM and NO_x, are being developed. The measures include supply of low-emission vehicles and clean vehicle fuels as well as introduction of DPF or DOC. They are expected to reduce the social cost by US\$ 5.8 million.

Travel demand management as instrument to reduce air pollution in Asian cities

Cornie HUIZENGA, Clean Air Initiative for Asian Cities, the Asian Development Bank (ADB), provided a review of a number of policy instruments for transport demand management in major Asian cities. In many cities, air quality remains problematic due to urbanisation and motorisation; in particular, the emission levels of SPM are exceeding the WHO guideline (Figure 38).

Figure 38. Air quality in selected Asian cities

Average annual pollution concentrations (1990-1999) by city
Source: AMIS database, WHO

Source: Cornie HUIZENGA

He stressed the need for an integrated strategy, which includes emission standards, fuel standards, effective inspection and maintenance systems, and transport planning and management. In the Asian context, transport demand management, focusing on promotion of public transport, in particular, buses, rapid rail system and non-motorised transport, is a key to success. In addition, transport planning must be supported by appropriate policies on taxation, pricing, institutional and legal reforms, and raising public awareness. He said that, currently, ADB's portfolio has relatively little focus on TDM, but that the ADB's new transport policy will have strong focus on environment, poverty, and public transport, by means of policy dialogue, investment projects, technical assistance and regional cooperation.

Environmental measures for vehicles in Aichi Prefecture

Takashi INAGAKI, Director of the Air Environment Division, Department of the Environment, Aichi prefectural government, overviewed transport trends in the prefecture. Due to the highly developed road infrastructure, Aichi prefecture has the highest rate of vehicle ownership in Japan, i.e., 4.73 million automobiles for 7.09 million population in 2001. As a result, there is a growing concern over air pollution, climate change, noise, congestion, and other transport-related environmental problems. To address this situation, the prefectural government developed a comprehensive package of measures, "*Aichi New Century Automobile Environment Strategy*," in October 2002, which called for joint efforts of local citizens, businesses, NPOs, and the government with a view to ensuring a more comfortable and healthy environment. The strategy sets specific environmental targets by 2005 and 2010 involving a variety of measures, ranging from promotion of low-emission vehicles, transport demand management (e.g., promotion of car-sharing, bicycles, park-and-ride, etc.), information provision, eco-driving programmes, and so on. In addition, recognising the need for broader efforts towards sustainable transport, Aichi prefecture promotes cooperative measures with other neighbouring prefectures and Nagoya city.

Sustainable mobility – Implications for Asia

George EADS, World Business Council for Sustainable Development (WBCSD), talked about WBCSD's sustainable mobility project and stressed the important role of the Asian region in terms of

attaining sustainable mobility. The sustainable mobility project consists of two parts: one is "*Mobility 2001*," a report of the state of world mobility and its sustainability at the end of the 20th century, and the other one is "*Sustainable Mobility 2030*," which aims to develop a vision of how mobility might be made sustainable in the future and identify strategies for the attainment of this vision.

He then described Asia's challenges and opportunities in achieving sustainable mobility. Asia has to cope with ever-increasing transport demands and resulting environmental pressures. Passenger transport in the Asian region is expected to grow up to 335% in 2030 from 2000, while world passenger transport is to increase 218% (Table 4). Goods transport will increase by 294% in 2030 (Table 5). As a result, projected transport-related CO₂ emissions in the Asian region will increase by 155% compared to 2000, and make up 32% of the world emissions in 2030 (Table 6).

Table 4. Preliminary projections of growth in passenger transport: World and Asia

	2000		2030		2030/2000
	pkt	% pkt	pkt	% pkt	
World	21182	100%	46269	100%	218%
Asia (including OECD Pacific)	3890	18%	13015	28%	335%
Asia (excluding OECD Pacific)	1899	9%	10517	23%	554%
OECD Pacific	1991	9%	2498	5%	125%

pkt = billions of personal kilometers traveled

Projections developed by SMP from IEA WEO 2002 "reference scenario"

Source: George EADS

Table 5. Preliminary projections of growth in goods transport: World and Asia

	2000		2030		2030/2000
	tkm	% tkm	tkm	% tkm	
World	11313	100%	22956	100%	203%
Asia (including OECD Pacific)	2218	20%	6515	28%	294%
Asia (excluding OECD Pacific)	1756	16%	5985	26%	341%
OECD Pacific	463	4%	530	2%	115%

tkm = billions of tonne-kilometers transported

Projections developed by SMP from WEO2002 "reference scenario"

Source: George EADS

Table 6. Projected transport-related CO₂ emissions: World and Asia

	2000		2030		2030 as % of 2000
	Mt	%	Mt	%	
World	4391	100%	8470	100%	193%
Asia	1062	24%	2715	32%	256%
Asia minus OECD Pacific	634	14%	2088	25%	329%
OECD Pacific	428	10%	627	7%	146%

Mt = millions of tons of carbon dioxide equivalent

Source: IEA, WEO2002, "reference scenario"

Source: George EADS

At the same time, wide differences among countries were highlighted. For example, while people in Japan and Singapore have very high levels of access to passenger and goods transport mainly due to well-developed public transport systems, 40% of India's rural villages, where 70% of its population lives, are not connected by all-weather roads to market centres or main road networks. He emphasised that Asia's growing share of world transport and its associated social costs require that Asia play a significant role in any mitigation strategy; however, this does not mean that the developing countries in Asia must be expected to bear an "equal or proportionate" share of the mitigation burden. Strategies in Asia need to draw on the experience of other parts of Asia or other regions outside Asia, reflecting local or regional priorities, such as access, conventional transport-related pollution, noise, congestion, and so on. Finally, he noted that decisions made by Europe and North America which affect the volume and composition of transport activity will have a major impact on trade-dependent Asian economies.

Discussion

Following the presentations, lively discussions took place. Among them, the issue of exportation of used cars drew a lot of attention. Although the primary responsibility should fall on importing countries to regulate the environmental performance of imported used cars, several participants and speakers discussed the need to establish an international standard/regulation which calls on exporting countries to certify the environmental performance of used cars. There was also a comment that in order for car manufacturers to export cars that run on unleaded fuel, the importing countries should provide the necessary infrastructure for unleaded fuels.

Hitoshi IEDA, session moderator, Professor of the University of Tokyo, summarised the situation in large Asian cities and highlighted particularities and commonalities of the transport and environmental issues. The particularities included Ho-Chi-Min city's high dependency on motorcycles, Manila's newly-constructed rail transit network, and Jakarta's traffic demand management. The commonalities included disparity in wealth and densely populated city areas (Table 7). He also presented a study on urban freight transport in Tokyo, Bangkok, and Manila. It showed that total mileage (vehicle-km/person/day) and NO_x emissions (kg/person/day) in Bangkok and Manila are disproportionately higher than Tokyo, compared to freight generation (kg/person/day) (Table 8). This implies that vehicle emission control and inspection and fuel quality are crucial to reduce the environmental pressures from motor vehicles in those cities.

Table 7. Commonalities and peculiarities in major Asian cities*Particularities by Country, by City ...*

Bangkok - Disregard of Rail Transit - Too Strong Truck-Ban	Manila - Newly Constructed Rail Transit Network - Lack of Secondary Roads due to "Exclusive Residential Areas"
Jakarta - Early Member of TDM (3 in 1) - Use of Existing Commuter Rail System	Ho Chi Min - Dependence on Motorbikes - Lack of Public Transit

Commonalities

- Disparity in Wealth	- Flexible Policy Adoption
- Concentration and High Density	- Poor Government
- Handicaps in Transport Development	- Internationalism in Private Economy

Source: Hitoshi IEDA

Table 8. Traffic/Environmental load of logistics

INDICES	TOKYO		BANGKOK		M. MANILA	
Freight Generation [kg/person/day]	65.5	1.00	21.2	0.32	12.6	0.19
Freight Transport Volume [ton-km/person/day]	3.38	1.00	0.58	0.17	0.46	0.14
Total Mileage [veh-km/person/day]	3.42	1.00	1.80	0.53	0.50	0.15
Average Travel Distance [km/vehicle/day]	37.7	1.00	37.6	1.00	27.3	0.72
Number of Trucks [vehicle/person/day]	0.091	1.00	0.048	0.53	0.018	0.20
Ratio of Small Trucks (vehicle-km)	63.3%		91.4%		79.2%	
NOx emission [kg/person/day]	6.16	1.00	4.40	0.71	3.06	0.50

Source: Ieda, Hoshida, Diaz and Fukuda "A Study on a Sustainability of Urban Logistics through Comparative Analysis among Asian Cities", EASTS-03, Fukuoka, Japan, 2003 (under review)

In conclusion, he emphasised that we can learn a great deal from each other and that communication, including Asian, as well as American and European countries, is very important to pursue EST. New technologies such as ITS would be of great help. It is true that we need a comprehensive approach; however, we have to make sure that it does not become a disguise of each entity/individual's responsibility. Comprehensive and focused approaches are needed.

Conclusions from Session 4

A number of measures have been taken towards sustainable transport. While there are many promising achievements in the region, and they can provide a basis for achieving an "Asian EST," ever-increasing transport demands could offset these efforts. Further steps should focus on the establishment of a solid inspection/maintenance system, improvements of fuel quality, as well as demand management measures. In order to avoid the same mistakes made by developed countries and find appropriate policy pathways towards EST, it is important to learn from other countries' experience, not only Asian countries, but also American and European countries.

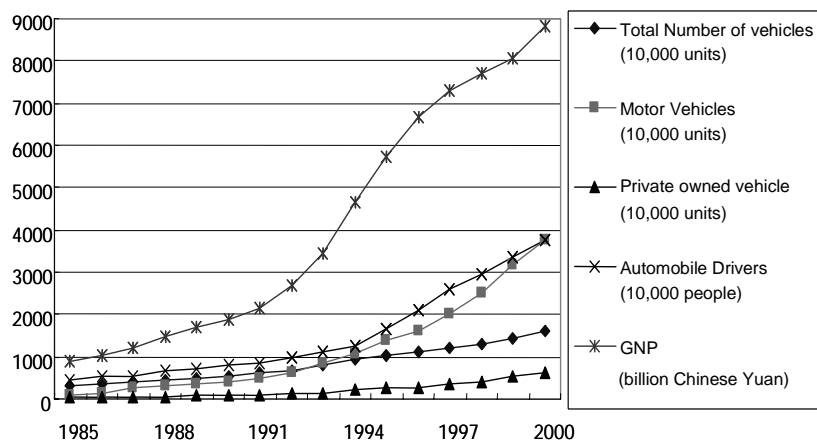
3.6 Ways and Means for Achieving EST

Session 5: Ways and Means for Achieving EST (Panel discussion)

This was a panel discussion in which representatives and experts from the business sector, research institutions, and national and local governments took part. Three main questions were raised for subsequent discussion: *What causes transport-related environmental problems? Which future direction should we take? How can we construct a cooperative network in the Asian region?*

LI Lei, Director, Division of Air and Noise Pollution Control, Chinese State Environment Protection Administration, presented the air pollution status and control strategy in China. In China, rapid growth of vehicle stock has caused serious air pollution. Currently, the number of automobiles is 16 million with an average annual growth of 11 to 13% in the country and 15 to 20% in large cities. Motorcycles are increasing even faster. There are 40 million motorcycles in the country and the number has been increasing by 30 to 35% annually (Figure 39). To address this situation, the government developed strategies to control new vehicle emissions, in-use vehicles emissions, and fuel quality. As further steps, she emphasized the need to learn from other countries' experiences through cooperative study of practical management regulations, long-term emission control planning, and economic instruments.

Figure 39. Motor vehicle stock in China



Source: Lei LI

Joseph HUI, National Environment Agency, Singapore, stated that there is a definite pattern behind transport-related environmental problems: starting from economic growth, income increases, increase in car ownership, lack of appropriate measures, and resulting in congestion and air pollution. He mentioned that good transport can solve both congestion and environmental problems, as MRT, a subway system in Singapore, demonstrates.

Rapin CHARUTULA, Deputy Director-General of the Office of Transport and Traffic Policy and Planning, Thai Ministry of Transport, introduced the master plan for transportation in Thailand. He stated that the master plan used to neglect transport-related environmental problems because they were not monitored or evaluated. The identified causes of the problems are: no control of land-use, insufficient transport networks, priority given to road networks, rapidly increasing car ownership, and lack of adequate regulation/enforcement. Regarding future directions, he suggested the need for strong environmental policies, land-use control by regulations/incentives, public transport improvement (mainly on rail), cooperation with industries, and education of the public.

Axel FRIEDRICH, Federal Environment Agency, Germany raised two issues as major problems in Asia: the priority almost exclusively given to road construction and the subsidies to construction of infrastructure. He also pointed out that the ADB provides more funding to road construction than other modes such as rail, and that the role of financial institutions should be reviewed.

He also stressed that Asian countries should not repeat all the steps which developed countries have already taken and that the lessons learned from OECD's EST work, i.e., a goal-oriented approach, would help find a more direct way to achieve EST. He emphasised that lack of knowledge is one of the main causes of the problems in the region, and thus, initiatives should be taken to spread knowledge and exchange experience among countries.

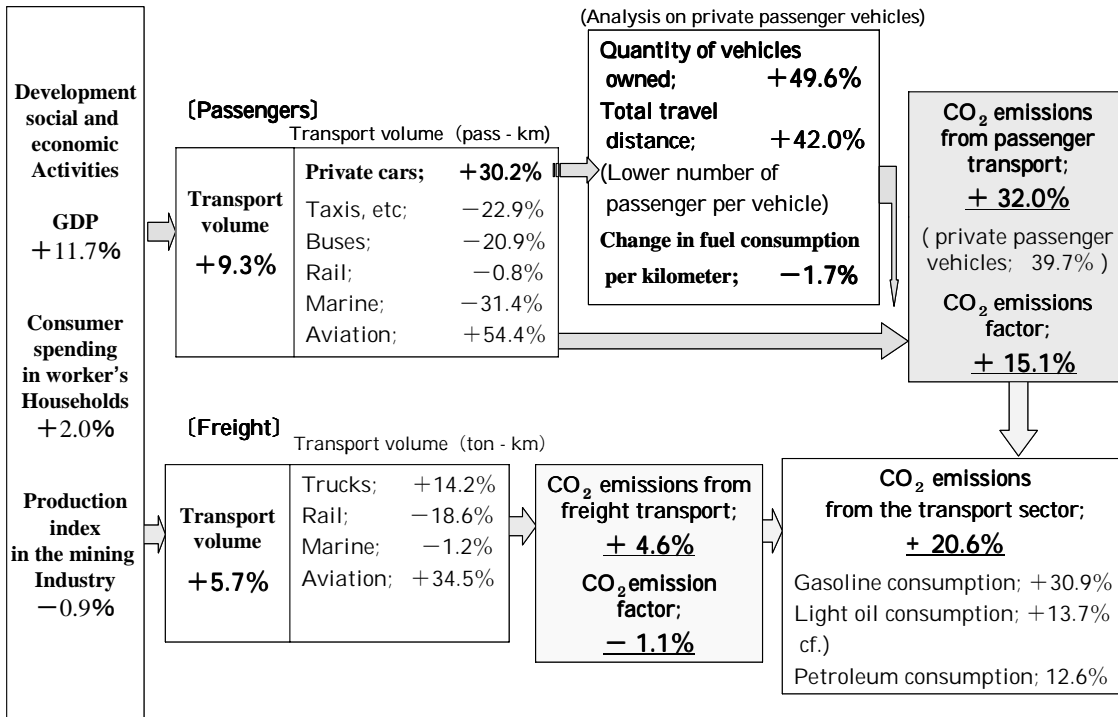
A number of comments were made on how to promote rail transport. In Europe, there are a considerable number of good plans/strategies for rail construction. In the US, the situation of the rail industry is quite different from EU and Japan. It is exclusively freight-oriented and the challenge is how to increase capacity. It was also noted that promotion of rail is not a cure-all solution for attaining EST.

George EADS, WBCSD, stated that Asian countries should try to understand the real costs behind transport activities and set concrete goals. The OECD's EST work was given as an example which should provide insights into ways, tools, and techniques to assist countries in doing so.

Yasuo MARUYAMA, Aichi Prefectural government, recalled that the government had developed a strategy to address air pollution and noise, taking a goal-oriented approach. In order to facilitate the process, the government considers stakeholder involvement and educational instruments to be essential.

Masaharu YAGUSHITA, Vice-chair of the conference steering committee, Professor of Nagoya University, Japan, emphasised the need to introduce the EST approach in Japan based on his analysis. Figure 40 is a summary of this analysis which revealed that CO₂ emissions from passenger transport increased by 32% between 1990 and 2000, while passenger transport volume (passenger-km) increased only 9.3%. This is because transport demands were shifted from public transport to private cars. Transport volume of private cars increased by 30.2%, while taxis, buses, and rail have been decreasing. Considering the fact that CO₂ emissions from freight transport only increased by 5.7%, curbing traffic volume of private cars is key to tackling the climate change issue in Japan. He concluded that to attain EST in Japan, integrated and comprehensive measures, which include not only technological improvements but also mobility management promoting public transport, are needed.

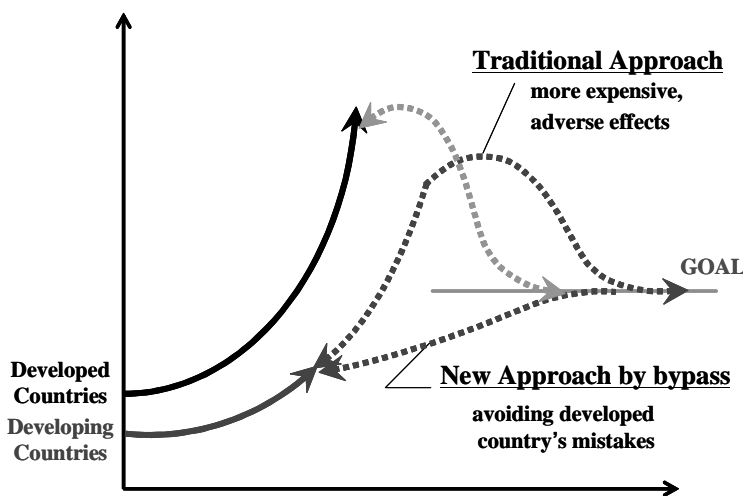
Figure 40. Causes for increases in CO₂ emissions from transport sector in Japan, 2000 vs. 1990 (%)



Source: Masaharu YAGISHITA

Mr. YAGISHITA also illustrated the approach for the Asian countries to take towards EST (Figure 41). As is shown, it would be desirable to find a short-cut (bypass) to achieve sustainable transport without repeating the same mistakes developed countries made. In addition, there should be various pathways to achieve EST according to each country's socio-economic situation. He restated the need for comprehensive measures, giving examples of Switzerland and France, which have comprehensive laws across transport modes.

Figure 41. Illustration of approaches towards EST



Source: Masaharu YAGISHITA

In response to the question on ways to make EST happen, Mr. HUI stressed the importance of pricing policies. Mr. YAGISHITA noted the successful example of Strasbourg, France, and listed three important elements of its success: i) having a clear vision, ii) establishing a financial and institutional capacity to make changes, and iii) involving stakeholders and persuading opponents.

Conclusions from Session 5

As main causes of transport-related environmental problems, lack of appropriate land-use planning and the rapid motorisation were pointed out. The need for long-term control planning and research for transport-related emissions problems were noted. Also, too much emphasis on road construction was pointed out one of the major problems in Asia. Pricing policies were stressed as an effective measure. Having a clear vision, establishing financial and institutional capabilities, and building public consensus were identified as key to developing environmentally sustainable transport systems. At the same time, comprehensive and integrated policies which include all transport modes and are suitable for each country's specific needs were requisites for pursuing EST in the region. Most importantly, each country should find its best way to achieve EST as fast as possible by learning from others' experiences.

3.7 Closing Session

On the basis of the issues presented and discussed and the priorities for the region highlighted, the Nagoya Statement was presented by Prof. Hayashi, and reviewed and endorsed by participants.

4. CONCLUSIONS

The main findings and conclusions of the conference include the following, issues related primarily to urban and metropolitan areas:

- The major transport-related environmental problems in the region are severe traffic congestion, inefficient energy use, air and water pollution and noise, resulting from:
 - large increases in traffic demand, resulting from rapid economic growth, urbanisation, and rapid motorisation,
 - poor control of vehicle emissions of road, rail and maritime transport,
 - absence of efficient inspection and maintenance systems,
 - use of low-quality fuels,
 - and lack of appropriate infrastructure.
- The expected high economic growth in the Asian region will not be sustainable unless issues of transport-related air pollution and use of fossil fuels are addressed.
- There are many advantages and achievements of Asian transport systems that can provide a strong foundation towards EST. However, the high growth in motorised road transport has partly offset these advantages.

- An Asian EST should reflect the diverse and unique patterns of socio-economic characteristic and transport systems in Asian countries. It could also build on OECD's work on EST, including the EST Guidelines and the goal-oriented approach.

The Nagoya Statement also sets forth specific future steps towards EST in cooperation with other countries in the region. These include: addressing pollution and energy efficiency issues, undertaking research activities, promotion of policy dialogues, exchanges of information and human resources, early stakeholder involvement, promotion of policy integration, and establishment of processes to monitor and report on progress.

All these issues were reflected in the final Nagoya statement that was presented to, reviewed, and endorsed by conference participants. The statement is provided as Annex 1.

ANNEX 1

Nagoya Statement on Environmentally Sustainable Transport in the Asian Region

The International Conference on Environmentally Sustainable Transport was held on 23-25 March 2003 in Nagoya, Japan, jointly organised and hosted by the Organisation for Economic Cooperation and Development (OECD), Japan's Ministry of the Environment, and Ministry of Land, Infrastructure and Transport. The meeting reviewed major trends in Asian countries, highlighted progress and remaining challenges, learned from the OECD's work on environmentally sustainable transport (EST), and considered policies and measures for achieving EST. This statement summarises the findings and conclusions of the conference.

In the context of sustainable development, EST means transport development that meets the needs of the present without preventing future generations from meeting their needs. Achieving EST is a major challenge faced by countries around the world, not only OECD countries but also other Asian countries. In Asia, there are serious transport-related economic and environmental problems, including traffic congestion, inefficient energy use, air and water pollution, and noise. These problems are caused by significant increases in traffic demand resulting from rapid economic growth and urbanisation, poor control of vehicular emissions, and lack of appropriate infrastructure.

The diverse and unique transport systems in Asia have coped with different types of demand for over a century. The numerous positive Asian models are known throughout the world, particularly those concerning passenger transport. Among many examples are the dense urban and interurban railway networks of Japan and Korea and Singapore's advanced systems of demand management, including road pricing. In some Asian countries, public transport systems can provide seamless, almost door-to-door service for large numbers of residents. In other countries, a variety of non-motorised and economical transport systems provide essential service.

However, the high state of growth in motorised road transport—including two-wheeled vehicles, cars, and trucks—has partly offset the advantages of these transport systems. This rapid motorisation, together with weak land-use planning, fills urban space and accelerates suburbanisation, leading to development of an inefficient urban structure that results in unnecessary energy use and negative environmental impacts.

In developing countries, public transport is usually heavily road-dependent. Urban and inter-city rail transit systems are yet to be developed or need much further expansion and improvement. Economic

conditions can require the use of low-quality fuels and poorly maintained low-quality vehicles, leading to high levels of pollution and inefficient fuel use.

Asia is expected to achieve significant economic growth during the 21st century. This growth will not be sustainable unless issues of transport-related air pollution and use of fossil fuels are addressed. There is need to establish clear environmental goals and timetables that are appropriate to local circumstances and to identify ways of meeting these goals while ensuring social and economic development. This is especially important for developing countries, which have shorter cycles of economic growth and urbanisation, and therefore need timely implementation of effective measures.

The significant achievements that have already been made throughout Asia provide a strong foundation for further progress towards an Asian EST. Development and promotion of an Asian EST will require substantial improvements in technology and in transport demand management. Effective policy instruments could include pricing, spatial planning, development of green transport infrastructure, investment in technology, tighter emissions standards, vehicle inspection systems, and other economic and regulatory policy instruments. An Asian EST could build on the OECD's work on EST, including OECD's EST Guidelines and the proposals for use of a goal-oriented approach, while taking into account Asia's special transport characteristics and needs.

Asian countries and regions are encouraged to:

- work towards reducing transport-related pollution and improving energy efficiency by developing and realising an appropriate vision of environmentally sustainable transport firmly rooted in the concept of sustainable development. The vision should include short- and medium-term targets that address matters of urgent concern. The vision should also help ensure future economic growth and social development and take into account specific national and regional features.
- undertake research activities and feasibility studies towards realisation of an Asian EST. Promote policy dialogues, exchanges of information and human resources, and support for the activities of relevant non-governmental organisations. These activities could be helped by international organisations such as the United Nations Centre for Regional Development and regional initiatives such as the Clean Air Initiatives in Asian Cities.
- involve all stakeholders from an early stage in decision-making about progress towards EST, recognising their respective interests and responsibilities. Stakeholder consultations should be supported by programs of public information and education.
- promote integration of policies for the environment and for economic and social development, including inter-agency coordination and cooperation.
- establish processes to monitor and report on progress and make the reports widely available.

endorsed at the International Conference on Environmentally Sustainable Transport in the Asian Region, Nagoya, Japan, 25th March, 2003

ANNEX 2

Conference Programme

Opening and Keynote Addresses

Shunichi SUZUKI, *Minister of the Environment, Japan*
 Chikage OOGI, *Minister of Land, Infrastructure and Transport, Japan*
 Kenneth RUFFING, *Acting Director, Environment Directorate, OECD*
 Shoichiro TOYODA, *Vice Chairman, World Business Council for Sustainable Development (WBCSD); Co-chair, WBCSD Sustainable Mobility Project*
 Primitivo C. CAL, *President, Eastern Asia Society for Transportation Studies (EASTS)*
 Kazunobu ONOGAWA, *Director, United Nations Centre for Regional Development (UNCRD)*

Welcome Addresses

Masaaki KANDA, *Governor of Aichi Prefecture*
 Takehisa MATSUBARA, *Mayor of Nagoya City*

Keynote Speech: An Evaluation Concept for Designing an EST Sector

Werner ROTHENGATTER, *President, World Conference on Transport Research Society (WCTRS)*

Session 1: Current Situations, Trends, Challenges and Priorities for Environment and Transport in the Asian region

Moderator: Primitivo C. CAL, *President, EASTS*

Presentations:**Keynote Presentation: Asian Perspectives – focusing on Mega-cities**

Yoshitsugu HAYASHI, *Chair, Conference Steering Committee; Japanese EST Study Team; Nagoya University, Japan*

Reports of the current national situation

- Development of ferry transport with the environmentally sustainable conditions in Indonesia
 Iskandar ABUBAKAR, *Director-General of Land Transportation, Ministry of Communication, Indonesia*
- Korea's situation and effort for Environmentally Sustainable Transport
 HONG Sooman, *Director, Surface Transport Planning Division, Ministry of Construction and Transportation, Korea*
- Current situation of transport and environment in Mongolia
 Davaakhuu NARANPUREV, *Deputy Director of State Administration Department, Head of Cooperation Division, Ministry of Infrastructure, Mongolia*
- Environmentally Sustainable Transportation – A Singapore Case Study
 Joseph HUI, *Head, Strategic Planning and Research Department, National Environment Agency, Singapore*
- Current situation of transport and environment in Thailand
 Silpachai JARUKASEMRATANA, *Director of Engineering and Safety Bureau, Department of Land Transport, Thailand*
- Environmental issues relating to transportation development in Vietnam
 MAI Thanh Dung, *Senior Officer, Ministry of Natural Resources and Environment, Vietnam*

Session 2: EST Initiative - Concept, Approach - and EST Guidelines

Moderator: Gloria VISCONTI, *Vice-Chair, Working Group on Transport of OECD Environment Policy Committee; Ministry of Environment, Italy*

Presentations:

- The EST project: Results and guidelines towards EST
Peter WIEDERKEHR, *Environment Directorate, OECD, Paris, France*
- Implication of backcasting approach for transport policy-making
Karst GEURS, *National Institute for Public Health and the Environment (RIVM), Bilthoven, Netherlands*

Session 3: National EST Case Studies in OECD Countries and Implications for the Asian Region

Moderator: Kenneth RUFFING, *Acting Director, Environment Directorate, OECD, Paris, France*

Presentations:

- Case Study for Japan
Yuichi MORIGUCHI, *Japanese EST study Team; National Institute for Environmental Studies, Tsukuba, Japan*
- Austrian contributions to EST Case Studies of the Alpine region and Central Eastern Europe
Robert THALER, *Federal Ministry of Agriculture, Forestry, Environment and Water management, Austria*
- Canada's Case Study: EST in the Quebec-Windsor corridor
Richard GILBERT, *Centre for Sustainable Transportation, Toronto, Canada; OECD Transport Consultant*

Presentation of Draft Nagoya Statement on EST in the Asian Region

Masaharu YAGISHITA, *Vice-Chair, Conference Steering Committee; Nagoya University, Japan*

Session 4: How to Make Measures Work Towards EST

Moderator: Hitoshi IEDA, *University of Tokyo, Japan*

Presentations:

Overview presentation

Kenji DOI, *Japanese EST Study Team; Kagawa University, Japan*

Technology Measures

- Environmentally Friendly Vehicles (EFVs) promotion
Yoshikiyo ONO, *Director, International Planning Division, Policy Bureau, Ministry of Land, Infrastructure and Transport, Japan*
- Inspection of emissions from in-use vehicle
Katsumori YAMAMURA, *President, ECOS NGO, Japan*
- Sustainable mobility projects in China (The Sino - Italian cooperation program for environmental protection)
Gloria VISCONTI, *Expert, Department for Global Environment, International and Regional Conventions, Ministry of Environment, Italy*
- Experience from cooperative programmes in the Asian region
Axel FRIEDRICH, *Head of Transport and Noise Division, Federal Environmental Agency, Germany*

Demand Management Measures

- The major policies and measures for obtaining EST in Korea
PARK, Chun-kyoo, *Automotive Pollution Control Division, Ministry of the Environment, Korea*

- Travel Demand Management, as instruments to reduce air pollution in Asian cities
Cornie HUIZENGA, *Clean Air Initiative for Asian Cities (CAI-Asia), Asian Development Bank*

Comprehensive Measures

- Environmental Measures for Vehicles in Aichi Prefecture
Takashi INAGAKI, *Director, Air Environment Division, Department of the Environment, Aichi Prefectural Government, Japan*
- Sustainable mobility: Implications for Asia
George C. EADS, *Lead Consultant, Sustainable Mobility Project, WBCSD*

Session5: Ways and Means for Achieving EST (Panel discussion)

Co-Moderators: Yoshitsugu HAYASHI, *Chair, Conference Steering Committee; Nagoya University, Japan*
Werner ROTHENGATTER, *President, WCTRS; University of Karlsruhe, Germany*

Panel:

Masaharu YAGISHITA, *Vice-Chair, Conference Steering Committee; Nagoya University, Japan*
Axel FRIEDRICH, *Head of Transport and Noise Division, Federal Environmental Agency, Germany*
LI, Lein, *Director, Division of Air and Noise Pollution Control, State Environmental Protection Administration, China*
Joseph HUI, *Head, Strategic Planning and Research Department, National Environment Agency, Singapore*
Rapin CHARUTULA, *Deputy Director-General, Office of Transport and Traffic Policy and Planning, Ministry of Transport, Thailand*
George C. EADS, *Lead Consultant, Sustainable Mobility Project, WBCSD*
Yasuo MARUYAMA, *Executive Director, Technical Matter, Department of the Environment, Aichi Prefectural Government, Japan*

Closing Session

Nagoya Statement on EST in the Asian Region

Yoshitsugu HAYASHI, *Chair, Conference Steering Committee; Nagoya University, Japan*

Closing Remarks

Tetsushige NISHIO, *Director-General, Environmental Management Bureau, Ministry of the Environment, Japan*

Steering Committee of the Conference

Yoshitsugu HAYASHI, *Nagoya University, Japan (Chair)*
Masaharu YAGISHITA, *Nagoya University, Japan (Vice-Chair)*
Primitivo C. CAL, *President, Eastern Asia Society for Transportation Studies (EASTS), the Philippines*
PARK, Chun-kyoo, *Director, Ministry of the Environment, Korea*
Hitoshi IEDA, *University of Tokyo, Japan*
Robert THALER, *Chair, Working Group on Transport of OECD Environment Policy Committee; Federal Ministry of Agriculture, Forestry, Environment and Water management, Austria*
Gloria VISCONTI, *Vice-Chair, Working Group on Transport of OECD Environment Policy Committee; Ministry of Environment, Italy*

REFERENCES

OECD. 2000. Environmentally Sustainable Transport (EST), Synthesis report: futures, strategies and best practices.

OECD. 2002. Policy Instruments for Achieving Environmentally Sustainable Transport.

OECD. 2002. OECD Guidelines towards Environmentally Sustainable Transport.

Japanese EST Study Team. 2003. Asian Perspectives: focusing on Mega-cities – current situations, trends, challenges and priorities for environment and transport in the Asian Mega-cities (Background Report for the Nagoya International Conference on Environmentally Sustainable Transport).

Japanese EST Study Team. 2003. Case Study for Japan. (Background Report for the Nagoya International Conference on Environmentally Sustainable Transport).

Japanese EST Study Team. 2003. Transport-related environmental practices in Asian countries (Background Report for the Nagoya International Conference on Environmentally Sustainable Transport).

* All presentations, abstracts, a list of principal participants, and background reports are available on CD-Rom.