

Appendix 3: Proceedings of the 1st Workshop

**Workshop of ERIA Research Project
on
"Project toward the
"Sustainable Automobile Society" in East Asia"**

Economic Research Institute for ASIAN and East Asia (ERIA), Indonesia

**Jakarta, Indonesia
Dec. 15-16, 2008**

1. Keynote speech: "Economic Interpretation of Sustainable Automobile Society"

ERIA

Fuku Kimura

The characteristics of public goods (bads) are non-rivalry and non-excludability. Sum of the private marginal benefits should be equal to social marginal benefit. Due to externalities, air pollution is not fully internalized in the market because private marginal cost is less than social marginal cost. It is often hard to measure in the real world. "Back to the original" or "complete removal of pollution" is often too costly. There is room for the government intervention. Pollution abatement at the level of marginal benefit is equal to marginal cost.

2. Keynote speech: "The global politics of climate change"

Member of Indonesian Academy of Sciences & the President's Council of Advisors

Emil Salim

Market system fails to reveal values of global environmental issues, which is considered external to the economic process and create issues, such as depletion of ozone layer, erosion of bio-diversity and climate change. To correct market failures, UN involves member states in conventions & legal binding arrangements on the basis of multilateralism & 1 country 1 vote democracy, which developed countries dislike; In handling climate change, national political interests supersede global Environmental Needs; Raise public transportation, railways, river boats, compact cities oriented vehicles; Promote low carbon fuel (gas, electricity, coal, liquefaction, gas-to-liquid, fuel hydrogen, fuel cell, natural gas hydrate, 2nd gen. bio-fuel;). Applying fuel efficiency standards rationalize energy prices, fiscal and non-fiscal economic incentives to promote efficiency; promote technology sharing globally & bilaterally are important.

As common developing countries face the challenges of poverty eradication, mitigating and adapting to climate change whose main causes are not under their control but harms their development. Developed countries have not met Kyoto bench-mark but are demanding developing countries also to reduce GHG emissions without technology transfer and funding. The crux of debate is in the principle of "common but differentiated responsibilities and respective capacities" between the two with legal commitments for developed countries through UN multilateralism. Agreements; Gaps in income level, financial resources, trade, technology, control and voting rights in World Bank, IMF, WTO and lack of adherence to multilateralism building democracy between nation states are inhibiting global cooperation to meet global challenges like climate change; The current trends of global CO₂ emissions will definitely change climate within 25-50 years. The future catastrophe of climate change must act as integrating factor for global cooperation through democratic multilateralism between nation states to achieve sustainable Asia & World. Asia will become the engine of global growth in 21st Century with different growth patterns with emphasis on ec-sos-ecol sustainability; Focus is on Millennium Development Goals with co-benefits in reducing CO₂ emissions in inter-sectoral development in the Asia Region. Crucial is transfer of technology from developed to developing countries through cooperative efforts supported by financial transfer and capacity building to enable

developing countries to grow with low carbon.

3. Country report: Vietnam "Transportation and the Environment in Viet Nam"

Hanoi University of Science

Nguyen Thi Ha

In the last ten years, Vietnam has been transformed from a country with relatively few motorized vehicles to a country with a large number of motorized vehicles, especially in urban areas. Unlike other countries, where automobiles dominate, motorcycles occupy by far the largest share of transport in Vietnam. In this presentation, the automobile use and air pollution in Vietnam is overviewed. The fuel quality specifications and emission; managing the transport system; policies, solutions and incentives to protect air environment are also discussed.

4. Country report: Thailand

Thailand Automotive Institute

Threepol Boonyamarn

The vehicle population in Thailand has increased since 1999. Even though, last year domestic sale slightly dropped compared to 2007, over 600,000 units of automobiles and 1.5 million units of motorcycle have been sold each year since 2003, and total number of registered vehicle in 2007 was around 25 million units. The average emission emitted by in-used vehicle in Bangkok area is considered under set limit. However, there were some types of vehicles such as van and mini bus that have shown higher emission levels with respect to black smoke. Considering activities related to environmental protection from automobiles, Thailand has controlled auto-exhaust emissions by using Euro III standards for newly produced automobiles and also enforced in-used vehicles to perform inspection and maintenance before annual vehicle tax. The government also reduced excise tax for environment friendly automobiles, for instance, automobiles that can consume E20 or E85, or hybrid electric vehicles.

The emission standard for the heavy-duty diesel vehicles shall be advanced to Euro III by March 2009. The emission standards for gasoline vehicles and light-duty vehicles will be relocated to Euro IV in 2012; however, it will be very much depend on the oil companies if they could provide the matching fuel quality. The new emission standards for motorcycle will also be effective from March 2009, which will comply with Euro III norms. To promote lower emitting vehicles, Bangkok Mass Transit Authority (BMTA) providing route bus services to serve commuters in Bangkok and vicinities is in the process of changing diesel driven buses to CNG buses. 4,000 New CNG-buses will replace conventional diesel engine buses by this year.

Since, the number of vehicles was drastically increased but there were limited number of inspection sites (controlled by Department of Land Transport's), Private Inspection Centers (PIC) were initiated in 1993. At the beginning, only PICs in Bangkok were authorized by DLT. Up till Dec. 2007, there were 2,500 PICs in every province around country.

To promote Thai automotive industry, the government of Thailand has promoted eco-car manufacturing by giving incentive to manufacturers, who can produce cars

according to required specification. The specification of eco-cars is not only concerned for less fuel consumption but also safety of driver and environmental friendliness. The eco-car must consume fuel not more than 5 liters per 100 kilometers, emit exhaust emission under Euro IV regulation limit, and produce CO₂ less than 120 gram per kilometer. For the safety aspect, car must pass frontal and lateral crash test according to ECE Regulations or better.

5. Country report: Singapore

LTA Academy Singapore
George Sun

Singapore's ambient air quality compares well with other cities in developed countries, achieved through continuous efforts over many years. In land transport, this includes the tightening control of automotive fuel quality and vehicular emissions. However, Singapore faces increasing challenges in maintaining good ambient air quality as population and economy grow further. For example, the fine particulate matter PM_{2.5} level exceeds the USEPA standard. To reduce PM_{2.5}, Singapore has introduced ultra low sulphur since Dec 2005, and mandated new diesel-drive vehicles to meet Euro IV emission standards since Oct 2006.

Singapore has been active in the global community to mitigate climate change, as a party to UNFCCC since 1997 and the Kyoto Protocol since 2006. To set clear directions, Singapore has published the Singapore Green Plan 2012, Energy for Growth (the National Energy Policy Report) and the National Climate Change Strategies. In the transport sector, it has launched the Land Transport Master plan (LTMP) in March 2008.

The LTMP outlined 3 strategies as a sustainable development plan for the land transport systems, they are: Making public transport a choice mode; Managing road usage; Meeting diverse needs. As mass transit is the most efficient means of transport, one of the key targets in the LTMP is to increase public transport modal share (AM peak) from the current 63% to 70% by 2020.

Singapore has pioneered many innovative transport policies to manage transport demand. The vehicle quota system implemented through certificate of entitlement (COE) and electronic road pricing (ERP) have kept Singapore roads relatively congestion-free, despite its limited land, rapid urbanisation and economic growth. Singapore is committed to more sustainable development policies, which include green vehicle rebate, facilitating non-motorised transport, and engaging the public to achieve the long-term targets.

6. Country report: Philippines

University of the Philippines
Crispin Emmanuel D. Diaz

The Philippines is moving toward greater energy self-sufficiency in the transportation sector while addressing safety and emission concerns. However, it is hampered by a lack of close coordination between different agencies and non-government organizations, despite legislation mandating such. Two factors for success have been identified from the experience in the Philippines:

(1) Based on the experience of taxi companies adopting LPG fuel systems, when the economics are beneficial, the shift to alternative energy sources will proceed, even with minimal direct government intervention.

(2) Promoting community ownership through the political will and skill of the political leadership at the local government (municipality) level, which promoted active participation by civil society groups, allowed the success of an environment-oriented programs such as in Puerto Princesa.

7. Country report: Malaysia "Air Quality Management in Malaysia"

National University of Malaysia

Mazrura Sahani

In Malaysia, the Department of Environment (DOE) monitors the country's ambient air quality through a network of 51 stations. These CAQM monitoring stations are strategically located in residential, urban and industrial areas to detect any significant change in the air quality which may be harmful to human health and the environment. The continuous air quality monitoring (CAQM) stations are equipped with continuous automatic analyzers for SO₂, NO_x, CO, O₃, PM₁₀ and HCO. In April 1995 Alam Sekitar Malaysia (ASMA) secured a 20 years concession for the privatization of the air and water quality monitoring and assessment.

The Pb levels monitored in the atmosphere were high in the eighties mainly due to the motor vehicles emissions. However, as a result of Government efforts to promote the use of unleaded petrol since 1991 and the total phase out of leaded petrol in 1998, the Pb level in the atmosphere had declined significantly.

The sulfur content in diesel and petrol will be reduced from 3,000 ppm to 500 ppm and from 1,500 ppm to 500 ppm respectively, with the adoption of EURO 2 specifications. New emission standards based on EURO 2 for diesel vehicles and EURO 3 for petrol vehicles will also be introduced to reduce emission of air pollutants from mobile sources. In addition, the capacity and ability to fight peat swamp fires, a domestic source of haze, will be strengthened.

In order to reduce Emission From Transportation Sector, government review motor vehicles emission standard to adopt EURO 2 standard for diesel vehicles and EURO 3 for petrol vehicles. To improve fuel quality, EURO 2 specifications are proposed. For diesel: sulfur content to be reduced from 3,000 ppm to 500 ppm. For petrol, sulphur content to be reduced from 1,500 ppm to 500 ppm. Implement effective public transportation system to achieve reduction in emission passenger per km, fuel consumption and emission per vehicle –km driven. Followings actions are proposed:

- ① Integrate Clean Air strategies into land-use planning
- ② Improved data management
- ③ Improved R&D programs on air dispersion modeling,
- ④ Environmental epidemiology, transport and environmental impact
- ⑤ Improved fuel quality

- ⑥ Further reduction below 500 ppm S in near term possible and roadmap towards 50 ppm.
- ⑦ Reduce emission from transportation and industrial sectors
- ⑧ Promote public awareness.

8. Country report: Indonesia

Institut Teknologi Bandung
Iman K. Reksowardojo

This report consists of two parts, discussing air pollution and energy in Indonesia. In first part, analysis of air pollution and strategy for air quality improvement are discussed. The analysis of air pollution is explained about:

1. Causes of air pollution mainly by population growth and rapid urbanization, which increase travel demand; unbalanced spatial development, which increases travel distance; change in lifestyle due economic growth; higher energy consumption and dependency on oil; and lack of environmental awareness.
2. Sources of air pollution are low quality of fuel and increases in motor vehicle ownership.
3. Ineffective monitoring of air pollution.
4. Impact of air pollution.
5. Institutional factors' contribution to poor air pollution management.

Strategy for air quality improvement are strategy to prevent air pollution, strategy to control air pollution, strategy to monitor exposure, strategy to mitigate the impact of air pollution and strategy to strengthen institutional capacity. The second part is discussed the unbalanced energy mix and the policy to balance the energy mix in Indonesia.

9. Country report: China "Vehicular Emissions and fuel consumption in China"

Tsinghua University
Lixin Fu

With the fast growing economy, the automobile ownership is soaring in China in recent years. According to the projection, although the overall urban air quality has improved, 39.5% of the cities don't attain standard. As per Gompertz model, the automobile stock will reach 227 million in 2030, among which 147 millions are private cars. In summer, several large cities which have severe traffic pollutions showed violations of ozone level already. Exposure concentrations: roadside level is 2-3 times higher than the general level which has significant health implications.

Emission standards for new vehicles are the basis to determine emission factors. Driving characteristics, Fuel quality, Geography and Environment, Load, Inspection and maintenance (I/M), etc. all have impact on real-world emission level. Beijing-Tianjin-Hebei region, the Yangtze River Delta and the Pearl River Delta, which cover only 6.4% of the Chinese territory, generate about 41% of the total vehicular emissions of each pollutants in 2005.

From 1997 to 2002, the share of road transport system's fuel consumption out of

the national total oil consumption increase from 23% to 32%. According to the projection, this share will further increase to over 50% in 2030. Proper land use can improve the traffic conditions and reduce VMT. Increase the share of public transportation will lower the traffic congestions and conserve the energy and environment.

For Emission control of in-use vehicle, I/M is the most effective means. Acceleration retirement of old and high-emitting vehicles can be done by restricting their use in city-center.

10. Country report: India "Air Pollution Control in India"

National Environmental Engineering Research Institute (NEERI-CSIR)

Nitin Labhsetwar

Air Pollution Control has been addressed through various acts and laws in India, the most important being - Air (Prevention & Control of Pollution) Act, 1981 and Environment (Protection) Act, 1986. With forecast of an impressive growth rate for India, the increased automobile usage is a certainty, which would eventually lead to emission issues. Therefore transport and auto-emission management will be even more important in years to come.

There is a comprehensive National Air Quality Monitoring Program in India with about 340 stations covering 126 cities/towns. Several criteria pollutants and other gaseous and PM emissions are being monitored regularly. The recent trends shows higher concentrations of PM emissions, while SO_x and NO_x are not of serious concern in the recent years. Different shares of automobiles towards overall air pollution are projected under different studies, however, their contribution appears to be considerable with in-use (particularly old vehicles) contributing more. A separate source apportionment study has been conducted recently in major Indian cities, which would lead to the assessment of air pollution from automobiles.

There is a regulatory framework in place and several actions have been taken including implementation of Euro norms, fuel quality standards and I&M (Pollution Under control with roadside emission testing etc) to control the automobile pollution in India. More needs to be done to address the emissions from in-use vehicles.

Though some improvement in air quality status has been reported, desired results in air quality improvement are probably not achieved mainly due to the unprecedented vehicle growth in the recent years and some enforcement issues related to I&M program. These issues are being addressed.

11. Country report: Japan

Japan Automobile Research Institute

Kiyoyuki Minato

In the Kyoto Protocol, Japan promised to reduce its greenhouse gas emissions by 6% from 1990 to 2010. In order to achieve this target, Japan has to knock the increase in CO₂ emissions from the energy sector down to 0.6% over 1990. In 2007, CO₂ emissions from the transportation sector occupied 20% of CO₂ from the total energy sector, reducing the volume by 4.2% by 2010 is required. Thanks to the cooperative efforts made by every stakeholder, CO₂ emissions in Japan's transport sector took a downward turn after

peaking in 2001. All these three factors contributed almost equally to the CO₂ reduction. Popularization of eco-friendly driving habits among vehicle users and promotion of efficient goods distribution have led to the decrease in travel distance. Development and introduction of advanced technologies by auto makers succeeded in increasing fuel efficiency. Upgrading of road infrastructure, including signal control systems, has alleviated traffic congestion. These results show the potential for CO₂ emissions reduction, each sector taking a bottom-up approach.

12. Technical report: Thailand "R&D in Biodiesel for Vehicle"

National Metal and Materials Technology Center (MTEC)
Nuwong Chollacoop

Since one-third of domestic energy consumption comes from transportation sector with overall twice consumption on diesel compared to gasoline, Thai government aims to reduce diesel consumption by other alternative energy sources. Blessed with tropical climate suitable for year-round agriculture, Thailand has surplus of food production so biodiesel has been considered as renewable energy option to diesel need.

To assess various diesel engines compatibility with biodiesel fuel in terms of engine performance, fuel consumption and emission.

Various engine tests with biodiesel generally show improved emission results, especially on black smoke, on the expense of slightly reduced torque/power and increased fuel consumption due to lower heating value. With biodiesel, thermal efficiency is also slightly improved since more fuel consumption of lower heating value is offset by not too much drop in power output. Slight engine modification can help fine tune engine performance and improve emission. However, long term endurance test must be performed to ensure full compatibility in addition to promising short term tests. More importantly, fuel of acceptable quality must be used.

13. Technical report: India

Automotive Research Association of India
A. A. Baikerikar

The Technical report presented was about the activities and over view of "The Automotive Research Association of India" based in Pune, India. The main responsibilities and activities carried out by the institute was briefed, which included R& D Activities, certification activities, preparation and harmonization of standards, facility creation, deliberation of policy matters etc. The special projects handled in various automotive fields were also narrated. The Indian automotive scenario, history of emission norms, fuel standard along with certification was also covered. Details of ARAI study on in-use vehicle and existing inspection system for in-use vehicle was also described. The presentation concluded with way forward for control strategy for India to achieve better air quality.

14. Technical report: China "Ethanol/Methanol and Diesel Fuel"

China Automotive Technology & Research Center

Li Wei

CATARC has done a lot of research in ethanol and methanol fuels since year 2000. Based on our technology reports, national standard of ethanol gasoline fuel(E10) has been implemented since 2001 and NDRC promoted E10 in 10 provinces step by step. The research on methanol fuel is still in progress. Comparatively high quality diesel fuel is a big challenge to our central governments and Beijing local government.

15. Technical report: "Automotive Emission Reduction Technology"

Japan Automobile Research Institute

Masahiko Hori

CO₂ from motor vehicles has been reduced in this decade by fuel consumption improvement Fuel Economy Standards in Japan: Fuel consumption improvement is still an important issue in the next decade to reduce GHG

With respect to emission regulations, NO_x has been improved up to 1/100 by emission regulation since 1970s.

16. Technical report: "Approach to Clean Air in Asia"

Japan Automobile Research Institute

Kiyoyuki Minato

Serious environmental problems are caused by rapid motorization and Urbanization in Asia. According to WHO report (2002), 2/3 of death by air pollution is concentrated in Asia. Trends in emissions: Transport activity is projected to grow much more rapidly in most developing countries. As the measures for air pollution control, I&M programs, improving fuel quality, strengthening emission regulations, promotion of clean vehicles (CNG,LPG,EV,HEV), air quality monitoring, public campaign and education for environment are important.