Summary and Recommendations of the 13th EA-RTM Symposium on

"Transportation toward Low Carbon Society"

held on September 24, 2009
at the Nagoya Congress Center in Nagoya, Japan

The Engineering Academies of Japan, China and Korea jointly held a symposium on a critical issue of "Transportation toward Low Carbon Society" in Nagoya, Japan on September 24, 2009 as part of their 13th East Asia Round Table Meeting of Academies of Engineering (EA-RTM).

CO_2 emissions from transportation modes are currently responsible for 10-20% of the total CO_2 emissions in East Asian countries and it is critically important to reduce these emissions, particularly in consideration of the rapidly increasing number of automobiles in East Asia.

Sharing a common awareness of the need to reduce CO_2 emissions and a strong sense of commitment as Engineering Academies to address this globally important issue, the symposium engaged in comprehensive discussions which considered the impact of technologies, human factors, social systems and policy.

As an outcome of the discussions at the symposium, the three academies unanimously agreed upon the following recommendations in order to appeal to the industries, academe and government authorities of their own countries and, further, to those of other countries through member academies of the International Council of Academies of Engineering and Technological Sciences (CAETS).

Recommendations

1. To meet challenging targets of CO_2 reduction, state-of-the-art scientific advancements and development and deployment of innovative, interdisciplinary technologies must be accelerated.
2. A bio-mimetic approach, inspired by living organisms, offers a potential paradigm shift towards minimum energy (minimum CO_2 emissions) transportation modes in the future and should be explored.
3. In addition to technological improvements of automobiles, trains and other transportation modes, factors such as driver behavior, design of urban transportation systems and a policy framework that promotes all these factors in a balanced and harmonious manner must be considered.
4. East Asian countries should cooperate to promote the innovations necessary for low carbon transportation and the standardization of the novel technologies and systems developed. The three Engineering Academies will exert concerted efforts to support implementation of such measures.
5. The private sector should proactively cooperate to realize such innovations with the support and involvement of East Asian and global governments to promote sustainable growth in East Asia as well as on a global scale.

Session Summaries

Opening Session

1. A near-term solution for the reduced CO_2 emissions from automobiles is hybrid vehicles (HV), and more advanced plug-in hybrid vehicles (PHV). Electric vehicles (EV) for short-distance compact commuters and fuel cell hybrid vehicles (FCHV) for heavy-duty vehicles and buses will follow. It is important to choose the right car in the right place at the right time.
2. In view of the anticipated depletion of oil, the development and use of alternative fuels such as bio-fuels, synthetic fuels and natural gases should be encouraged with due consideration to environment.
3. To solve energy and CO_2-related issues, a comprehensive approach is needed involving such factors as people, vehicles and traffic environment.
4. Apart from the above conventional approaches, a bio-mimetic approach inspired by living organisms, has a potential to apply to the development of transportation modes with minimum energy consumption and minimum CO_2 emissions

Session 1: Power Trains and Energy Sources of Automobiles and Other Transportation Systems for Low Carbon Society

1. Battery electric vehicles (BEV), fuel-cell electric vehicles (FCEV) and bio-fuels are candidates for next generation vehicle technologies.
2. Bio-fuels for internal combustion engines should be developed, avoiding both the destruction of nature and competition with the supply of food.
3. Japan, China and Korea have been developing BEV and FCEV with challenging technological and cost targets, although the priority between BEV and FCEV varies from country to country. Both basic research on materials and electrochemical systems and, demonstration programs for systems prototypes are necessary to advance these technologies in a timely manner.
4. The application of these technologies to other transportation systems, e.g. battery driven light rail vehicles should also be investigated.

Session 2: Cross-cutting Technologies for Transportation Systems

1. Options for employing interdisciplinary, cross-cutting technologies for energy efficient, comfortable and safe driving of vehicles and reducing congestion related pollution emissions should be examined.
2. Much higher fuel economy can be achieved by developing a chassis system with innovative brake, steering and integrated systems, e.g., “Adaptive Cruise Control”, in which all of the sub-components can be adaptively controlled according to the traffic situation.
3. Traffic flow stability is crucial to reduce emissions, increase fuel efficiency and increase safety. It is important to understand driver behavior to allow design of driving assistance systems to achieve flow stability control. In academia, basic research is on-going to address these issues.
4. To achieve safer and more fuel-efficient driving, R&D of driver assistance technologies should be further promoted.

Session3: Acceptable Future Transportation System in Low Carbon Society

1. City lay-out and land use patterns are key factors to determine the characteristics of travel demand. Integrated consideration of land-use patterns, transportation strategies, technology options and transportation policy is necessary to reduce CO_2 emissions.
2. The selection of an optimal public transportation mix among railways, buses, monorails and light rail vehicles depends on travel demand characteristics and should be made considering contributions from bicycles and advanced personal vehicles, ships and airplanes.
3. Information on CO2 emissions for each transportation mode with "visualization" technology and traffic information on public transportation managed by advanced ICT (Information and Communication Technologies) should be offered to the public to encourage them to choose environmentally-friendly transportation modes also from a physical-distribution-system point of view.
4. An intelligent transportation system is important to collect and provide traffic information as well as to enable an advanced billing method, thereby forming the basis of a low carbon transportation system.
5. To design a human-oriented transportation system for a low carbon society, multiple strategic elements (related to social infrastructure, economics, public information, industry/technology, spatial development, mode choice, car ownership, traffic/driving, etc.) must be considered.
6. The industrial sector and academia in Japan, China and Korea should cooperate to develop and validate the strategies and technologies necessary to accelerate the development of a human-oriented, harmonized transportation system for a low carbon society.

Issued by: The Engineering Academy of Japan (EAJ)
The Chinese Academy of Engineering (CAE)
The National Academy of Engineering of Korea (NAEK)

The Drafting Committee members:
Chair: Okada, Masatoshi
Members: Hara, Kunihiko,
Kamimoto, Masayuki,
Lee, Kunwoo
Lu, Huapu
Matsui, Tsuneo
Park, Jong Keun
Wu, Jianping