Reducing GHG Emissions from Transport by Improving Public Transport Systems through Capacity Building and Use of Technology: Capacity building in Thailand

15 – 19 February 2016

Bangkok and Chiang Mai, Thailand

National Science Technology and Innovation Policy Office
Ministry of Science and Technology, THAILAND

March 2016

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PART I

WORKSHOP SUMMARY

1. PROGRAMME

Programme

15th February 2016	
9.00 - 9.15	**Opening and Welcome Remark** • *Assoc. Prof. Dr. Somchai Chatratana* Deputy Secretary General National Science Technology and Innovation Policy Office (STI)
9.15 – 9.30	**Introduction** • *Dr. Surachai Sathitkunarat* Director, Department of Energy and Environment National Science Technology and Innovation Policy Office (STI)
9.30 - 10.00	**Transport and Climate Change** • *Dr. Jakapong Pongthanaisawan* Senior Policy Researcher National Science Technology and Innovation Policy Office (STI)
10.00 - 10.15	**Coffee Break**
10.15 - 12.00	**Introduction to Intelligent Transport System (ITS)** • *Assoc. Prof. Dr. Sorawit Narupiti* Chulalongkorn University **ITS Experience in Thailand** • *Dr. Passakon Prathombutr* Thai Intelligent Transport System Association (ITS)
12.00 - 13.00	**Lunch**
13.00 - 13.10	Walk to The Intelligent Traffic Information Center Foundation (iTIC), Chulalongkorn University
13.10 - 14.00	**iTIC introduction**
14.00 - 14.30	**Traffic management and control** • Mr. Arata Doi Sumitomo Electric Thailand, Ltd.
14.30 - 15.00	**Connected Navigation System** • Dr. Donald M. Ugsang AAPICO ITS Company Limited
15.00 - 15.30	**Traffic information and big data analytic** • Mr. Nuthapong Dumrongrat Toyota Tshsho Electronics (Thailand) Co.,Ltd.
15.30 - 16.00	**Q&A**
17.30 - 19.30	**Reception Dinner at STI**

16th February 2016	
8.00	Meet at STI office
9.00 - 12.00	**Visit : Expressway Authority of Thailand (EXAT) Headquarter** **Topic : Expressway Traffic Control and Management**
12.00 - 13.00	**Lunch**
13.00 - 16.30	**Visit : Bangkok Mass Transit System (BTS) Headquarter** **Topic : Urban Mass Rapid Transit Operation and Management**

17th February 2016	
8.00	Meet at STI Office
9.00 - 12.00	**Visit : Pollution Control Department** **Topic : Vehicle Emission and Testing System**
12.00 - 13.30	**Lunch**
13.30 - 16.00	**Visit : Thai Traffic Police** **Topic : Traffic Management and Control**
16.00 – 18.00	Head to Don Mueang International Airport
19.00 – 20.10	Bangkok – Chiang Mai

18th February 2016	
8.30	Meet at “Mayflower Grande Hotel, Chiang Mai”
9.00 - 12.00	**Visit : Municipality of Chiang Mai** **Topic : Chiang Mai City Traffic Control and Chiang Mai Municipality Bus Service**
12.00 - 13.30	**Lunch**
13.30 - 16.30	**Visit : Department of Rural Road** **Topic : Rural Road Traffic Control**

19th February 2016	
9.00	Meet at “Mayflower Grande Hotel, Chiang Mai”
9.30 - 12.00	**Visit : Chiang Mai University** **Topic : Conclusion of Workshop and Closing Remark**
12.00 - 13.00	Lunch
15.25 – 16.30	Chiang Mai – Bangkok

2. SUMMARY

Summary

The Climate Technology Centre and Network (CTCN) aims to facilitate transfer of climate technologies by providing technical assistance to developing countries through their NDEs, in order to create enabling environment to reduce greenhouse gas (GHG) emissions and climate vulnerability, to improve local innovation capacities, and to increase investments for large scale clean technology deployment in the country. By responding to a country request, the CTCN will help create conditions for improved climate technology transfer and diffusion to support national sustainable development.

With supports from CTCN, the first south-south collaboration between National Designated Entities, Thailand and Bhutan, through a workshop "Reducing GHG Emissions from Transport by Improving Public Transport Systems through Capacity Building and Use of Technology: Capacity building in Thailand" was held in Bangkok and Chiang Mai during the 15th – 19th of February 2016. The workshop was organized by the National Science Technology and Innovation Policy Office (STI), as Thailand NDE, and the Thai Intelligent Transport System Association (ITS).

This workshop provided Bhutan's participants with an overview of Thai experiences in Bangkok and Chiang Mai: intelligent transport systems and public transport systems by Thai intelligent transport system (ITS) experts from Thai Intelligent Transport Systems Association (ITS Thailand), the Intelligent Traffic Information Center Foundation (iTIC), Expressway Authority of Thailand (EXAT), Bangkok Mass Transit System (BTS), Thai Traffic Police, Pollution Control Department (PCD), Municipality of Chiang Mai, and Department of Rural Road Region 10 (Chiang Mai). Through practical examples and case studies, the workshop enhanced participants' knowledge on relevant technologies. The participants were also taken to field visits to observe the application of Thailand's intelligent transport management systems and public transport systems, and to gain an opportunity to interact with experienced officials and engineers.

Day 1 - 15th February 2016 - Morning Session

Opening and Welcome Remark by
Assoc. Prof. Dr. Somchai Chatratana
Deputy Secretary General
National Science Technology and Innovation Policy Office (STI)

Introduction of the Workshop by
Dr. Surachai Sathitkunarat
Director, Department of Energy and Environment
National Science Technology and Innovation Policy Office (STI)

Transport and Climate Change
Dr. Jakapong Pongthanaisawan
Senior Policy Researcher
National Science Technology and Innovation Policy Office (STI)

Introduction to Intelligent Transport System (ITS)
Assoc. Prof. Dr. Sorawit Narupiti
Chulalongkorn University

ITS Experience in Thailand
Dr. Passakon Prathombutr
Thai Intelligent Transport System Association (ITS)

Day 1 - 15th February 2016 - Afternoon Session

Visit: The Intelligent Traffic Information Center Foundation (iTIC)

Topic: Traffic Management and Control System

iTIC introduction
Traffic management and control
- Mr. Arata Doi
  Sumitomo Electric Thailand, Ltd.

Connected Navigation System
- Dr. Donald M. Ugsang
  AAPICO ITS Company Limited

Traffic information and big data analytic
- Mr. Nuthapong Dumrongrat
  Toyota Tshsho Electronics (Thailand) Co.,Ltd.

The Intelligent Traffic Information Center Foundation (iTIC) was officially approved the registration by Ministry of Interior as a non-profit organization on June 14, 2010 with a registered capital of 500,000 Baht supported by Thai ITS Association.

iTIC collects public traffic data from both government and private sources in order to develop into high quality real time traffic report. The service of iTIC is established to minimize traffic congestion, increase road safety and improve efficiency of logistic system in Thailand. iTIC aims to contribute to society under the co-operation by several sectors.

iTIC has invited prominent figures from intelligent transportation system industry to administrate the foundation in order to achieve mission described above. iTIC collects and processes public traffic data from both government (CCTV) and private sources from Taxi, Bus, Logistic and Mobile Phone probes. The combined traffic data will be processed for adding value before disseminating to public .Revenue of iTIC is supported by donors from both government and private sectors. The fund is mainly used to improve quality of traffic information without paying dividend to stakeholders.

Objective of iTIC: To be the traffic information center that provides the information to general public in order to reduce traffic congestion and increase road safety.

Ref.: http://www.iticfoundation.org/

Day 2 - 16th February 2016 - Morning Session

Visit: Expressway Authority of Thailand (EXAT) Headquarter
Topic: Expressway Traffic Control and Management




Thailand's expressway system comprises (usually elevated) high-capacity controlled-access highways serving the Greater Bangkok area and some nearby provinces. The system is operated under the oversight of **the Expressway Authority of Thailand (EXAT)**, and is distinct from the Thai motorway network. First opened to service in 1981, the system currently consists of seven completed sub-systems completed adding up to a total distance of 207.9 kilometres (129.2 mi).

The constituent expressway systems are:

- Chaloem Maha Nakhon Expressway (First Stage Expressway System)
- Si Rat Expressway (Second Stage Expressway System)
- Chalong Rat Expressway (Ramintra – At Narong Expressway)
- Burapha Withi Expressway (Bang Na Expressway)
- Udon Ratthaya Expressway (Bang Pa-in – Pak Kret Expressway)
- Third stage expressway System, S1 section (At Narong - Bang Na)
- Bang Phli – Suksawat Expressway (South Kanchanaphisek ring road)
- Ramintra – Outer Ring Road Expressway

Research and Development of Expressway Service

- EXAT's Intelligent Traffic Sign Development

In 2008, the Expressway Authority of Thailand (EXAT) received complaints from the expressway users saying that EXAT did not provide traffic information while they were on the expressway leading to installation of intelligent traffic signs version 1 in 2009. Due to general public's complaints and the senate's discussion on the position of sign installation, the signs were developed into version 2 in 2014 and installed in the position where the expressway users could shift to use normal roads after knowing about the traffic condition on the expressways. However, the output format remained unchanged from version 1. EXAT has further developed the system of

the sign in version 3 in response to the clients' need and to serve beyond their expectation. The signs of this version can automatically report travel duration as well as expressway and at-grade traffic condition and display PR messages. In addition, the signs are installed outside expressway right-of-way in a position enabling the users to change to a normal road. The sign performance has been assessed for accuracy of travel duration shown on the sign on a monthly basis and its result is used to improve mathematical equation developed for generating precision that meets the defined criteria. Currently, 1 sign has been installed on an at-grade road outside expressway right-of-way in front of Ramintra Expressway toll plaza and 2 signs have been mounted on Chalong Rat Expressway to report travel duration. EXAT has planned to expand the sign service in different areas in the future as well.

- Expressway Travel Information System (TIS) Development

Development of intelligent traffic system (ITS) and data exchange center has enabled EXAT to perform data processing and automatically report traffic condition on the expressway in a timely manner. The traffic information is useful for expressway motorists to make their travel plan. At present, EXAT has provided traffic information service through the following channels including EXAT Call Center 1543, mobile application and EXAT's website. As a result, Expressway System Engineering Research and Development Division has jointly discussed with Toll Collection Department to develop a channel to report an expressway traffic situation to the expressway users at Easy Pass Fast Service point at Bang Na rest area (Outbound), enabling the expressway users and the general public to view a traffic condition on every expressway via CCTV mounted on the expressways. This project is the work performance developed by EXAT's employees from Expressway System Engineering Research and Development Division and serves as a research model which can be employed to tangibly provide services to the general public and support service expansion to other service points in the future.

Ref.: www.exat.co.th

Day 2 - 16th February 2016 - Afternoon Session
Visit: Bangkok Mass Transit System (BTS) Headquarter
Topic: Urban Mass Rapid Transit Operation and Management

Inaugurated on 5th December 1999, the BTS Sky Train was the first electric mass transit railway system to commence operations in Thailand. Built and operated by the Bangkok Mass Transit System Public Company Limited (BTSC), the project was entirely funded by private enterprise. The BTS Sky Train operates on two lines: The Sukhumvit Line, royally bestowed with the title 'Elevated Train in Commemoration of His Majesty the King's 6th Cycle Birthday, Route 1 (Sukhumvit Line), running 17 kilometers and on 12th August 2011, a 5.25 kilometer extension of the Sukhumvit Line commenced operations, expand in train services from On Nut to Bearing Station.

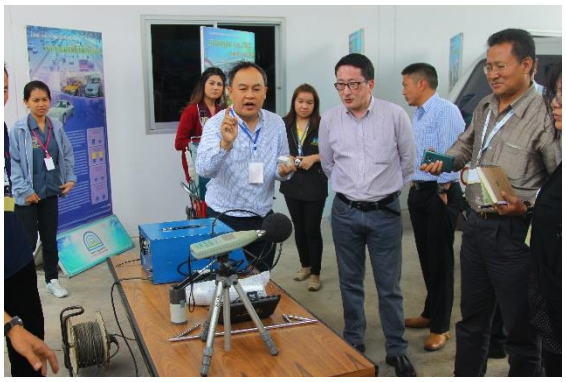
The Elevated Train in Commemoration of His Majesty the King's 6th Cycle Birthday, Route 2 (Silom Line) running 6.5 kilometers was officially inaugurated on 5th December 1999. Subsequently on 23rd August 2009, a 2.2 kilometer extension of the Silom Line commenced operations, expanding train services from Saphan Taksin to Wongwian Yai station on Thonburi side of the Chaophraya River. On 14th February 2013, a further 2.17 kilometer extension of the Silom Line commenced operations to Pho Nimit and Talat Phlu stations. Finally, on 5th December 2013, a further 3.8 kilometer extension of the Silom Line commenced operations to Wutthakat and Bang Wa stations. Currently BTS SkyTrain lines run a total combined length of 36.9 kilometers, connecting 34 stations.

The BTS Sky Train system is a standard mass transit system commonly used in cosmopolitan cities. The Sky Train runs on an elevated track, using a third-rail system to supply electricity, with in-bound and out-bound trains running on separate tracks and platforms. The BTS Sky Train changes the face of the urban commute and raises the standard of mass transit services with each train serving up to 1,000

passengers per journey compared to the 800 vehicles on the roads transporting the same number of commuters. In addition to serving businesses, shopping districts and residential areas in the heart of Bangkok, an extension project is also in the plan in order to reach the broader community of potential passengers in suburban Bangkok.

Ref.: www.bts.co.th

Day 3 - 17th February 2016 - Morning Session
Visit: Pollution Control Department
Topic: Vehicle Emission and Testing System



The Pollution Control Department (PCD) was established on June 4, 1992 under the Royal Decree on the Organizational Division of Pollution Control Department, Ministry of Science, Technology and Environment B.E. 2535(1992), as result of the Enhancement and Conversation of the National Environment Quality Act B.E. 2535 (1992).

The mission is to control, prevent, reduce and eliminate pollution and to conserve and rehabilitate the environment conducive for human life. To achieve our mission , 5 Strategies are used;
1. Reform the management system concurrent with change.
2. Develop a modern database system.
3. Increase the efficiency of environmental law compliance and enforcement.
4. Prevent and resolve pollution problems of the people.
5. Perform our duties to rehabilitate the environment by integrated management.

Automotive Emissions Laboratory
The Automotive Emissions Laboratory of the Pollution Control Department (PCD), founded in 1996, has the following responsibilities:

- To analyze and evaluate the overall motor vehicle emissions situation and set standards for vehicle emissions control;
- To monitor in-use engine performance and the deterioration rate of in-use emissions reduction devices to set new vehicle standards and implement in-use vehicle emissions control measures;
- To monitor and evaluate the effectiveness of emissions control measures;
- To reduce motor vehicle emissions by monitoring fuel quality and developing technical procedures to improve air pollution measurement;
- To inspect and certify new motor vehicle emission standards issued by the Thai Industrial Standards Institute

Technical Specifications

1. Motorcycle Laboratory

The Motorcycle Laboratory uses direct measurement and Constant Volume Sampler (CVS) measurement to monitor the following vehicle exhaust components: Carbon Monoxide (CO), Carbon Dioxide (CO2), Hydrocarbon (HC), and Nitrous Oxide (NOX). The chassis dynamometer can handle vehicle weights between 100-450 kg at a maximum speed of 200 km/h.

2. Light Duty Gasoline Vehicle Laboratory

The Light Duty Gasoline Vehicle Laboratory uses direct measurement and Constant Volume Sampler (CVS) measurement to monitor the following vehicle exhaust components: Carbon Monoxide (CO), Carbon Dioxide (CO2), Hydrocarbon (HC) and Nitrous Oxide (NOX). The chassis dynamometer can handle vehicle weights between 400-3,500 kg at a maximum speed of 200 km/h.

3. Light Duty Diesel Vehicle Laboratory

The Light Duty Diesel Vehicle Laboratory uses direct measurement and Constant Volume Sampler (CVS) measurement to monitor the following vehicle exhaust components: Carbon Monoxide (CO), Carbon Dioxide (CO2), Hydrocarbon (HC) and Nitrous Oxide (NOX), and Particulate Matter (PM). The chassis dynamometer can handle vehicle weights between 400-3,500 kg at a maximum speed of 200 km/h.

4. Heavy Duty Diesel Vehicle Laboratory

The Heavy Duty Gasoline Vehicle Laboratory uses direct measurement and Constant Volume Sampler (CVS) measurement to monitor the following vehicle exhaust components: Carbon Monoxide (CO), Carbon Dioxide (CO2), Hydrocarbon (HC), Nitrous Oxide (NOX), and Particulate Matter (PM). The chassis dynamometer can handle vehicle weights between 5,000-21,000 kg at a maximum speed of 100 km/h

5. Heavy Duty Diesel Engine Laboratory

The Heavy Duty Diesel Engine Laboratory uses direct measurement and Constant Volume Sampler (CVS) measurement to monitor the following engine exhaust components: Carbon Monoxide (CO), Carbon Dioxide (CO2), Hydrocarbon (HC), Nitrous Oxide (NOX), and Particulate Matter (PM). The Laboratory has the capacity to measure engines that run at 110-500 HP with a maximum torque of 2500 nm.

Ref.: www.pcd.go.th

Day 3 - 17th February 2016 - Afternoon Session

Visit : Thai Traffic Police
Topic : Traffic Management and Control

Royal Thai Police has installed the traffic detection system in Bangkok, and traffic data have been collected and processed at Traffic Command and Control center. Traffic data are collected and processed using image processing cameras at 152 locations throughout the road network in Bangkok, at 45 intersections. In this project, 77 CCTVs have been installed for traffic surveillance purpose. The project can be seen as a large scale implementation of the advanced traffic data collection technology. In addition, the command and control center has been updated to integrate many parts of the center's functions together, such as the integration of Phase 1 and 2 CCTV to the new central surveillance system and traffic report from traffic data processing (image processing) at 152 detection locations in Bangkok.

The Bangkok traffic monitoring system aims at enhancing the traffic management in Bangkok. It provides knowledge of traffic to the traffic operators and commanders. The traffic information can be used for planning and operational aspects.

For planning analysis, the traffic data can be used for reviewing the historical traffic conditions. Traffic volumes are reviewed to get the actual traffic demand patterns which would lead to examination of the past traffic management strategies, finding traffic "hot spots" (critical junction/area), and the periods of traffic congestion. This could help the operator (police) to plan the workforce for their manual operation. At the same time, the traffic information can be used for detailed traffic analysis to determine the systematic traffic management solution, such as the optimization of traffic signal control, lane management, or the implementation of traffic management measures.

For operational analysis, the traffic monitoring system provides timely and continuous traffic surveillance. The monitoring of the changes in traffic conditions is crucial for real-time traffic management decision. At this time, city of Bangkok does not possess urban traffic signal control (UTC) which could automatically control traffic signals in the road network in real-time. Nonetheless, the traffic monitoring system gives valuable traffic conditions for operators and commanders at the center. The continuous surveillance enables the operators to explore the change in traffic conditions, the change in traffic "hot spots", and the effect of congestion of one intersection to adjacent nodes. The operator can not only judge the right execution through numerical data, but also quickly scan the current and historical traffic conditions through a series of traffic images.

Ref.: Narupiti S. et al. "BANGKOK TRAFFIC MONITORING SYSTEM"

Day 4 - 18th February 2016 – Morning Session

Visit : Municipality of Chiang Mai
Topic : Chiang Mai City Traffic Control and Chiang Mai Municipality Bus Service

Chiang Mai Municipality has a total area of approximately 40.216 square kilometres. It has a population about 174,235 people in 75,878 households. Currently, Chiang Mai has become a hub of regional prosperity all areas. The native population Immigrants living in Chiang Mai than 2.5 million people. Private transport, i.e. car and motorcycle, share almost of transportation in the area. Public transport are provided by paratransit (red-car), taxi, tricycle (tuk tuk) and bus. Chiang Mai Municipality set up a traffic control center with the aim of managing traffic and road safety.

Day 4 - 18th February 2016 – Afternoon Session

Visit : Department of Rural Road
Topic : Rural Road Traffic Control

Department of Rural Roads (DORR) is a department of the Thai government, under the Ministry of Transport. It maintains rural roads, under a different numbering scheme from national roads, which are managed by the Department of Highways (DOH). In Chiang Mai, the Department of Rural Road District 10 has installed the intelligent transport system technology in the middle ring road of Chiang Mai. The system of Area Traffic Control (ATC) has been used for traffic control and road safety purposes.

Day 5 - 19th February 2016 – Morning Session

Visit : Chiang Mai University
Topic : Conclusion of Workshop and Closing Remark

Thailand NDE and Bhutan's participants were discussed about the results of this workshop and further collaboration. The potential topics of the collaboration between Thailand and Bhutan are as follows:

- Capacity Building for Bhutan's Local Government/Young Officers
  - Urban Transport Planning
  - Land Use Planning
  - Road Safety
  - Emission Control
  - Intelligent Transport System
  - Biofuel
- R&D Support for Climate Change Technology and Policy
- Master and PhD Program on Climate Change Technology and Policy
- TNA Experience Sharing