ASEAN INTELLIGENT TRANSPORT SYSTEM (ITS) POLICY FRAMEWORK *v2.0*

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ASEAN ITS POLICY FRAMEWORK
v2.0

The ASEAN Secretariat
Jakarta

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The Member States are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.
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The map in this publication is only indicative and is not drawn to scale.

Content

1. INTRODUCTION

The ASEAN ITS Policy Framework outlines guiding principles for the planning, evaluating and prioritising Intelligent Transport Systems (ITS) projects. The Framework, is intended to be broad enough to cater to the varied needs of the ASEAN Member States, and is therefore not prescriptive. Through this framework, it is hoped that ASEAN Member States is able to identify specify ITS programmes, projects and activities to be implemented within their countries. Equally important, this Framework also emphasises the importance of promoting and create awareness of the significance of ITS applications across the industry within the country as well as ASEAN. Each ASEAN Member State should use the Framework as a guide in planning, evaluating and facilitating ITS projects in their respective countries according to their needs.

The first ASEAN ITS Policy Framework was developed with the active participation of all ASEAN Member States in 2006. This document, ASEAN ITS Policy Framework V2.0, is an updated and revised version of the first document.

STATUS OF ITS IN ASEAN

2. STATUS OF ITS IN ASEAN

ASEAN Member States differ greatly in size, social, demographic and economic set-ups as well as human/vehicle populations and level of land transport infrastructure development. The degree of development and deployment of ITS also varies among ASEAN Member States. Based on the information submitted by the ASEAN Member States collected via the recent survey, the table below shared some selected information of recent ITS deployment in some of the ASEAN Member States, its current ITS developments and future ITS plans.

INDONESIA (1)

Type of system	: Intelligent Transport System
Name of system	: Area Traffic Control System
Objective	: Manage traffic flow automatically at an intersection area.
Beneficiaries	: Commuters and transport operators at large
Promote the use of system/awareness	: Legislation to enforce use
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Private companies
Information & data ownership	: Government
Information sharing	: Portable devices, internet, Variable Message Systems
Extend of system integration	: Integration with other GPS enable devices such as smartphone / portable devices

MALAYSIA (1)

Type of system	: Intelligent Transport System
Name of system	: Integrated Transport Information System (ITIS)
Objective	: Traffic information dissemination, improve incident management, create systematic system for traffic information collection, utilise traffic information for traffic planning and management.
Beneficiaries	: Public & private transport users and operators and emergency services
Promote the use of system/awareness	: Public education program, advertisement
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Government
Information & data ownership	: Government
Information sharing	: Mass media, portable devices, internet, Variable Message Systems
Extend of system integration	: Had been integrated with Malaysia Highway Authority (MHA) and plan to integrate with other traffic related agencies in the future

PHILIPPINES (4)

Type of system	: Traffic Information Advisory System
Name of system	: LED Traffic Information Board Project and Traffic Navigator
Objective	: To save travel time by 44000 vehicle hours per day
Beneficiaries	: Commuters and transport operators at large, including tourist visiting Metro Manila.
Promote the use of system/awareness	: Public education program, advertisement, incentives for usage
Funding	: Government fund, local private companies, external funding
System ownership	: Government
Maintenance responsibility	: Government
Information & data ownership	: Government
Information sharing	: Mass media, traveller's advisory radio, portable devices, internet, Variable Message Systems
Extend of system integration	: Will be integrated in ITS project

Type of system	: Toll Road Interoperability and Standardization
Name of system	: Electronic Toll Collection (ETC) System
Objective	: Reduction in vehicle queuing time at toll plaza, Reduction in travel time, cost reduction in toll operation
Beneficiaries	: Public & private transport users and operators and freight companies
Promote the use of system/awareness	: Incentives for usage
Funding	: Local private companies
System ownership	: Private companies
Maintenance responsibility	: Private companies
Information & data ownership	: Owner of the system
Information sharing	: In-vehicle navigation devices
Extend of system integration	: For integration with ITS project

Type of system	: Advanced Traffic Signalization Project
Name of system	: MMDA Traffic Signalization Project
Objective	: Travel time savings of 1-vehicle hours at intersection or for 84 intersections savings of 14,866 vehicle hours per day
Beneficiaries	: Commuters and transport operators at large, including tourist visiting Metro Manila.
Promote the use of system/awareness	: Incentives for usage, legislation to enforce use
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Government
Information & data ownership	: Government
Information sharing	: Mass media
Extend of system integration	: Planned to integrate with ITS project

Type of system	: Public Transport Route Information Service
Name of system	: Philippines Open Transport Database- General Transit Feed Specification Project
Objective	: Internet, Smart phone and SMS based public transport information system for Metro Manila
Beneficiaries	: Commuters and transport operators at large, including tourist visiting Metro Manila.
Promote the use of system/awareness	: Public education programmes, incentives for usage
Funding	: External funding (World Bank)
System ownership	: Joint ownership between public and private sector
Maintenance responsibility	: Government, joint responsibility of government agency and private company, funding agency (World Bank)
Information & data ownership	: Government
Information sharing	: Mass media, traveller's advisory radio, portable devices, internet, Variable Message Systems
Extend of system integration	: Integrate with the upcoming ITS project

SINGAPORE (1)

Type of system	: Traffic Monitoring and Management
Name of system	: Expressway Monitoring and Advisory System (EMAS)
Objective	: Minimise traffic congestion improve road safety and recovery of incidents on expressway.
Beneficiaries	: Private transport users and operators
Promote the use of system/awareness	: Public education program
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Government
Information & data ownership	: Government
Information sharing	: Mass media, portable devices, in-vehicle navigation devices, internet, Variable Message System
Extend of system integration	: Had been integrated with other systems for incident recovery management, data analysis and traveller information purpose

THAILAND (5)

Type of system	: Automatic Data Collection System & Traveller's Information
Name of system	: -
Objective	: To collect traffic data for engineering usage, to monitor traffic conditions on major highways, to facilitate road users for trip planning
Beneficiaries	: Private transport users and operators
Promote the use of system/awareness	: EXPO, radio media, conference
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Joint responsibility of government agency and private company
Information & data ownership	: Government
Information sharing	: Traveller's advisory radio, internet, Facebook, portable devices [coming soon]
Extend of system integration	: Highly flexible

Type of system	: Real Time Information
Name of system	: Real Time Parking Spaces System
Objective	: To give real time parking spaces information on internet or mobile. To persuade drivers to leave their vehicles in park & ride and transfer to MRT system for the rest of their trip
Beneficiaries	: Public transport users and operators
Promote the use of system/awareness	: Brochures, website
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Government
Information & data ownership	: Government
Information sharing	: Internet
Extend of system integration	: -

Type of system	: Traffic Data Information System
Name of system	: The Real Time Traffic Data Integration System
Objective	: To develop the traffic and transportation data management system and develop the traffic and Transportation integration system that can exchange traffic data with other agencies. Some traffic information will be reported as Real Time Traffic Situation to people with free of charge.
	: The OTP has developed and managed the traffic and transportation data and enveloped the traffic and transportation integration system that can exchange traffic data with the Bangkok Metropolitan Administration (BMA), the Royal Thai Police (RTP), the Department of Highway (DOH), the Expressway Authority of Thailand (EXAT), and other agencies. These agencies also plan to undertake the ITS operations in the future; however, with the budget constraints, the operations are gradually on-processed in order to achieve the objectives of each project in the general framework of the future ITS. The related agencies in the OTP integration system as follows:

1. The OTP: Monitor traffic on road network using loop detectors, CCTVs, Image processing. Record data on database at the control at the OTP
2. The BMA: Monitor traffic. Traffic Control. And CCTV cameras at some major intersections to collect traffic volumes.
3. The Royal Thai Police (RTP): CCTV system for monitoring traffic in Bangkok.
4. The DOH: CCTV system for monitoring traffic and automatic Traffic count detectors
5. The EXAT: Install CCTV and traffic detectors all expressway every 500-1000 m.

	6. Genius Traffic System Company Limited: Traffic report on intelligent traffic signs System CCTV system. 7. Pattaya City: Area Traffic Control system and CCTV system for monitoring traffic.
Beneficiaries	: Public & private transport users and operators
Promote the use of system/awareness	: Advertisements
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Government
Information & data ownership	: Government
Information sharing	: Mass media, traveller's advisory radio, portable devices, internet, Variable Message Systems, information kiosks
Extend of system integration	: The system has connected the information from many agencies while OTP is the data center. The connected information consists of data from 500 CCTVs, data from160 automatic traffic counts and other traffic situation data from other agencies. These obtained data will be analyzed in traffic congestion and velocity database and will be shown in Real time Traffic situation report by internet and smart phone with free of charge

Type of system	: Accident Data Information System
Name of system	: Transportation Route Accident Management Systems (TRAMS)
Objective	: Office of the Permanent Secretary, Ministry of Transport (MOT) has developed Transportation Route Accident Management Systems (TRAMS). To develop and report the accident data management system on the transportation route that can exchange accident data with the Department of Highway (DOH), the Department of Rural Roads (DRR), the Expressway Authority of Thailand (EXAT) and now developing with other agencies such as the State railway of Thailand (SRT) and the Bangkok Mass Transit Authority (BMTA). The related agencies in the TRAMS integration system as follows: 1. The DOH: Report accident on highway network. 2. The DRR: Report accident on rural roads network. 3. The EXAT: Report accident on expressway. 4. The SRT: Report accident on railway. 5. The BMTA: Report accident on bus and van routes throughout the Bangkok and its suburban provinces. TRAMS will be present in the MOT Operation Center (MOTOC) for support to the executive's decisions and resolve the situation.
Beneficiaries	: Public & private transport users and operators, Pedestrians
Promote the use of system/awareness	: Incentives for usage
Funding	: Government fund
System ownership	: Government
Maintenance responsibility	: Government
Information & data ownership	: Government

Information sharing	: Mass media, portable devices, internet
Extend of system integration	: The system is the integration of accident data on transportation route from many agencies and report via internet and smart phone with free of charge. In the future is to develop accident report for water and air. Including link the traffic data, the risks point and hazardous area data and develop the route to avoid the accident system.

Type of system	: GPS
Name of system	: Tracking and Tracing
Objective	: Bus monitoring, reduce accident, create information about transportation
Beneficiaries	: Public transport users and operators
Promote the use of system/awareness	: Incentives for usage
Funding	: BMTA's budget
System ownership	: BMTA
Maintenance responsibility	: BMTA
Information & data ownership	: Owner of the system
Information sharing	: Portable devices, internet
Extend of system integration	: Share information with others transports

VIET NAM (1)

Type of system	: Currently unclassified
Name of system	: Currently unclassified
Objective	: In order to connect with other regional ITS Beneficiaries: Private and public transport users and operators
Beneficiaries	: Promote the use of system/Awareness:
Promote the use of system/awareness	: Public education programmes, advertisement
Funding	: Government fund, joint venture between public and private sector, external funding
System ownership	: Government
Maintenance responsibility	: Joint responsibility of government agency and private company
Information & data ownership	: Government
Information sharing	: Mass media, traveller's advisory radio, portable devices
Extend of system integration	: Under studying phase

TRANSPORT CHALLENGES

3. TRANSPORT CHALLENGES

Today, ASEAN Member States face many transport challenges. Some of the key transport challenges are:

TRAFFIC CONGESTION

Traffic congestion contributes to economic costs, losses in productivity and environmental pollution. Ensuring smooth mobility for roads has always been a challenge for transportation agencies around the world. The use of ITS to mitigate traffic congestion is considered a cost efficient option when compared to the high construction costs of expanding the road network to help combat congested road network. ITS can also optimize the use of limited resources such as land space and funds.

SAFETY

Introducing measures to reduce road accidents that may result in injury or fatality is of paramount importance. As a country develops, inevitability traffic accidents also increase in tandem with the growth of motorization and road infrastructure. Study has shown that road safety is of great concerns in developing country as the inadequacy of public transport services results in greater demand for private transportation. The goal to reduce traffic accidents on the road can be achieved considerably with the assistance of ITS developed to enhance road safety.

GOOD PUBLIC TRANSPORT SYSTEM

To entice private transport users to make the switch to public transport, a good public transportation system needs to be in place to facilitate a convenient and enjoyable travel experience. Having a good public transportation system will give travellers an option, beside private transport, to get to their destinations with minimal hassle. ITS applications can be developed to provide travellers with real-time information on public transport such as estimated train/bus arrival times for them to make informed travel choices.

FINANCING ITS

Traditionally, the government is responsible for the funding for the ITS capital development and their operation and maintenance. Hence, it is a important to be able to quantitatively justify the benefits and saving that ITS can bring in order to secure adequate funding for ITS development and deployment. One of the key quantifiable benefits that ITS can bring is saving in time, which can then be translated in economic savings for travellers, the freight industry and the whole country in the long run. Funding for ITS development can also explored and leveraged using public / private partnership, particularly from within the region.

ENVIRONMENT

The emission of CO^2 is a major contributor towards global warming, hence it is important to consider ITS systems that can help reduce environmental impact. For example, dynamic parking guidance system helps to avoid unnecessary traffic circulation on the road when looking for parking availability and this helps to reduce CO^2 emission generated. Other measures include the development of intuitive ITS applications which provide motorists with information on personal CO^2 emission indicators, thus raising public awareness on the level of CO^2 emission.

SECURITY

As the delivery of transport information is an increasingly important element of ITS applications, there is a need to establish standards and open communication protocols as well as ensure network security. This will help to ensure the overall ITS ecosystem remains robust and secure.

ADVANCEMENT IN ITS TECHNOLOGIES

4. ADVANCEMENT IN ITS TECHNOLOGIES

With the advancement of technologies, a wide spectrum of products have become available for realising ITS. The applications of ITS depend on several factors such as the readiness of infrastructures, incentives for transport operators to use ITS, public acceptance and readiness for ITS, the cost of implementing and operating ITS, and ease of use of ITS. This section broadly categorises ITS technology developments into the following main categories.

ITS FOR TRAFFIC DATA COLLECTION

Traffic data collection technology has seen much progress. Data that previously took time to collect could now be easily transmitted real-time to backend system for consolidation for traffic analysis. Such data collected are also of higher quality and accuracy as compare to the past. From manual site survey and manual count to the use of traffic loops counters, countries are now able to leverage on surveillance camera and other sensor technology solution to collect traffic information like traffic speed, vehicle classification, volume, and incident/ accident.

The increasing prevalence of mobile technology and penetration of smart phones provides a probing mechanism similar to floating car that leverages on crowd sourcing to harvest traffic information including data such as “origin & destination”.

ITS FOR TRAFFIC DATA DISSEMINATION

The rise in socioeconomic developments have resulted in increasing demand for supplementary traffic information such as estimated travel time and alternative routes. Ensuring the availability of accurate and timely traffic information to the motorists has been seen as essential as it helps to influence motorist travel behaviour and, in doing so, mitigates traffic issues. Conventional dissemination technology like radio broadcasting and Variable Message Signs (VMS) are now supplemented with other channels such as on-board real time in-vehicle routing guidance systems, websites and mobile smart phones that provide dynamic traffic information.

ITS TO PROMOTE PUBLIC TRANSPORT SYSTEMS

The ease and convenience in planning and taking a multi-model journey is an important factor in moving commuters from private to public transport. Implementing traveller information systems allows for pre-trip information as well as real-time updates on buses/trains arrival times. It takes the guesswork out of using public transport. Such systems help to enhance traveller’s ability to switch seamlessly between different types of public transport.

To improve connectivity so that transfers may be seamless to travellers, the adoption of an easy payment system is critical to ensure quick convenient charging transaction. Payment process can be carried out through short-range communication technologies offering an easy and cash-free payment option to travellers. Alternative form factors for e-payment solution like the use of Near Field Communication (NFC) found in mobile phones can be used to provide greater convenience and seamless access to an even wider variety of services possible such as instant displaying of e-receipt on mobile device per transaction.

ADVANCEMENT IN TRAFFIC LIGHT SYSTEM

For many years traffic lights that have been operating in silos with fix plans at various junctions across regions are now becoming gradually intelligent via an integrated traffic light networks that provide adaptive traffic measures across the entire traffic light network. Traffic light systems are now designed to have functional capability adapted accordingly to real time traffic condition to give “green wave” to priority vehicle such as ambulance, fire engines and public buses.

ITS FOR SAFETY

Conventional investment in the form of speed cameras, dynamic hazard warning sign boards are now seeing the possibility of supplementary vehicle control systems, which include a range of products from cruise control to collision avoidance systems. In addition, vehicles will become more actively and highly connected to each other as well as the road-side infrastructure. Such high connectivity will see the emerging of a plethora of safety-related features and functions such as emergency braking, off-road alerts, and headway distance monitoring with in-vehicle alert.

INTEGRATED TRAFFIC INFORMATION SYSTEM

To effectively harness the information gathered from various ITS, it has to be properly consolidated and integrated into a hub to facilitate processing and analysis in manner that is timely and useful for dissemination in a presentable format to various stakeholders such as travellers, motorists, transport operators and traffic engineers. Such traffic information hub had become an essential tool that has evolved from a simple computation and reporting system to one that will house a simulation engine, recommendation engine and even predictive engine as basis for traffic planning and decision making.

A NATIONAL ITS POLICY

5. A NATIONAL ITS POLICY

A national ITS policy should be established by the government of each Member States in collaboration with key stakeholders in both the public and private sectors. This is to guide the harmonious and efficient deployment of ITS systems nation- wide.

A national ITS policy is unique to every country. In view of the different levels of ITS development in the ASEAN Member States, an open ITS standard would be the most practical, as this would allow compatibility amongst the various ITS. The needs of each country should be clearly identified, defined and agreed beforehand. Setting the policy requires careful consideration of the country's demographic, social and economic trends, current state of transport infrastructures/ITS developments, availability of resources, local skill base or funding and transportation aspiration. Key considerations in establishing the policy are:

a. **A national ITS architecture** – to provide a framework to ensure compatibility and coherence between different ITS, and to foster interoperability of applications, services and materials.

b. **Standards to be adopted** – to form a basis for ITS standards setting in the country as well as region, like the adoption of open ITS standards to ensure system compatibility and seamless interoperability.

c. **Funding of ITS projects** – to prioritise projects and ensure that funds are properly allocated and wisely spent. Where funds are limited, low cost projects could be started first to demonstrate the effectiveness of ITS and then these early successes can be built upon by expanding ITS to meet more difficult challenges.

d. **ITS implementation programme** – to guide the co-ordinated implementation of ITS and the migration from current to future systems. Also identify and prioritise projects that would have the most immediate or cost-effective beneficial impacts.

e. **Collaboration with inter-government agencies** – to share common pool of resource to promote and develop ITS solutions, to kick start pilots project with common interest to conduct technology test-bedding and trial.

f. **Co-creation with the industry players** – government can leverage on the industry's technical strength and experience in implementing innovative and challenging ITS solutions. Industry players could share and demonstrate their ideas and technologies in the local context. This will help government to identify the most suitable technical solution that best suit ones' environment constraints.

g. **Collaboration with Institutions of Higher Learning (IHL)** – working with local and overseas academia in the various researches and academic studies on transportation, in particular ITS, will help generate awareness and interest that

plays a strategic role towards steering the direction for ITS developments and research in the years ahead.

PLANNING OF AN ITS PROJECT

6. PLANNING OF AN ITS PROJECT

In deciding the implementation of any ITS project, the proposed ITS must first of all fit into the national ITS policy framework in terms of functionality, anticipated benefits and timeframe. In addition, the following should be considered during the planning stage:

a. The main reason for implementing any project would be potential benefits outweighing cost of implementing and operating the system. Preliminary cost/ benefit analysis should be carried out and should cover the entire life cycle cost of the system. Clear criteria should be set to measure the success of any projects.

b. A deployment strategy addressing the incremental development of the various components or geographical coverage of the system should be identified. This strategy should determine components or coverage that would have the most immediate or cost-efficient impacts on operations and realisation of potential benefits of the system.

c. Initial conceptual planning for a system should identify the proper personnel, equipment, staff and budget resources necessary for implementing, operating and maintaining the system. This should include the operations concepts and phased implementation strategy.

d. Relevant information and data like traffic counts, communication network coverage, available technologies, etc should be determined to assess the technical feasibility of the project and to determine key functional requirements.

e. Encourage partnership when appropriate and explore innovative funding sources. Potential funding sources could include public-private partnerships, resource sharing with public/private agencies and revenue opportunities.

f. Identified all potential stakeholders and establish groups or committees to communicate, co-ordinate and ensure commitment and consensus from participating agencies. These groups should deals with all activities related to the project from planning through operations.

g. The interfacing requirements with other systems, existing or new, should also be identified. The operational and functional requirements should be determined so that they could be adhered to during the development phase.

SYSTEM DESIGN & EVALUATION OF AN ITS PROJECT

7. SYSTEM DESIGN AND EVALUATION OF AN ITS PROJECT

The system design plan should build off from the conceptual design developed at the planning stage. The plan should address the special needs and interests of the public, elected officials, transport service providers and the media.

A detailed analysis of the transportation problems and how technologies can resolve or improve the problems should be carried out. Technology assessment should identify the most cost-effective approach to meet functional and reliability requirements. It should include:

a. **Open Standard** - Interoperability and compatibility of technologies with other systems/components

b. **Future Proof** - Performance, availability and reliability of current and potential future alternative technologies compared to identified technologies

c. **Scalability & Expandability** - Future expansion capabilities of technologies, as well as the interfacing requirements, with various systems

d. **Conforms to ITS Standards** - Available national ITS standards in assessing technologies

e. **Total Cost of Ownership** - Initial implementation cost, operational cost and future asset replacement cost in the life cycle cost of the system

f. A detailed cost benefit analysis over the system life span should be carried out and should consider variables like initial cost, operating cost, maintenance cost, expansion/asset replacement cost and anticipated benefits. Both tangible and intangible benefits should be considered. Intangible benefits should be converted in monetary terms and considered in the analysis whenever possible. Again, clear criteria should be set to measure the success of projects.

g. Before and after studies/surveys should be conducted to demonstrate that expected benefits are realised, and to determine remedial actions when they are not. Studying their costs and benefits before and after ITS implementation would help to secure future ITS funding support.

h. The design and installation of computer systems should use generally accepted software and management practices. As far as possible, a common open standard should also be utilised. In order to enhance the maintainability and expandability of the system, a consistent method of system and software coding should be required and adopted. Level of access to important system should be designed to include a high level of security. Investment in system

should be protected by assuring access to source code when the original vendor no longer supports the system.

IMPLEMENTATION, OPERATION & MAINTENANCE OF ITS

8. IMPLEMENTATION, OPERATION AND MAINTENANCE OF ITS

The specifications for procurement of system should clearly define and consider the following:

a. **Objective** – to identify the beneficiary and principle behind the implementing the system

b. **Scope of Work** – to identify clearly the boundaries of work and deliverables associated with the implementation of the system within the stipulated timeframe.

c. **Design & Development** – to provision for components and services like communication protocols, computer source codes and access to system software to ensure that system can be upgraded or modified.

d. **Operation & Maintenance** – to identify the technical supports to ensure the availability of the system for give define period. To state the requirements for provision of spares, warranty, documentation, period testing and training.

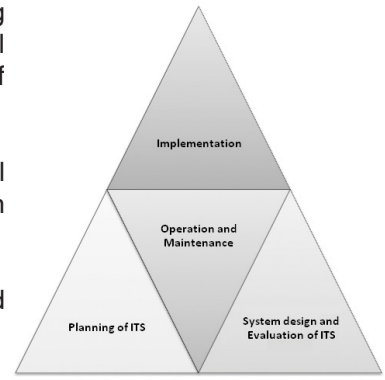
e. **Technology Transfer** – to set aside a sufficient period for proper handing over. Such as documentations / manuals, system's source codes and access rights are provided.

f. **Migration Plan** – to establish guideline for migration into existing system or a new system. Ensure continual operational while doing so and to avoid the risk in doing so.

When procuring existing software or developing customised software, identify who has intellectual property right to software and ownership of software code.

Effective project management is also essential in ensuring the final system is implemented in accordance to functional requirements.

Good documentation provides current and historical lineage for proper operation and maintenance.



Documentation control should be incorporated into all ITS installation projects. "As-built" drawings/documentation should be included in contracts. Operational plans, manuals and documentation should be properly maintained and periodically updated. The operational plan should include staffing needs and descriptions of current system.

The specifications for the procurement of operation and maintenance service should identify clear performance measures associated with effective traffic management and system maintenance including downtime and staffing.

Service to provide hardware and software support should be considered and this includes mechanisms to fix software bugs as they are discovered, repair or replace hardware components, adding devices and minor system modifications.

When determining whether to contract out operation and maintenance services, an evaluation of in-house capabilities and resources against the complexity of the system should be carried out. As far as possible, each country should also encourage and develop a local skill base.

CONCLUSION

9. CONCLUSION

The ASEAN ITS-Policy Framework V2.0 broadly covers some key issues to be considered in implementing ITS. It sets out guiding principles to achieve coherent and cohesive applications of ITS within a country. It is hoped that each ASEAN Member State, according to its individual needs, considers the guiding principles in further developing its specific ITS programmes and activities, taking advantage of the many potential benefits of ITS.

It should be noted that, in addition to technological problems and solutions, resolving institutional problems and constraints when implementing ITS projects is just as important if not more important. Good working relationships need to be established among different related agencies within the country, and ITS projects should be carried out in close consultation with all stakeholders.

Finally, to solve or improve transport problems, the planning and development of basic conventional land transportation infrastructures and facilities can benefit from the wealth of traffic data harvested through ITS implementations. Information mined from these traffic data will help support important transport policy decision marking and promote good governance.

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