POLICY BRIEF:

Establishing the Intelligent Transport Systems (ITS) sector in Egypt

PHAROS
Integrated Eco-routing and Fleet Management System

Center for Environment and Development for the Arab Region and Europe (CEDARE), May 2016

What is ITS?

Intelligent transportation systems (ITS) are advanced applications which (...) aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

- EU Directive 2010/40

ITS involves three components: Infrastructure, vehicles, and people, and it optimizes the use of the *existing* infrastructure, thus reducing costs of additional infrastructure to meet the growing demand. As an example, many countries in the EU have car ownership rates that exceed 600 cars per 1000 inhabitants, while in Egypt the figure is 45 cars per 1000 inhabitants only. However, traffic congestion and pollution is clearly much more elaborate in Egypt's cities despite this much lower ownership rate. Therefore, along with improved policies, law enforcement and urban design, ITS is a fundamental cross-cutting component to addressing such challenges.

Why ITS for Egypt?

There are many intelligent solutions available to improve road safety, reduce fuel consumption on a national scale, and improve traffic management in Egypt. These solutions are offered through the applications of the established field of Intelligent Transport Systems (ITS). However, to date, ITS is greatly underutilized in Egypt and many fuel-saving opportunities are lost along with potential for congestion reduction and other lost benefits as follows:

- Reducing fuel consumption and the costs of fuel subsidies
- Reducing road casualties and improving safety,
- Limiting air pollution from vehicles as fuel consumption is reduced.
- Reducing the need for expanding road capacity/infrastructure due to better management of existing infrastructure and enabling measures for congestion reduction.
- Supporting better enforcement of traffic laws and regulations.
- Improving fleet management system efficiency for the public and private sectors.

The cost of congestion for example, according to the World Bank studies is approximately 47 billion LE wasted annually in Greater Cairo alone due to congestion as a result of loss of productivity, delays, health impact of pollution, wasted fuel, among other factors, constituting approx. 3.6% of national GDP[1].

[1]See: Cairo Traffic Congestion Study Executive Note, available at http://www.worldbank.org/content/dam/Worldbank/TWB-Executive-Note-Eng.pdf

Case study: Singapore's i-Transport:

Singapore has very limited land space and must therefore optimize it's use of the limited road capacity and transport infrastructure available. Already one decade ago, in 1997, the government of Singapore approved the *Integrated Transport Management System (ITMS)* project that aims to integrate all ITS including obtaining real travel time travel information on the surface street system, the interface with car parks, mass Public Transport, bus transport and the associated interchanges. It can also be complemented with data from fleet management systems of private operators. In 1999, the system was renamed *i-transport*. It was implemented through four phases: (1) Integration of Traffic Information (Traffic.Smart); (2) Integration of Public Transport Information (Transit.Smart); (3) Multi-modal Route Advisory System (Route.Smart); (4) Manage.Smart, integrated traffic management systems for management and monitoring.

Source: Adapted from: Sayeg, P., Charles, P. 2005: Intelligent Transport Systems, GTZ Sourcebook Module 4e.

Main services of ITS

Main ITS services area as follows:

1. Traveler information (route guidance and navigation, trip planning support, travel services information, etc)
2. Traffic management and operation services (to reduce the demand for motorized travel and to give priority to buses, non-motorized vehicles (NMVs) and pedestrians)
3. Vehicle services (collision avoidance, vision enhancement, etc)
4. Freight transport management (administration, safety inspection, fleet management, eco-routing, intermodal information management, etc)
5. Public Transport management (system optimization, demand responsive and shared transport, etc)
6. Electronic payment (congestions charging, multi-modal transport ticketing, tolling, bicycle and car sharing schemes, etc)
7. Safety and security (e.g. emergency management, license plate identification, etc)

Figure 1: ITS associations around the world established to advance ITS and reap its benefits

Success stories in Greece

Traffic Management Centre (ATMC): Energy, time, and cost savings

The Athens Traffic Management Centre (ATMC) of the Prefecture of Attica became operational in July 2004. Since then, it operates 24 hours per day, 365 days per year with the following assets: 550 monitoring positions (75% are single inductive loops and 25% are Video Detection loops), 216 CCTV control cameras, 24 Variable Message Signs (VMS), Traffic controllers in the signalized intersections for communication between the 1,100 signalized intersections and the ATMC, 1 control room with 10 workstations, 1 video-wall, 42 monitors for screening the CCTV cameras and a dual fiber optics telecom network.

The primary objectives are as follows:

- Traffic optimization of the most heavily loaded urban roads of Athens o Provision of travel time information to the drivers via Variable Message Signs
- Quick incident response
- Collection, analysis and use of the traffic data (traffic flow, time occupancy, average speed) collected from the 500 monitoring positions
- Real-time intervention in the traffic signal programs o Supply of real-time data to the drivers.

As a result of ITS, the heavy traffic conditions time intervals have decreased, and there is an increase in traffic flow (ranging from 10% to 15%), and an increase in average vehicle speed (ranging from 15% to 20%).

Attica Tollway: Reductions in accidents and casualties

Attica Tollway is a best-practice in Road Safety, and was awarded the 1st Prize for Road Safety by the International Road Federation (IRF), in recognition of the quality road safety services provided to the Attiki Odos users.

According to official figures, the percentage of serious traffic accidents in relation to the vehicle kilometres driven on the Attiki Odos, is 3 to 4 times lower than in similar motorways in the country without ITS, while it is at the same scale as European motorways. Each 1 € invested in ITS for management and information systems in urban areas, results in gains 26 Million Euros or higher by reducing, travel time and cost, energy consumption, and air pollution.

Other examples of improvement of road safety in Greece are many, such as the Egnatia Odos motorway, stretching over 670km (the Greek part of the European route E90). ITS on the motorway reduced accident rate by 76% over a period of 14 years despite increase in traffic volumes.

Fuel consumption reduced, accidents reduced, congestion reduced, although traffic volumes increased,
i.e. it is not always necessary to invest in widening/building new roads to improve traffic flow and safety.

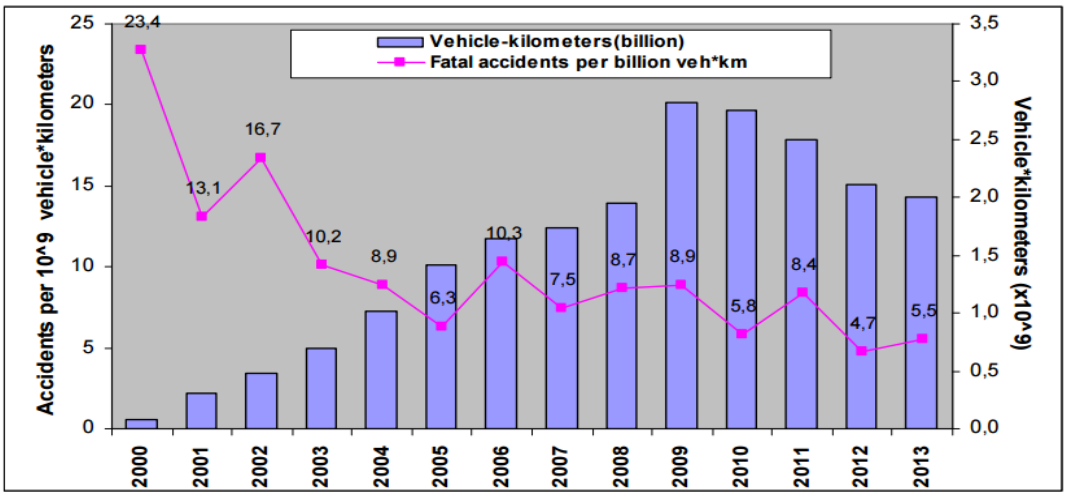

Figure 2: Decreasing trend of accidents with introduction of ITS measures

Table 1: Examples of ITS projects and respective stakeholder groups

Operational Requirements	Stakeholder Groups	ITS Examples
Improved urban traffic management	- Local traffic management agencies - Regional transportation authorities - Bus operators	- Real time adaptive traffic signal control - Integration of urban arterial and urban freeway traffic management systems - Introduction of active bus priority schemes
Reduction in traffic demand	- Local traffic management agencies - Local businesses - Motorists - Community - Truck operators - Bus and rail transport operators	- Congestion charging - Integrated parking management
Introduction of new automatic payment systems	- Toll road operators and managers - Local traffic management agencies - Bus and rail operators, passengers	- Non-stop electronic tolling - Multi-modal electronic ticketing
Strategic and tactical management of inter-urban traffic	- Expressway, toll road, and freeway operators and managers - Local traffic managers - Traffic police and emergency services	- Regional traffic control centers - Incident detection - Emergency response - Variable Message Signs (VMS) and driver information support
Better integration of transport modes	- Operators of bus companies, urban rail and associated terminals and interchanges - Transport management agencies - Private information service providers - Vehicle manufacturers	- Multi-modal transportation information - Fleet management systems - In-vehicle navigation systems

Example-1: Electronic congestion charging

What is congestion charging? To reduce congestion, some cities impose a toll on cars entering a certain area. This reduces demand, and then public transport is given priority in the freed up road space.

What cities implement it? Cities include London, Stockholm, Singapore, and Milan, as well as other smaller towns elsewhere.

How does it work? Drivers prepay their account online (or through other payment services) before entering a specific area. When they drive through a congestion zone, their plate is read by one or more cameras and the account is debited on entry, otherwise a fine is issued if no money is in the account. There are also various different methods and models for implementation. Similar models can be used to create a **low-emission zones (LEZ)**, where substandard vehicles are charged upon entry.

The boundary of the current Congestion Charging zone in London

Low Emission Zones, an additional measure to limit entry of substandard vehicles to maintain clean air in the city.

Example-2: Multi-mode real and scheduled real time information

What is multi-mode real time information? To assist commuters in making more efficient travel plans and make public transport more fun and attractive, many cities provide real time information about all transport services through various media. This way, commuters can easily choose how to plan their trips through various modes of public transport.

What cities implement it? Early-adopter cities included Hong Kong, Brisbane, London, Berlin, Paris, and many more cities as it is becoming a common practice in service provision.

How does it work? Information from different public transport services are exchanged between the systems. Timetables and routes are shared and used for trip planning across different modes, such as buses, tramways, and metro. This information is also used to harmonize schedules of connecting services.

Common pitfalls in developing countries

- Lack of a clear "owner" within the government and fragmentation of resources and responsibilities within government agencies.
- Deficient monitoring and evaluation (and documentation) of the progress of any initial attempts in ITS development, including documentation of successes and failures (e.g. case studies and lessons learnt), which result in a non-constructive development process and repetition of mistakes.
- Short-sighted implementation of individual ad hoc projects without an ITS vision and strategy and without setting the institutional setup and policy framework.
- Lack of clear policies for private sector involvement in development of ITS.
- Delay in developing and retaining the local technical capacity and local expertise in ITS.
- Lack of appropriate standards and specifications to encourage development of open architecture ITS applications and ensure compatibility between systems.
- Resistance due to security related fears (*fear of the unknown*), causing stagnation in a comfort zone and loss of opportunities and loss of global competitiveness.

Current status in Egypt

Currently in Egypt, although there have been commendable advancements in recent years in ITS-related applications, there is however no ITS strategy to date yet and no organized community to make the necessary transformational change. However, there is strong political will to develop the sector and also find solutions to reduce Egypt's fuel consumption, for both economic and environmental reasons.

ITS is a young field in Egypt, and has so far been limited only to it's initial fields of application, such as vehicle tracking and fleet management, among other applications that are applicable to Egypt. Automatic Vehicle Location (AVL) services, were first (formally) launched in Egypt in June 2013. It was activated by Egypt's three telecommunications companies, with the collaboration with a single Egyptian shareholder company that was deliberately established as the only legal company in Egypt to have a license to offer online tracking of all types of road vehicles, individuals, and pets, with all its servers stationed in Egyp[1,2]. Different modes of participation and collaboration of previously active private sector stakeholders is still in an ongoing development process, and they continue to provide complimentary products and services.

As for governmental ownership, to date, there is no governmental entity assigned the responsibility for developing the ITS strategy to start the awaited transformational change. Today, responsibilities and resources are distributed between different ministries. Many opportunities are therefore lost. As an example of the extent of lost opportunities, in some local experiences with individual fleet management projects in Egypt, fuel savings of up to 40% were observed only due to the introduction of vehicle tracking for fleet management, one of many applications of ITS that must be replicated and expanded. Another example is the cost savings that can be made if there is a mechanism in place to manage big data in Egypt, which facilitates better transport planning and reduces data collection costs for the government. Other examples of cost savings, road safety and environmental improvements are many.

[1] See press release: http://www.mcit.gov.eg/Media_Center/Press_Room/Press_Releases/2714
[2] For an overview see: http://www.amcham.org.eg/events_activities/committees/Speeches.asp?E=612&t=8&Y=13

CASE STUDY: PHAROS Project and R&D Progress in Fleet Management Systems in Egypt

PHAROS is a two year project (2014-2016) for development of fleet management systems aiming to reduce fuel consumption and environmental emissions in Egypt. PHAROS project aims to provide low-cost smart solutions for fleet managers to facilitate efficient route choices and eco-driving that minimizes fuel consumption and carbon emissions, as well as manage maintenance. The system is being integrated into an existing fleet management system developed in Egypt. PHAROS is implemented by a consortium led by Center for Environment and Development for the Arab Region and Europe (CEDARE) in partnership with Patras University in Greece, the universities of Utrecht and Eindhoven (TU/e) in the Netherlands, and the Egyptian industrial partner SOFTEC International, as well as the associate partner, the Egyptian Ministry of Communications and Information Technology (MCIT). It is funded by the EU-Egypt Innovation Fund, through the Research, Development and Innovation Programme (RDI) of the Ministry of Scientific Research of Egypt.

The project demonstrates an example of collaboration between academia and the local industry to develop innovative ITS solutions. The integrated Eco-routing has been estimated to possibly save up to 30% of fuel consumption, while the maintenance management solutions are estimated to save up to 20% of maintenance costs and extend the life of vehicles up to 10 more years.

Pharos project field visit at one of Egypt's leading FMCG companies

ITS Policies needed for nation-wide Impact

With demonstration of innovative solutions and development of local know-how, it is possible to expand on project results to create nation-wide impact. ITS policies to encourage widespread adoption of FMS solutions and innovations, such as those promoted in PHAROS project, are expected to offer the following benefits:

-Reducing the costs of fuel subsidies in Egypt.

- Improving road congestion and safety, and improving quality of vehicles.

- Reducing dependence on fossil fuels and reducing carbon emissions.

Furthermore, the establishment of supportive ITS policies would stimulate the local industry active in ITS development and improve its global competitiveness.

[1] See press release: http://www.mcit.gov.eg/Media_Center/Press_Room/Press_Releases/2714
[2] For an overview see: http://www.amcham.org.eg/events_activities/committees/Speeches.asp?E=612&t=8&Y=13

Recommended Approach

The following sections provide the recommended approach to develop the following steps of an ITS roadmap:

- ITS VISION
  - ITS MISSION
    - ITS NATIONAL STRATEGY
      - ITS ARCHITECTURE

Based on international common practice, two processes must run in tandem:
(1) The establishment of a national ITS society,
(2) The development of a government-led national strategy, with a clear owner within the government.

(1) Establishing an ITS Society in Egypt

The ideal approach to develop the ITS sector is to start with collaboration between proactive key stakeholders and interest groups to participate in developing the ITS vision and mission. It is therefore necessary to establish the national society that shall oversee the development of ITS in Egypt, similar to the German Society for Intelligent Transport Systems (ITS Germany[1]), Intelligent Transportation Society of America (ITS America[2]), or as an example of a regional organization, ERTICO of the EU (ITS Europe[3]).

Case Study: Birth of Hellenic Organization of ITS of Greece (ITS Hellas)

ITS Hellas is a nationwide organization that supports the dissemination and use of Intelligent Transport Systems in the country and ensures conditions for increasing the competitiveness of Greek technological solutions.

Since 2001, there have been several attempts to establish a National ITS Platform for Greece. Finally, in February 2006, with the momentum of the 2nd meeting of the *E-Business forum, Intelligent Transport Initiative*, with over 95 representatives of companies, research and academic institutions and actors involved in the development, implementation, management and evaluation of new technologies in the transport sector in Greece. As a result of the particular interest in the promotion of ITS in Greece by all participants, a working group was established with the sole purpose of marking distinct initiatives for the establishment of ITS-HELLAS (i.e. ITS Greece).

The working group systematically worked on the definition of the content and objective of ITS-HELLAS, the preparation of the statute setting up the non-profit organization and the promotion of the idea of ITS HELLAS to industrial partners and stakeholders for ensuring their active participation. In the same period, since October 2004, the Network of National ITS Platforms was established at a European level as an initiative by ERTICO (ITS Europe). The purpose of the network is to provide new impetus to the promotion and support of national ITS associations in Europe. From the outset, Greece participated as a founding member in this initiative.

The vision of ITS Hellas:

- Competitive Greek Intelligent Transportation Systems technology industry
- Efficient, safer and environmentally friendly operation of transport networks using new technologies across the nation
- Integrated and common approach of all involved in the design, implementation and operation of the Intelligent Transportation Systems in the nation
- Intelligent Transportation Systems: *the rule* rather than the exception in Greece.

[1] ITS Deutschland: http://www.its-deutschland.info/pages/en/home.php?lang=EN
[2] ITS America: http://www.itsa.org/
[3] ITS Europe: http://ertico.com/

(2) Develop government-led national strategy with clear ownership

The development of an envisioned national ITS society, which sets the vision and mission, is followed by the development of a national strategy. Notably, the national strategy should naturally be developed by the government through a clearly defined owner within the public authorities[1] to cater to the vision and mission established. It will also indicate *who* will design the ITS Architecture.
ITS plans are most effective on a national, regional, or city level, rather than at a localized level, and the strategy should include the following components:

What do we need? A needs assessment of current and envisioned future of the transport sector is necessary, with prioritization and identification of challenges.
What do we already have? An inventory of existing and proposed ITS applications is needed, including all ad hoc installations by different agencies, demonstration projects, research and development projects and ITS projects in forward programs and budgets.
What know-how should we build on? A review of current technology infrastructure as relates to ITS applications, especially telecommunications and any systems architecture and standards in use.
How do we organize ourselves and mobilize necessary resources? A description of existing and desired institutional arrangements, including roles and responsibilities and funding arrangements.

These are the very first steps to start building a roadmap for ITS in any country. It must also be noted that ITS as a whole is too large and complex to install all at once in any nation. The right approach is therefore to introduce ITS gradually and in stages, focusing first on the parts of ITS that provide the greatest value at least cost. Successful introduction of ITS must therefore include staging, and planning for change, growth, and ongoing integration as new functions are introduced and existing functions evolve.

Case study: Abu Dhabi, UAE

In Abu Dhabi, the Integrated Intelligent Transportation Systems Division in the Department of Transport is responsible for ITS on a city-level. The Department of Transport (DoT) of Abu Dhabi was established in 2006. It has an Integrated Intelligent Transportation Systems (Integrated ITS) Division responsible for regulating the deployment of ITS in the Emirate as well as planning and overseeing the design and implementation of these systems, in addition to the operation and management of the Transportation Management Centers to ensure the seamless integration between all modes of transport to fulfill the transport safety, mobility and sustainability needs in accordance with the vision Abu Dhabi 2030 and the Transport Master Plans.

The main objectives of the Integrated ITS Division are:

- Develop, maintain and update the DoT ITS strategy and architecture for Abu Dhabi Emirate and oversee the implementation action plan of its outcome projects to ensure proper integration, quality and best use of resources.
- Define the appropriate policies, technical standards, regulation and key performance indicators relating to the deployment, operation and maintenance of ITS in Abu Dhabi Emirate.
- Plan, design and deploy multi-modal ITS schemes across the Emirate to serve all transport modes including:
    - *Transportation Management Centers.*
    - *Advanced Traffic Management Systems (ATMS).*
    - *Advanced Public Transportation Systems (APTS).*
    - *Commercial Vehicles Operation Systems (CVO).*
    - *Traveler Information Systems through smart phones and in-car navigation systems.*
    - *Integrated and unified Payment System (IPS) to cover all modes of transport (Buses, Parking, Taxis, Ferries, Toll Gates, Metro, Trams... etc).*
    - *Advanced communication network (wired, wireless and fiber optics).*

Source: Department of Municipal Affairs and Transport of Abu Dhabi (dot.abudhabi.ae)

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ABOUT PHAROS PROJECT

PHAROS Eco-Routing and Fleet Management Systems project (2014-2016) is a research project aiming to provide low-cost smart solutions for fleet managers to facilitate efficient route choices and eco-driving that minimizes fuel consumption and carbon emissions. The system will be integrated into an existing fleet management system developed in Egypt. PHAROS is implemented by a consortium led by Center for Environment and Development for the Arab Region and Europe (CEDARE) in partnership with Patras University in Greece, the universities of Utrecht and Eindhoven (TU/e) in the Netherlands, and the Egyptian industrial partner SOFTEC International, as well as the associate partner, the Egyptian Ministry of Communications and Information Technology (MCIT). PHAROS is funded by the EU-Egypt Innovation Fund, through the Research, Development and Innovation Programme (RDI) of the Ministry of Scientific Research of Egypt.

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