Course: ITS solutions for traffic and safety management

Topic 1. Introduction to ITS and C-ITS

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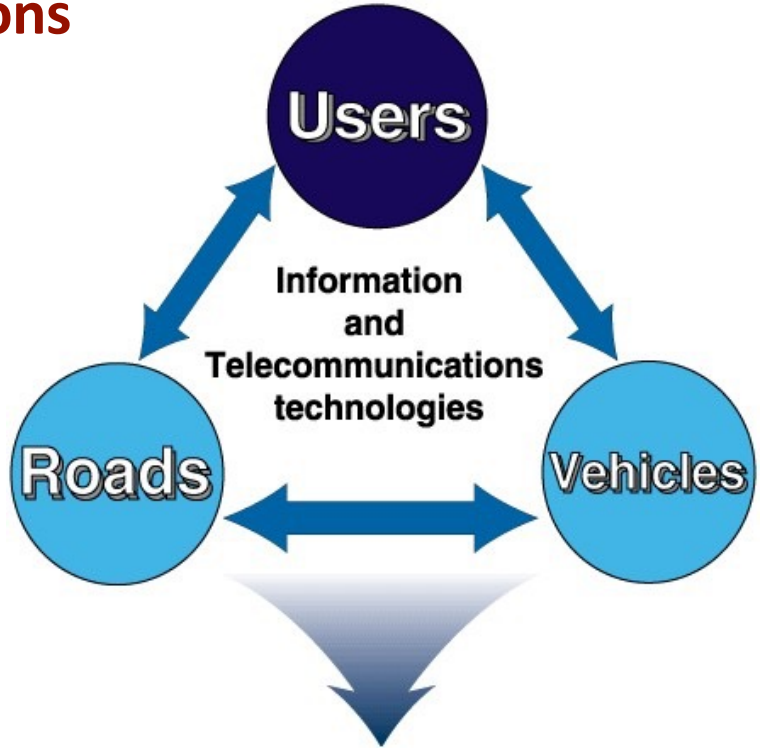
Definitions

Intelligent Transport Systems (ITS) are the control and information systems that use integrated communications and data processing technologies for the purposes of:

- improving the mobility of people and goods;
- increasing safety, reducing traffic congestion and managing incidents effectively;
- meeting transport policy goals and objectives – such as demand management or public transport priority measures.

The definition covers a broad array of techniques and approaches that may be achieved through stand-alone technological applications or through integration of different systems to provide new (or enhancements to) existing transport services. ITS provides the tools to transform mobility and improve safety – and is particularly relevant in the context of road network operations.

The term **Transport Telematics** is often used as an analogue of the term **Intelligent Transport Systems**.
Telematics = **tele**communications + infor**matics**



Improving safety
Increasing(Improving) traffic efficiency
Improvingcomfortableness (convenience)
Contributing to the preservation of environment
Creating new industries/business

Source: https://www.its-tea.or.jp/english/its_etc/abou_its.html

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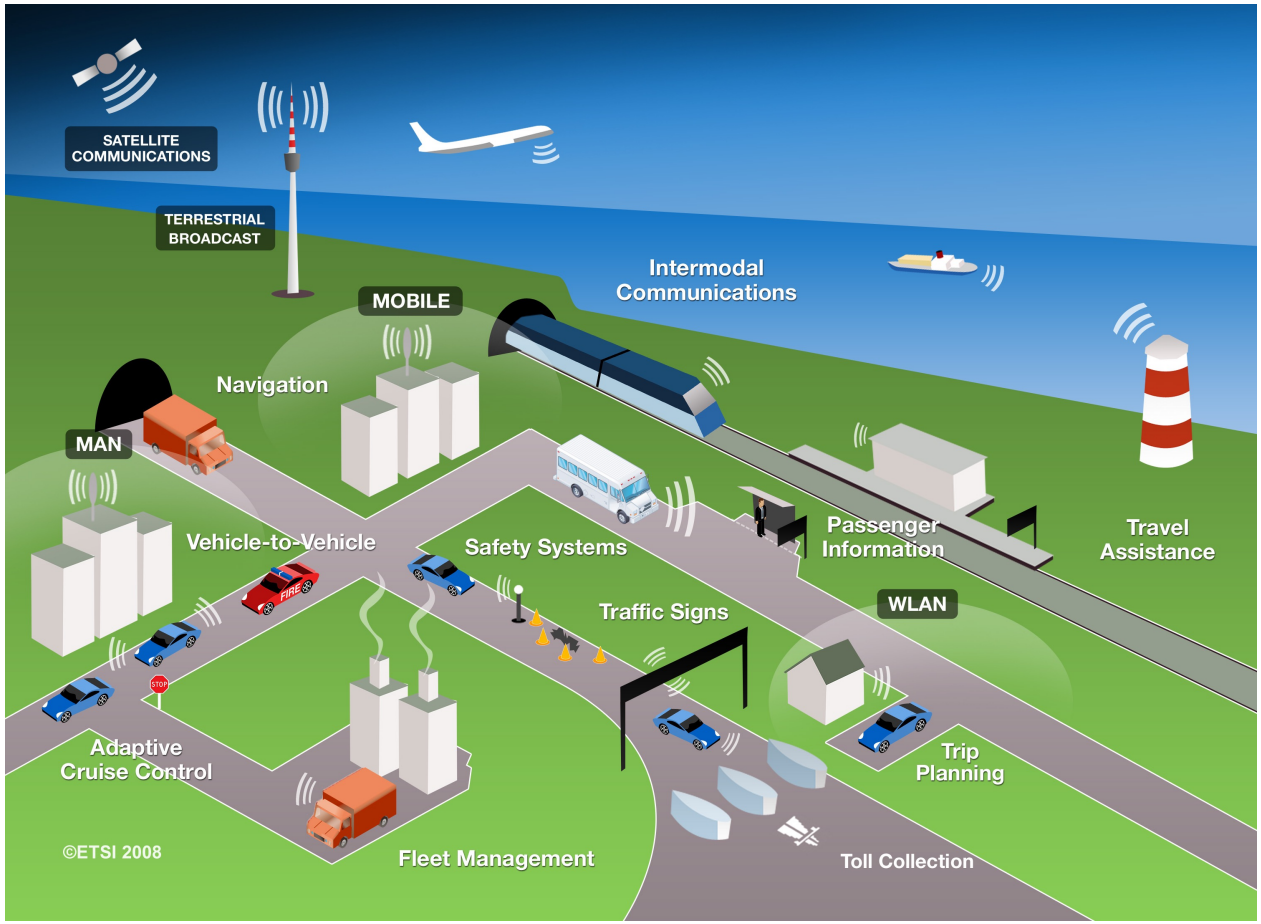


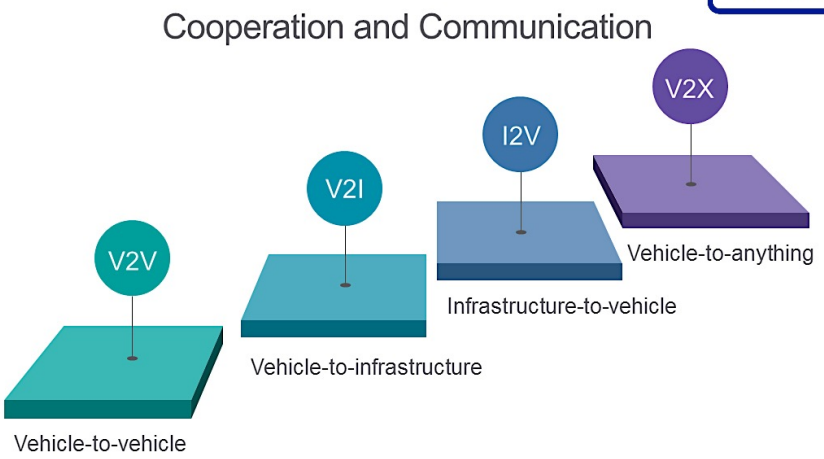
The main function of ITS is to provide services and information for the full spectrum of users – in particular drivers, passengers, vehicle owners and operators, but also vulnerable road users like pedestrians and cyclists – and support safe and efficient traffic management by the transport network operators. The intention is to improve the operation of the entire transport system. With ITS, road users such as motorists, freight and commercial fleet operators and public transport customers can make better judgements on their travel decisions. Factors such as traffic conditions, road maintenance or construction work may potentially impact on travel times; weather conditions will affect the road network and safety.

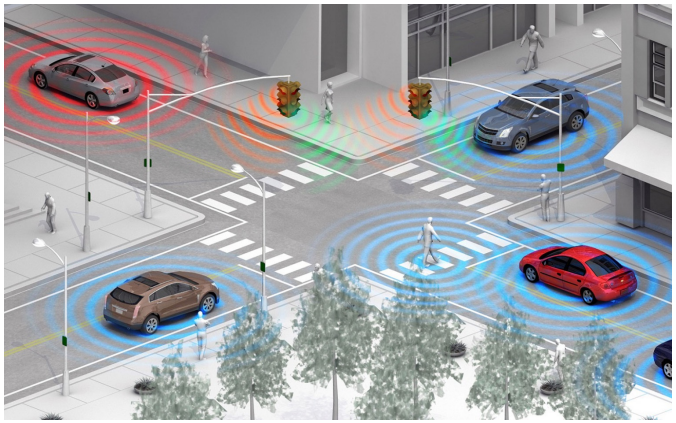
Cooperative Intelligent Transport Systems and Services C-ITS

Cooperative Intelligent Transport Systems and Services (C-ITS) refers to transport systems, where the cooperation between two or more ITS sub-systems (personal, vehicle, roadside and central) enables and provides an ITS service that offers better quality and an enhanced service level, compared to the same ITS service provided by only one of the ITS sub-systems.

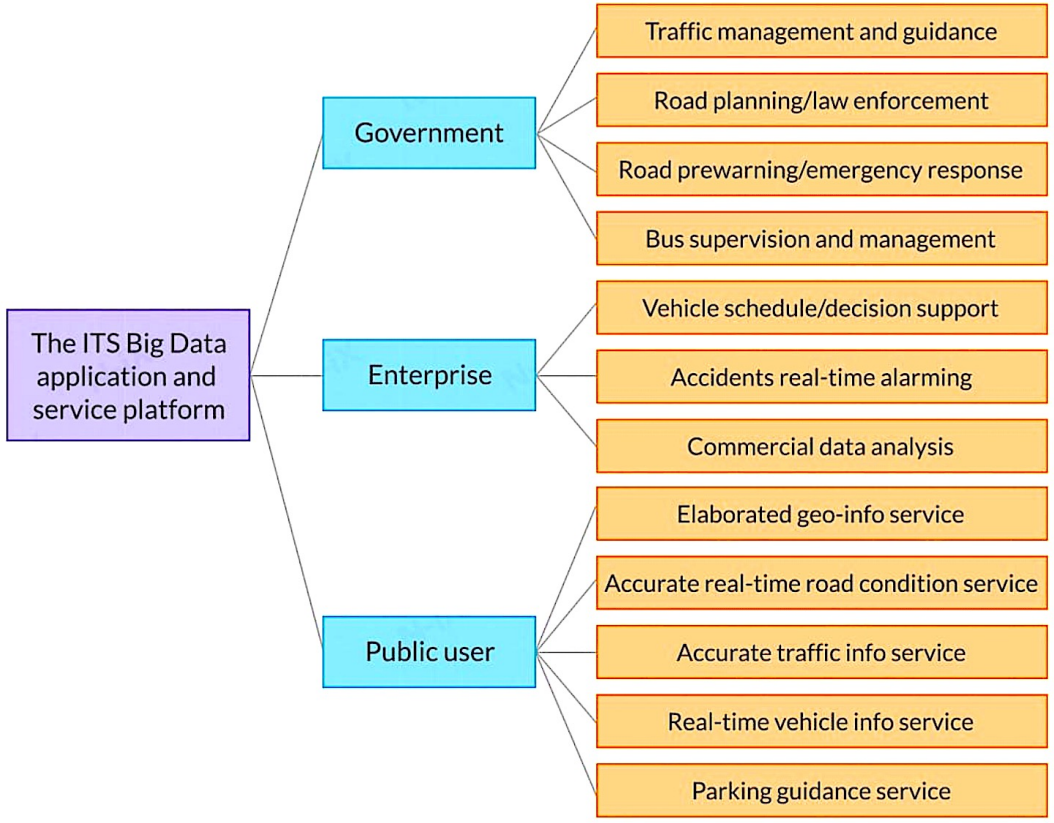
According to the C-ITS Deployment Platform having been organised by the European Commission, cooperative Intelligent Transport Systems (C-ITS) shall use mature ad-hoc short-range (like ETSI ITS G5) and complementing wide-area communication technologies (like 3G, 4G, future 5G) that allow road vehicles to communicate with other vehicles, traffic signals, roadside infrastructure and other road users.

The cooperative **V2X** systems are also known as vehicle-to-vehicle communications (**V2V**), vehicle-to-infrastructure communications (**V2I**) or vehicle-to-person (**V2P**) communications. In summary, the wireless data exchange between the different actors and ITS stations and related functions are named cooperative V2X communication. It supports a number of information, warning and assistance services which will be gradually deployed in coordinated innovation phases during the oncoming years.



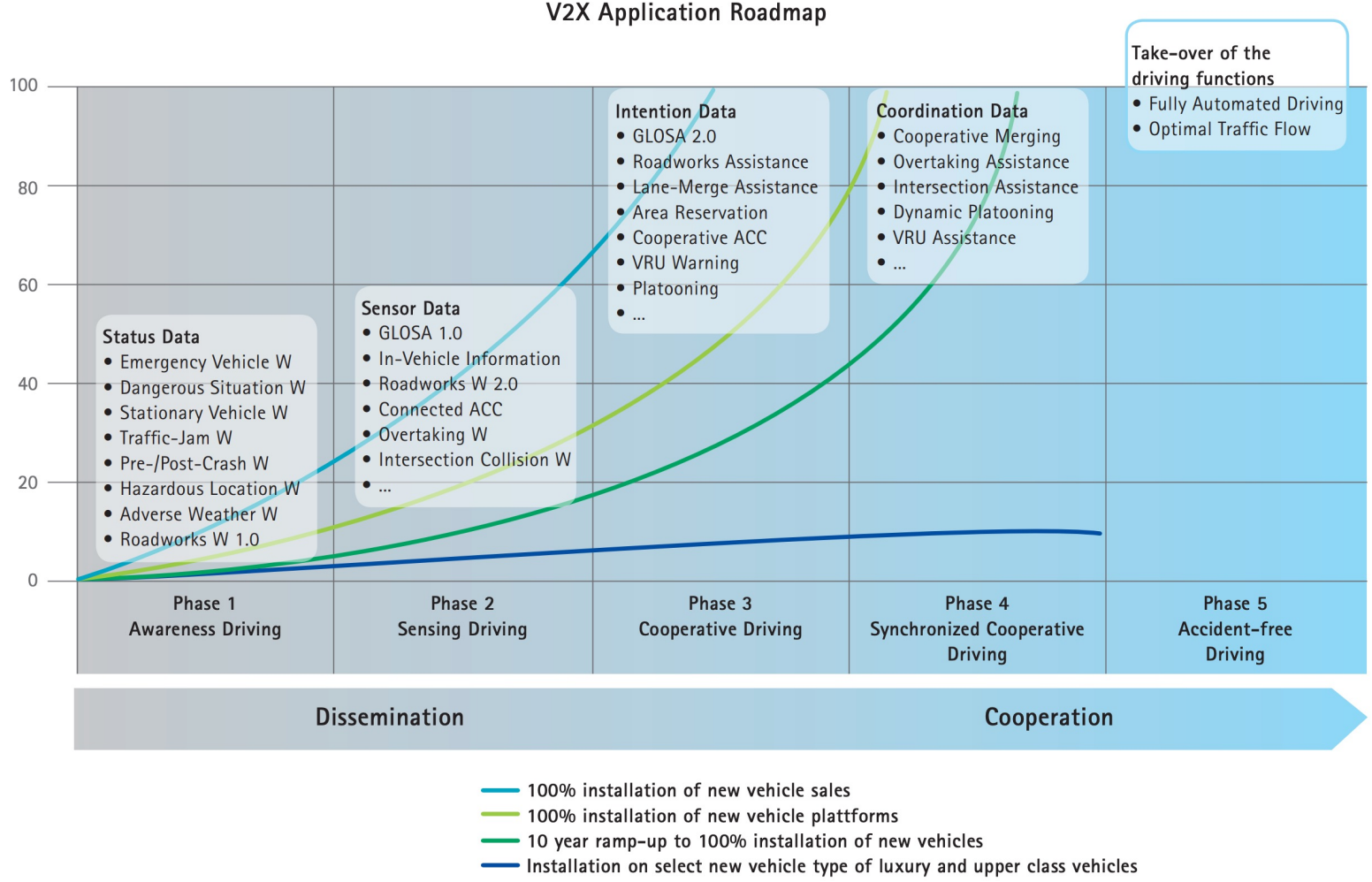


Why is ITS needed?



Source: https://www.n-ix.com/intelligent-transport-system/

V2X Application Roadmap



THE ROLE OF INTELLIGENT TRANSPORT SYSTEMS (ITS) IN SUSTAINABLE URBAN MOBILITY PLANNING

MAKE SMARTER INTEGRATED MOBILITY PLANS AND POLICIES

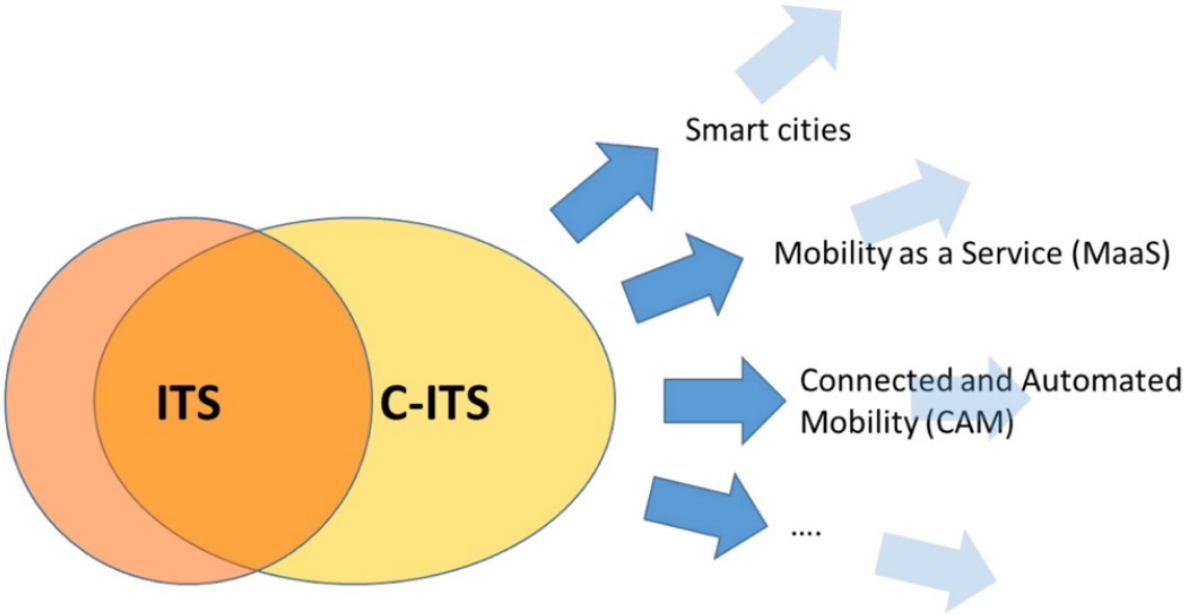
https://www.eltis.org/sites/default/files/the_role_of_intelligent_transport_systems_its_in_sumps.pdf

Sustainable Urban Mobility Planning is a strategic and integrated approach for dealing with the complexity of urban transport. Its core goal is to improve accessibility and quality of life by achieving a shift towards sustainable mobility.

ITS solutions already adopted for mobility management in urban areas include: interactive traffic management, integrated multimodal traveller services (multimodal information services and smart ticketing and booking), Cooperative Intelligent Transport Systems (C-ITS) services, access control to road infrastructure, user mobility behaviour monitoring and demand management for supporting sustainable mobility choices.

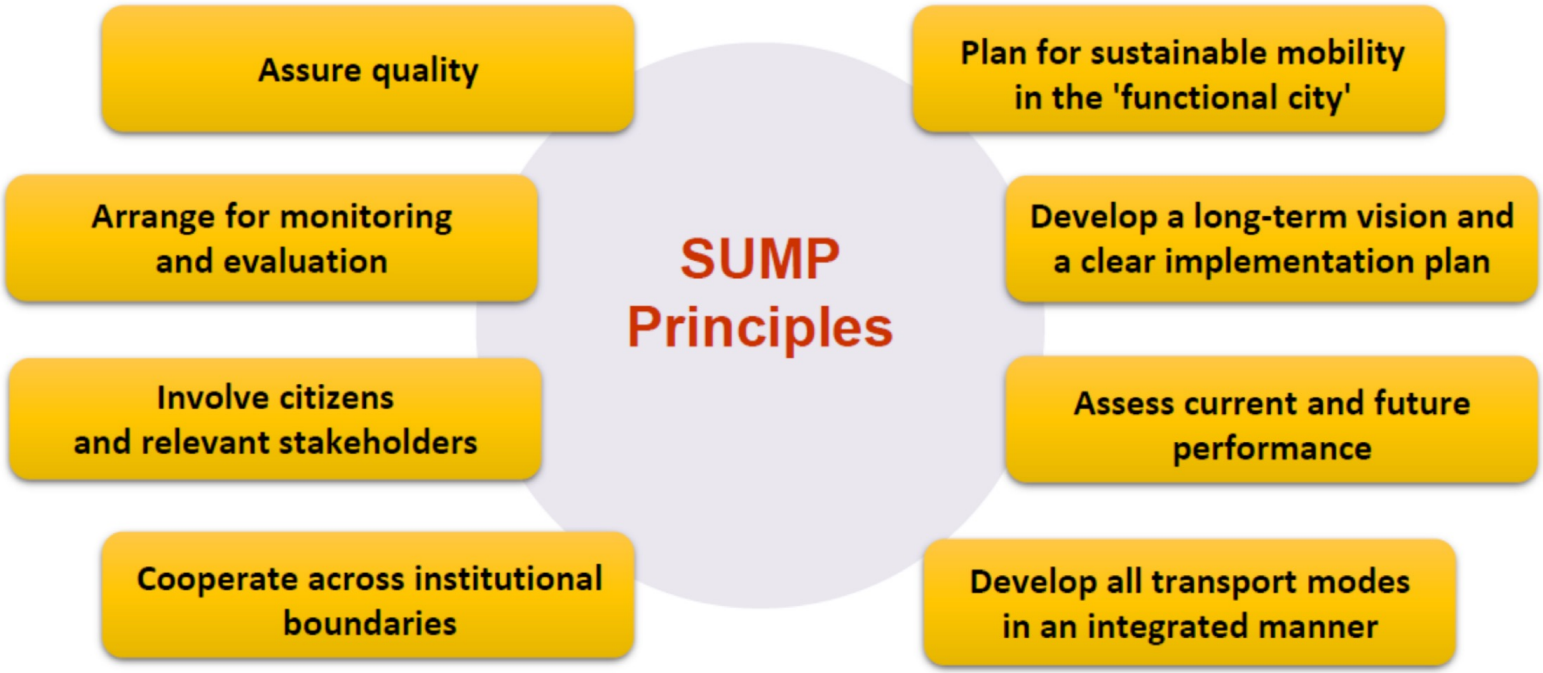
More recently, a range of ITS services is providing the underpinning systems for Mobility as a Service (MaaS) – the concept that a single mobility service accessible on demand delivers an integrated range of transport services as an alternative to owning a vehicle and accessing transport modes separately.

ITS are currently undergoing a significant expansion in terms of both actual deployment and application areas with a shift towards user-centric and multimodal services. New solutions are also being used to persuade users to change their travelling or driving behaviour. For example the focus might be travellers changing to other modes or on drivers making a more efficient use of existing infrastructures and networks.



Sustainable Urban Mobility principles

Building on existing practices and regulatory frameworks, the basic characteristics of a Sustainable Urban Mobility planning can be summarised in the following 8 principles according to the Urban Mobility Package.



The planning process for SUMP

Usually the **national ITS** architecture defines the typology of systems and services, the high-level specifications and the technical interoperability requirements of urban ITS.

At **regional level** the detailed ITS systems design and operation is made by private and public stakeholders on a transport network that includes multiple municipalities and service providers.

At **local level** operational requirements for fulfilling users' needs or sustainability objectives are formulated demanding customised operations (i.e. C-ITS services for priority of buses at signal intersections) or radical changes (i.e. reduce traffic in city centre or support Low Traffic Zone implementation).

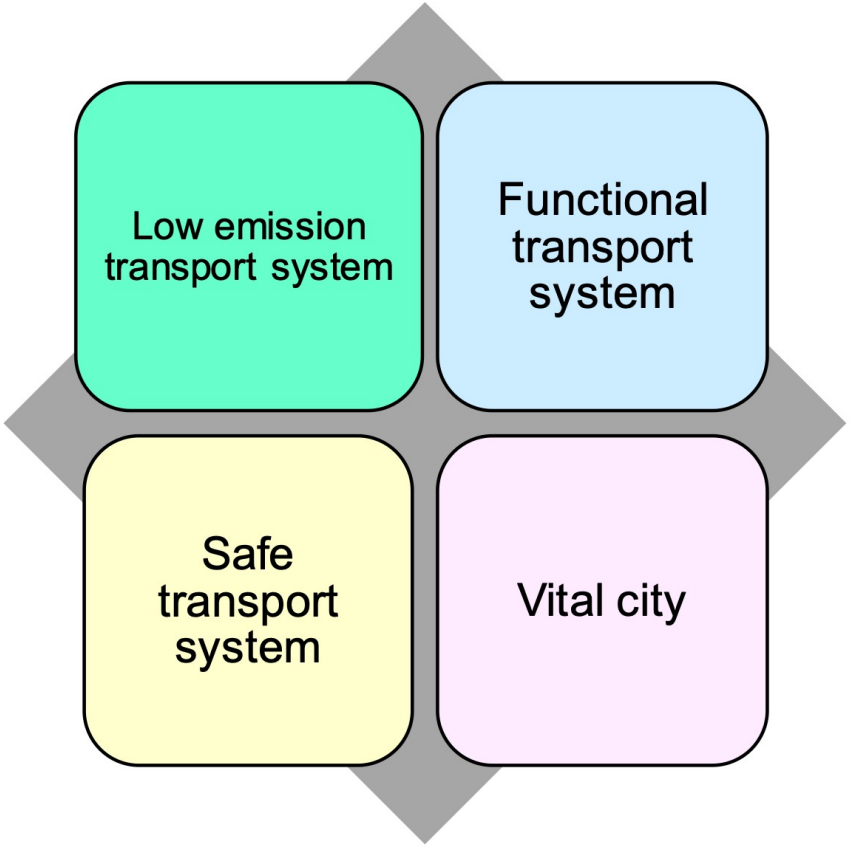
SUMP processes can take advantage of the existence of integrated ITS in urban areas as they often create the basis for multi-stakeholders common understanding and cooperation.

The essential actions and considerations that urban planners and decision-makers should take into account for an ITS integrated approach during each one of the four phases of the SUMP process are presented in the figure.

Target areas of the intelligent transport development programme

City is developing intelligent transport and transport services in cooperation with businesses, the development programme is also linked to the city's industrial policy goals.

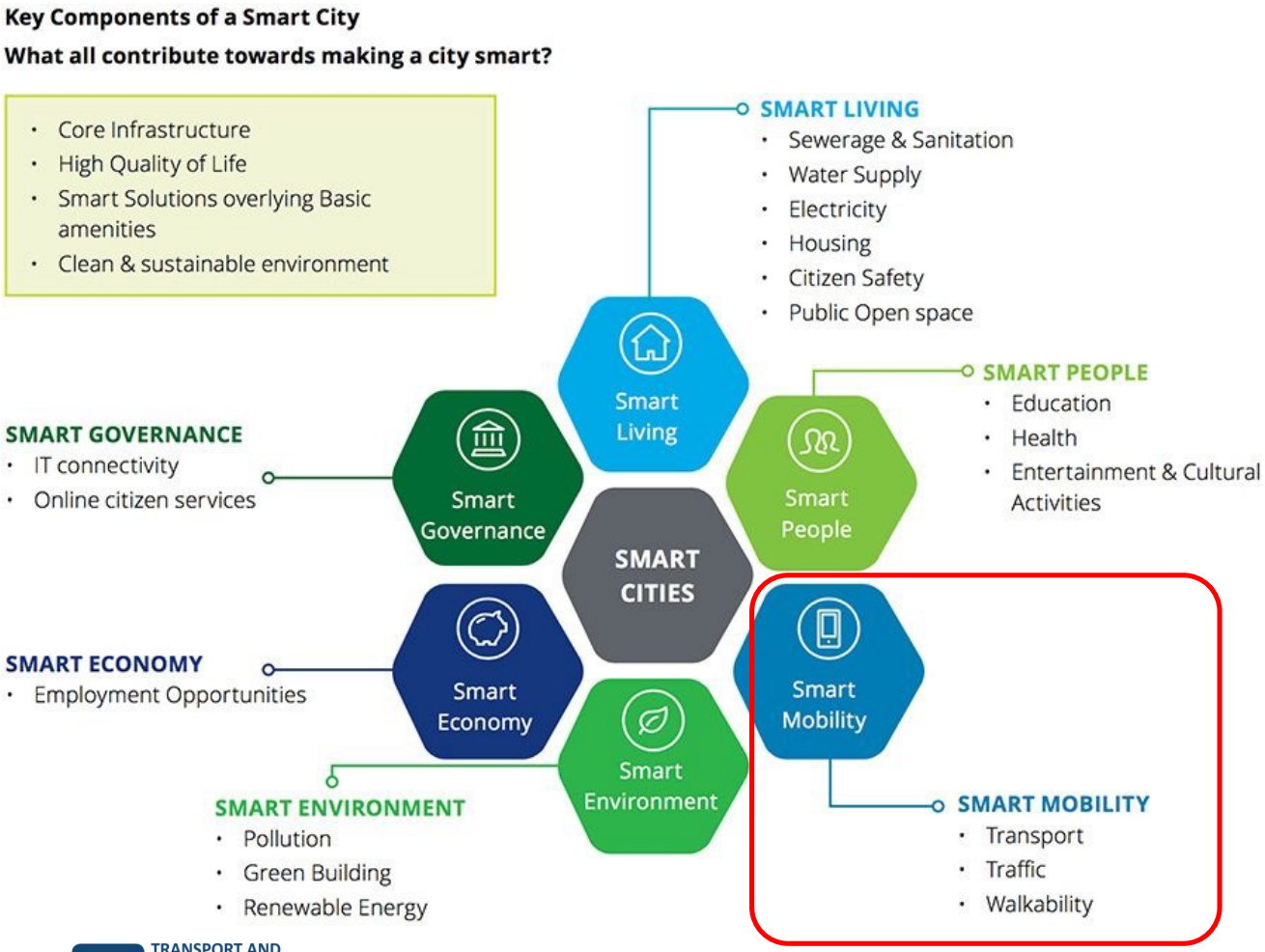
The transport-related goals of the intelligent transport development programme can be divided into four target areas.



Urban transport remains the primary area of investment in Smart Cities

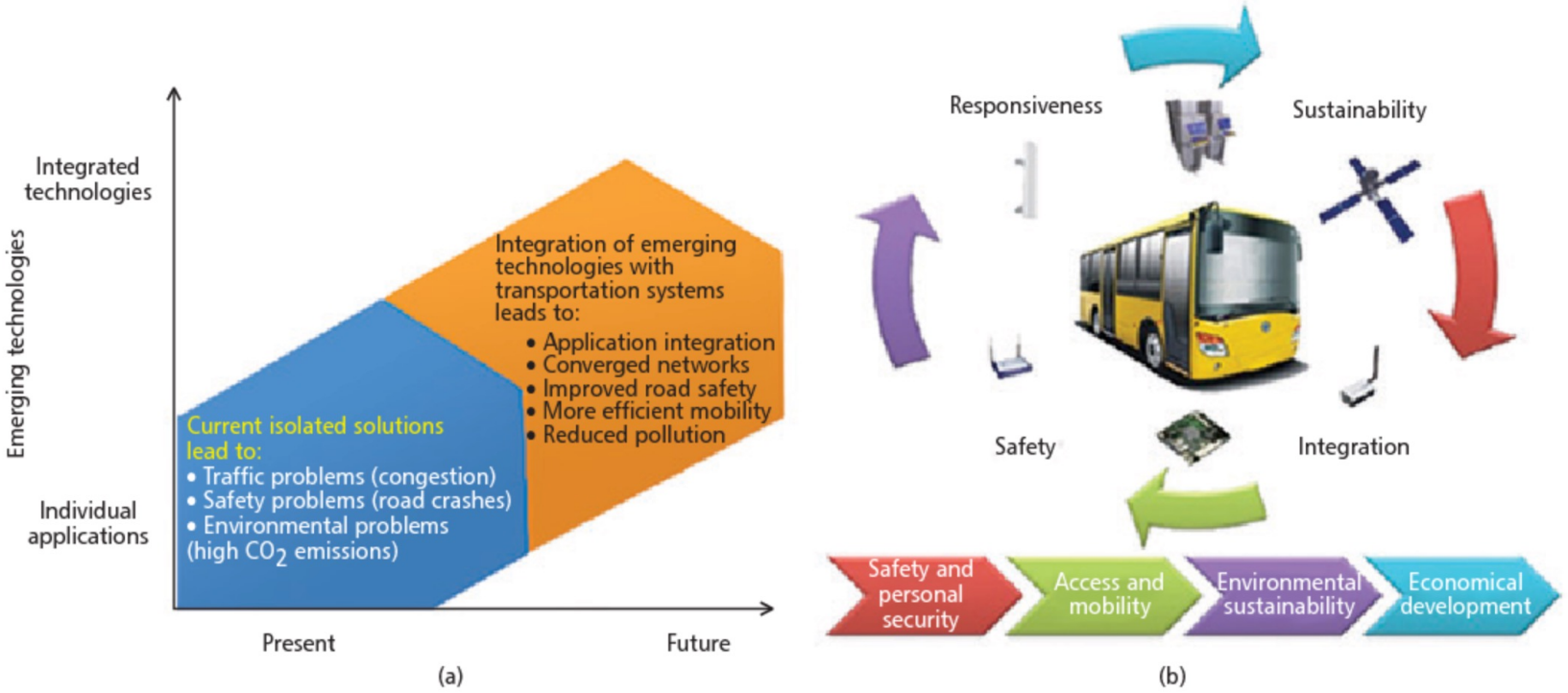
A **smart city** is a technology-intensive city that has sensors installed everywhere and offers highly efficient public services using information gathered in real time by thousands of interconnected devices.

World Bank



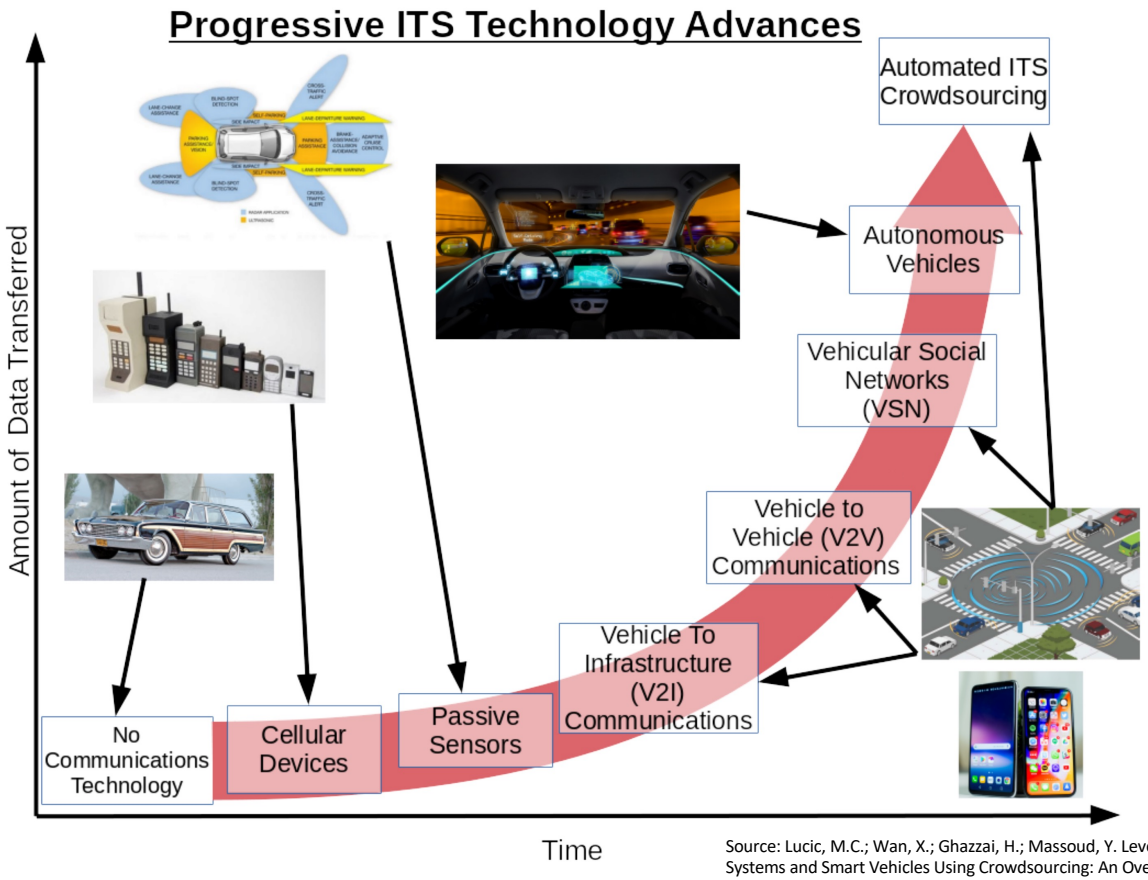
Source: https://www.consultancy.in/news/2122/urban-transport-remains-the-primary-area-of-investment-in-smart-cities

Future trends of ITS



Source: Ibáñez, J.A., Zeadally, S., & Contreras-Castillo, J. (2015). Integration challenges of intelligent transportation systems with connected vehicle, cloud computing, and internet of things technologies. *IEEE Wireless Communications, 22*, 122-128.

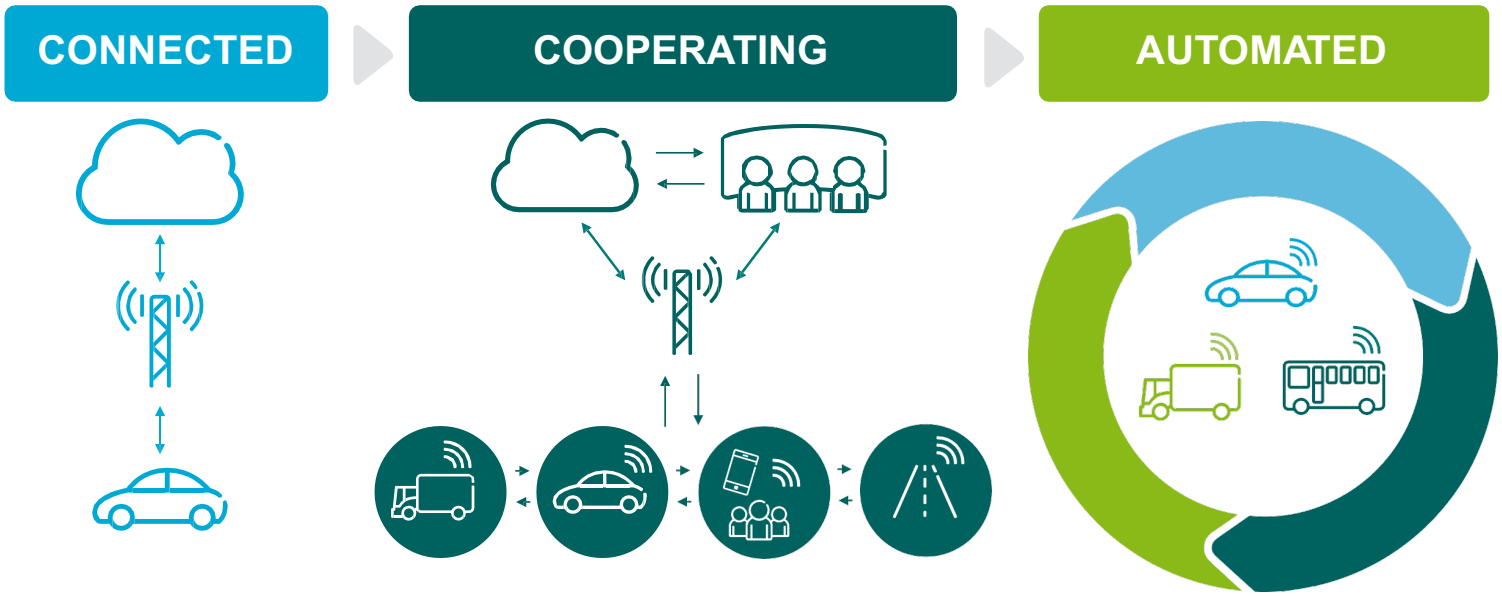
Future trends of ITS



Source: Lucic, M.C.; Wan, X.; Ghazzai, H.; Massoud, Y. Leveraging Intelligent Transportation Systems and Smart Vehicles Using Crowdsourcing: An Overview. *Smart Cities* **2020**, *3*, 341-361. https://doi.org/10.3390/smartcities3020018

Future trends of ITS

TOMORROW STARTS NOW



Source: Ericsson, 2014

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