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Smart community infrastructures — Best practice guidelines for transportation

Infrastructures territoriales intelligentes — Lignes directrices relatives aux pratiques optimales pour le transport

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 268, *Sustainable cities and communities*, Subcommittee SC 1, *Smart community infrastructures*.

Introduction

A well-functioning community infrastructure, of which energy (power), water and wastewater, solid waste disposal, information and communications technology and transportation are essential elements, is critical to the quality of life and economic productivity of any city or human settlement. Transportation plays a highly visible role in the lives of residents, ensuring people can get to work, engage in social activities, take part in commerce and access cultural institutions and any other amenity the city offers. In addition, transportation networks are needed for the distribution of goods throughout a city or region. Inadequate or poorly designed transportation systems can create significant economic costs from lost productivity, environmental impacts and health problems.

The features and services provided by such infrastructures are intended to assist people in communities with their businesses and lives, and to help stimulate activities to promote their businesses and enhance their lives by providing opportunities to come to, stay in and move within/outside communities. People do not want to spend all their time at home or in an office, even though improved information and communication technologies would bring them possibilities to do business or take action anywhere they like and anytime without moving. There is more to life than just business supported by electronic communication. People want to be able to move around independently and see, hear, touch, taste and smell directly what they have an interest in.

Transportation networks can be very complex, interweaving many different modes: by air, ship, ferry, train, truck and passenger vehicle, and by human-powered modes, like walking or biking. In particular, transportation serviced for intra-/inter-city communication by commuter rail, inter-city rail, high-speed rail, metro, trams, monorail, light rail transit, automated guideway transit systems, buses, trucks, ferries and air vehicles is popular and convenient for people, including the disabled, the elderly and those whose physical performance is declining, working or living in communities and coming to or out from there. This is because such means of transportation successfully convey passengers, delivery items and freight in large lots, punctually and at low cost, supported by established basic technologies that have developed over a long period and that are still being steadily improved even now. Cities need to have transportation systems that meet the needs of a diverse group of users, including commuters both within and outside the city, persons with disabilities and the elderly, and those shipping freight or other goods and parcels.

This document describes how transportation is planned, designed, implemented, operated, maintained and upgraded to take into account the points of view of different stakeholders, including the residents and governing authorities of communities, as well as the needs of the environment. This document also outlines minimum conditions to be respected in the performance of transportation systems, even after they have been installed, in order to realize the objectives of a smart transportation infrastructure, i.e. economically efficient transportation systems that meet or exceed user needs while minimizing environmental impact.

Decisions ranging from large-scale planning and investments to individual choices can shape the impact of transportation systems on a city. Decision makers need to think critically about transportation modes, as well as the features and services of those modes, to ensure the positive impacts of transportation infrastructure outweigh the potential negative impacts. In addition, given that populations and technologies change, decision makers need to monitor transportation systems to ensure that they continue to meet transportation goals. This document describes the smart transportation objectives and offers support for the development of integrated urban mobility plans, including the selection and application of transportation services.

Smart community infrastructures — Best practice guidelines for transportation

1 Scope

This document provides general guidance on the planning, design, development, organization, monitoring, maintenance and improvement process of smart transportation systems and infrastructures, which can help promote solutions for intra- and inter-city issues, i.e. for issues both within and outside the city that impact quality of life, the environment or any other areas of city performance. This document applies to transportation infrastructures used for the movement of people, freight or other goods, including items transported for delivery.

This document is intended for use by city planners and other community decision makers, government officials, insurance providers, investment and financing organizations, transportation operators and service providers and manufacturers of transportation equipment. In particular, this document is intended to be used by those involved in making decisions about transportation modes to meet the objectives related to affordability, convenience, low environmental impact and reliability, while satisfying the needs of a diverse group of stakeholders, including city residents, visitors, government authorities, transportation operators.

This document addresses smart transportation by considering the factors that shape communities, such as population, demographics, locations, local culture and history. It addresses the scope of services, features and objectives to be met through smart transportation solutions. This document does not contain technical specifications for the construction of transportation assets of facilities.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
city issue
problem or challenge that negatively impacts the quality of life for residents, visitors and workers in cities, the environment or any other aspects of city performance

3.2
transportation mode
specific means by which passengers, freight or goods, including delivery items, move throughout a city or area

3.3
transportation feature
feature of transportation technologies

EXAMPLE A feature of a light rail transit (LRT) system is that it can transport a specified number of passengers each hour.

3.4
transportation service
service provided by *transportation features* (3.3)

3.5
transportation infrastructure
infrastructure platforms that support *transportation services* (3.4)

3.6
smart transportation solution
solution to one or more *city issues* (3.1) provided by transportation systems that meets the needs of various city users

3.7
smart transportation
transportation that provides *smart transportation solutions* (3.6) given by *transportation services* (3.4)

3.8
private transportation
transportation that is personally owned

3.9
public transportation
transportation provided to the public

3.10
transportation modality
modality by single or multiple modes of public and/or private transportation for passengers, delivery items and freight

4 Fundamentals

4.1 Basic ideas and goals

The suitability or applicability of any particular technology or services to a smart transportation solution depends on the transportation mode and its technical and/or business case characteristics.

Smart transportation solutions support sustainable community development and align with the standards and existing framework that also support that goal. For example, ISO 37101:2016 identifies six areas critical for the development of smart and sustainable communities:

— attractiveness;

— preservation and improvement of the environment;

— resilience;

— responsible use of resources;

— social cohesion;

— well-being.

The objectives listed below, which demand smart transportation solutions, all support the overarching goals of ISO 37101:2016, Table A.1.

In addition, the 14 community needs identified in ISO/TS 37151:2015 that infrastructure performance should be measured against (availability, accessibility, affordability, safety and security, quality of services, operational efficiency, economic efficiency, performance information availability, maintainability, resilience, effective resource use, climate change mitigation, pollution prevention, and eco-system conservation) align with one or more of the objectives listed below (see Table A.2).

Objectives to be considered when evaluating the performance of transportation in the context of achieving smart transportation are as follows:

— to provide all persons, including children, the disabled, the elderly and those whose physical performance is declining, and economic actors with the means for convenient and productive lives and economic activity;

— to promote lifestyles that are not dependent on private automobiles;

— to promote transit-oriented development;

— to ensure convenient access to city markets, resources and amenities;

— to stimulate economic activity in downtowns or economically depressed areas of the city;

— to increase the city's competitiveness and status compared to other cities regionally, nationally or globally;

— to decrease the impact of human activities on the environment;

— to plan and develop transportation facilities and services based on well-sourced, stakeholder driven plans that consider budget resources and pay-back periods, safety and security, facility capacity versus projected need and environmental impacts;

— to preserve and enhance the scenic, aesthetic, historic, cultural and environmental resources of the community.

4.2 Location and objective for the development and installation of transportation infrastructures to provide smart transportation solutions

4.2.1 General

Transportation features and services should be selected and applied to achieve smart transportation solutions either within a single community or between communities within a larger region.

Transportation investments should be prioritized to achieve one or more of the objectives listed in 4.1, when the transportation is subsidized. To aid in the process of prioritizing the issues transportation infrastructures should address, community decision makers should develop an integrated urban mobility plan that identifies factors that shape transportation needs and choices and compares these factors to those that shape the smart community objectives.

EXAMPLE 1 Karlsruhe, Germany, is the first city to successfully organize through operation of LRT rolling stock between LRT lines in the city centre and heavy rail lines by Deutsche Bahn. By starting the passenger services in 1992, the LRT network was serviced in a wider area including the city centre and suburbs resulting in easy commutation for the people living and working in the area covered with the services.

EXAMPLE 2 Nagoya, Japan, installed a specific bus system or guided bus transportation. Basically, Nagoya City and the areas surrounding it have bus services as inside transportation for each city or area. However, the passengers' number increased, who commute between Nagoya and the surrounding areas. To provide a higher capacity for the commutation but not to change the transportation mode or bus that the citizens are already used to, Nagoya City installed a bus transportation system running vehicles inside Nagoya City and in the surrounding areas as a normal bus and between Nagoya City and the areas as a rapid bus running in an exclusive guideway.

4.2.2 Location where transportation infrastructures should be installed to achieve smart transportation solutions

Transportation infrastructures for smart transportation solutions may be installed in the following locations:

— within a region or a community;

— on routes connecting regions;

— on interfaces of transportation inside/outside communities;

— as improvements to existing transportation infrastructures.

An integrated urban mobility plan should, to the maximum extent practicable, identify for users the factors that shape the locational needs of transportation infrastructures, such as:

— size, location and demographics of residential population centres within and surrounding the city or community;

— location of low- and moderate- income households and the distance to affordable public transportation, as well as the potential impact improvements to transportation infrastructures could have on housing affordability;

— size and location of areas of commercial activity and employment within and outside the community;

— flow of freight and/or goods through a community;

— inventory of existing transportation facilities and assets;

— current transportation patterns, including mode use and traffic levels;

— current costs of the transportation system;

— environmental impacts of current transportation activity.

4.2.3 Objectives for smart transportation infrastructures

When making decisions about transportation infrastructures, planners should identify the options:

— to transport people, freight and goods safely, reliably, conveniently, efficiently and economically;

— to provide transportation services that satisfy demand;

— to reduce environmental impact without reducing the quality of the transportation services;

— to improve the efficiency of connections between different modes of transportation;

— to reduce the total energy usage of the transportation infrastructure;

— to make transportation operation economically sustainable while ensuring it is affordable and accessible to all users;

— to improve communication to the public about all aspects of transportation services.

The above-mentioned objectives can be achieved by ensuring the transportation systems to be installed:

— to convey passengers, delivery items and freight safely;

— to convey passengers, delivery items and freight, especially when they are in a large lot;

— to convey passengers, delivery items and freight at a time;

— to convey passengers, delivery items and freight on time;

— to convey passengers, delivery items and freight as planned;

— to convey passengers, delivery items and freight at a low cost;

— to provide dense networks for transport;

— to provide frequent services for transport;

— to provide successful and easy connection for transport between different transportation systems or modes;

— to communicate where no public transportation is available;

— to communicate anytime, especially without being concerned about public transportation schedules;

— to communicate at convenience of passengers and senders/recipients of delivery items and freight;

— to communicate personally while securing privacy;

— to control total energy saving/consumption for transportation;

— to lower environmental load without degradation in service quality of transport operation.

With planning integrated urban transportation, the plan should enable:

— the transport of people and goods safely, reliably, efficiently and economically;

— the provision of networks appropriate for transportation needs, especially investing in and improving existing infrastructures;

— the creation of frequent services for transport;

— the provision of efficient connections for transport between different transportation systems or modes;

— the lowering of the total energy saving/consumption for transportation;

— the lowering of environmental impact without degradation in service quality of transport operation;

— the economically stable operation of transportation with fares that are reasonable or payable by local citizens.

4.3 Consideration of city planning

Selection of transportation features and services should fit together with city or regional planning and planning covering national boundary areas to provide smart transportation solutions in communities including national boundary areas. Such planning includes plans listed below:

— master plans for a city and a region (e.g. urban structures, use of land);

— general plans for transportation in a city and a region;

— master plans for a city and a region including national boundary areas (e.g. urban structures, use of land, sightseeing and exchange induction, welfare, local economy, housing and the residential environment, natural environment preservation, disaster prevention);

— general plans for an area having cities;

— developing plans using transportation services for a huge area fondly called a megalopolis;

— general plans for inter-city transportation networks;

— economy-developing plans for specific areas having cities connected by high-speed communication;

— co-operative developing plans for national boundaries.

5 Selection of transportation modes, features and services for smart transportation solutions in communities

5.1 General

This clause helps those with an interest in introducing transportation as solutions or smart transportation (e.g. governors, transportation operators) find the features of smart transportation to be set up by selecting transportation modes and features.

To solve specific city issues by introducing suitable transportation, transportation modes, features and services should be selected and installed to meet the needs of stakeholders and for the convenience for transportation users and to achieve smart transportation solutions. From the potential options identified in the integrated urban transportation plan, planners including stakeholders should determine which modes, features or services best advance smart transportation goals. Those goals should be designed and chosen to address city issues.

A planning phase is necessary to install transportation features and services that are deduced by transportation modes to be selected. This is because each transportation has its own transportation features that bring specific transportation services. The selection of transportation modes should carefully be determined by smart community governors, planners or developers to have public transportation carriers or private transportation holders/users successfully introduce smart transportation solutions aiming at solutions to the issues.

NOTE The selection of transportation mode is a critical step in introducing smart transportation into communities since the investment in transportation infrastructures can create path dependencies that will shape and effect the community far into the future. Care can help to emphasize modes that reduce the use of private vehicles and made the best possible use out of existing assets and facilities.

5.2 Selection criteria

5.2.1 General

The following criteria should be taken into consideration when selecting appropriate transportation modes, features and services.

5.2.2 Parameters to be considered in the selection of public transportation modes

In making decisions about public transportation investments, transport capacities between different potential modes (i.e. rail or bus) should be compared (see Figure B.1), as well as potential routes, the number of anticipated riders, transporting distances, the availability of land (for rail), carrying performance required (number of riders per hour), service speed (km/h), and budget scale. For good selection, some of such parameters should be combined for comparison.

5.2.3 Subsidization to transportation operating business

Basically, transportation business is run with two aspects; one is as public work and the other as private business. The former is nowadays common, including private company-operating business partly subsidized, while the latter is not easy or successful due to difficulties in operating transportation business with good financial management. In case private business is partly or fully subsidized, it is not necessarily private business but sort of public work. Private business is run to seek profit while public work is organized for public welfare. Then, the direction of operation of transportation business depends on management with/without subsidized.

Transportation decision makers should analyse the business cases and the availability of funding to determine how different funding models will affect transportation services, maintenance and other aspects of transportation systems.

