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Smart community infrastructures — Smart transportation for compact cities

Infrastructures communautaires intelligentes — Transport intelligent dans les villes compactes

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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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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

In the development of this document, ISO Guide 82 has been taken into account in addressing sustainability issues.

Introduction

A compact city is an urban design concept that invites people back to a small area in a city where the population has decreased or is decreasing. Modal shifts of passengers from public to private transportation have resulted in people moving out of the city centre into the suburbs, since private transportation enables movement without dependent time schedules and fixed routes. The problems associated with public transportation are mainly related to station or stop intervals, service frequency, approaches to stations/stops and service routes and networks. Furthermore, large-scale shopping malls and hospitals are frequently constructed outside cities. Such a situation accelerates the outflow of residents, resulting in the de-urbanization of city centres. Downtown, the public realm and community safety fall into decline, causing more people to move out to the suburbs. This negative spiral continues, changing the character of a city.

One way to pre-empt the deterioration of a city centre is through the creation of a compact city. The concept behind compact cities is that facilities for citizens, such as shopping malls, offices and hospitals, are placed in a small target areas. These facilities are connected to one another by short-interval, high-frequency public transportation which can be easily accessed by citizens. Additionally, this type of transportation reconnects citizens living in the suburbs to the urban centre, with service lines laid radially in relation to the suburbs surrounding the area. This transportation network successfully attracts people into a target area from its periphery and retains them therein. This is a solution to the problem of declining city centres, utilizing smart transportation to resuscitate small downtown areas. This document describes a way to organize smart transportation to create a compact city that regenerates a declining urban centre and rejuvenates its economic, physical and social infrastructure.

Smart community infrastructures — Smart transportation for compact cities

1 Scope

This document describes criteria to help plan or organize smart transportation for compact cities. It is intended to apply to cities facing a decline in population. Smart transportation can be applied to the issue of population loss as a means of attracting people back to the city.

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 https://www.iso.org/obp

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

3.1
compact city
city where the majority of facilities and amenities that support life for citizens are accessible within a radius of approximately 1 km

Note 1 to entry: Such facilities and amenities would generally include those that support employment, shopping and commerce, medical and educational needs and cultural activities.

3.2
light rail transit
LRT
transportation system using trams or rolling stock

3.3
automated guideway transit
AGT
automated operation-applicable transportation system using polymer tire-supporting rolling stock equipped with guide wheels contacting guide rails for steering

Note 1 to entry: Typical AGT service lines are Bukit Panjang LRT in Singapore, Port Liner in Kobe, Japan, and MIA Mover in Miami International Airport, USA.

4 Concept of smart transportation for compact cities

4.1 General

The facilities of a compact city should be connected by transportation systems that provide a high frequency of service and are easily accessible. In addition, the transportation systems' stations or stops should be located at close intervals, and serviced by vehicles that can successfully start and stop at short intervals. These vehicles need not necessarily be high capacity. Such specific transportation systems provide people living in the suburbs with easy access to the target area and encourage them to stay therein. By using these transportation systems, the target area begins to be repopulated.

4.2 Applicable city issues

The criteria for smart transportation described in this document are appropriate for addressing the issue of declining population within a city where the goal is to retain and attract more people to the city.

5 Adoption of smart transportation for compact cities

5.1 Objectives

As mentioned in 4.2, smart transportation as described in this document can help address the issue of declining population within a city where the goal is to retain the current population and attract more people to the city.

To help achieve this goal, transportation modes which meet the conditions described in 5.3 should be selected.

5.2 Target area

A depopulated area to be repopulated by building facilities for city life, such as shopping centres, offices, hospitals, residential areas, educational facilities and cultural facilities, which are connected by smart transportation. Examples of compact cities using smart transportation are listed in Annex A, Table A.1.

5.3 Selection of transportation modes

5.3.1 General

Transportation modes which provide transportation services meeting the conditions specified from 5.3.2 to 5.3.14 should be selected.

NOTE Light rail transit (LRT), buses and automated guideway transit (AGT) are typical transportation modes that foster the development of compact cities.

5.3.2 Service frequency

The transportation service should be provided no less than every 10 min during rush hour.

NOTE Normally, the higher the population density and expected passenger numbers, the higher the service frequency that would be needed.

5.3.3 Station/stop interval

Stations or stops should be placed so that the average distance between them is no more than 300 m, except when it is hard to place stations or stops at this distance due to geographical or traffic conditions or specific local situations.

NOTE Typical exemptions include smart transportation routes on bridges or in tunnels.

5.3.4 Effective area size

The area afflicted by depopulation to be addressed by smart transportation should be contained within a 1-km radius.

5.3.5 Service network shape

Smart transportation service networks should be arranged in a radial formation from the centre of a target area to the suburbs.

5.3.6 Coach convenience, ride comfort and safety

Entry and exit from the transportation vehicle should be easy and accessible for all, including the elderly, children and people with small children. Users with disabilities should be able to enter and exit with minimal or no assistance. Vehicles should provide a comfortable ride for all, including the elderly, children and those with disabilities, with little vibration or noise. Where appropriate, vehicles should be air-conditioned. Vehicles can also include space for bicycles or other large items.

Vehicles should be equipped with handrails, handgrips, hanging straps and non-slip floors for safety, and there should be easy communication channels, especially with a dispatcher, in case of emergency.

NOTE Battery-powered buses provide comfort, and are widely used, because no gear changes are needed, meaning no sudden shocks.

5.3.7 Geographical applicability

Suitable transportation systems should be used in according with the geographical and meteorological conditions they will operate in.

Often, the target area to be developed as a compact city used to be the city centre, with narrow, winding streets. The transportation system should be suitable even in such conditions.

5.3.8 Running performance

Vehicles should have acceleration high enough to ensure time saving for travel on such a service line with stops/stations at short intervals.

5.3.9 Exclusive tracks

Tracks and/or dedicated street lanes should be placed in service for use by the smart transportation system only.

5.3.10 Promotion of environmentally friendly vehicles and life-cycle performance

Transportation systems which produce low chemical emissions, vibration and noise levels should be used. Furthermore, positive application of technologies should be promoted to develop environmentally friendly vehicles and enhance the life-cycle performance of the transportation.

EXAMPLE To promote environmentally friendly performance, many cities across the world have introduced battery-powered buses, which produce no CO_2, NOx, SOx or PMs. An example of a successful trial is given in Annex B.

5.3.11 Improvement of land reuse

Transportation modes which allow for the reuse of compact city land for any kind of facilities that do not have a chemical or geological impact should be used.

5.3.12 Energy saving

Transportation systems which can save energy by, for example, using recovered braking energy, minimizing energy consumption, optimizing operation schedules or controlling vehicle running performance should be used.

5.3.13 Information provision

Information should be provided to customers on transport operation through signage and web applications (e.g. displays for passengers indicating bus/train final destinations, service routes, stops/stations, estimated arrival time and available Wi-Fi networks).

5.3.14 Rider fees

Where the service is fare-based, transportation systems should provide an electronic-based payment system that interacts with those of other public transportation systems in the area.

5.4 Installation of smart transportation

By using the transportation modes selected, a smart transportation system should be set up to meet the conditions described in 5.3.

6 Maintaining the quality of smart transportation for compact cities

6.1 General

To maintain the performance and monitor the effectiveness of smart transportation in compact cities, observe the parameters in 6.2 periodically. If the effectiveness of smart transportation cannot be confirmed, modify the current smart transportation services by changing the conditions detailed in 5.3, where possible and reasonable.

6.2 Parameters to be observed

To maintain the performance of smart transportation, observe the following parameters:

- population in the target area where smart transportation was installed;
- traffic flow from/to the target area;
- the modal split of smart transportation in the target city/area;
- the required capacity of smart transportation;
- city axes of the target city.

These parameters have been developed based on proven measures for transit performance.

6.3 Modification of smart transportation

When unwanted changes in the value of the parameters in 6.2 are identified, modify the conditions of smart transportation, as detailed in 5.3, where possible. To correct the transportation parameters, analyse any unexpected or irregular occurrences in the area where smart transportation was installed. Modify the irregular conditions of the smart transportation system if these are not acceptable.

Annex A
(informative)

Examples of smart transportation for the development of compact cities

Table A.1 provides an overview of the places where smart transportation has been used to develop compact cities.

Table A.1 — Examples of best-practice solutions using smart transportation for the development of compact cities

Aspect of compact city	City						
	Freiburg, Germany	**Karlsruhe, Germany**	**Nantes, France**	**Kobe, Japan**	**Portland, US**	**Singapore**	**Toyama, Japan**
Population	230 000	300 000	290 000	Port Island, 15 000; Rokko Island, 17 000	580 000	Punggol area, 110 000	420 000
Transportation modes	Tram, bus	Tram	LRT, bus	AGT	LRT, bus	AGT	LRT
Service frequency (service interval/min)	6	5	5	Port Island, 2; Rokko Island, 6	10	4	10
Network shape	Radially from the city centre	Radially from the city centre	Radially from the city centre	Radially from the city centre with a loop line	Radially from the city centre	Radially from the city centre with a loop line	Radially from the city centre with a loop line
Facilities covered	Shops, hospitals, universities, churches, theatres	Shops, offices	Shops, offices	Housing estates, offices, shops, hospitals, schools	Offices, shops, public parks	Housing estates, offices, shops, hospitals, schools	Shops, offices, hospitals
City centre radius (km)	0,5	1	1	0,5	1,5	0,5	1
Stop interval (m)	400	300	200 to 400	Port Island, 500; Rokko Island, 600	300	700	300
Specific conditions	Park and ride services also installed	Direct operation of trams to heavy rail lines	Exclusive tracks	Port and Rokko Islands or new artificial islands, where compact cities were organized with AGT transportation	Stops with parking lots for park and ride services, a transit centre placed in the centre of the target area	A newly developed area connected to metro by AGT	A loop line organized in the city centre

