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Smart community infrastructures — Smart transportation for newly developing areas

Infrastructures urbaines intelligentes — Transport intelligent pour les territoires en développement

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Contents

Page

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 of 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 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*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Although overall populations in developed countries have started to decrease, many cities are looking for more space for citizens to reside and locate businesses, and are developing virgin or desolate land, since convenient places are normally limited in existing cities. Developing countries whose population is sharply increasing are also in the same situation due to these population explosions and the shortage of places for comfortable city life and effective business expansion.

A newly developing area is a type of district newly planned and developed to achieve such goals where the land has never been touched but is located within commuting distance of the current main city centre. Once a small or medium-sized city is developed near a metropolis, the new city is often called a satellite city.

In order to establish a newly developing area, passenger transportation services are indispensable as an easy means of travel from place to place inside the area and between the area and established cities nearby. 24-h transportation plays a key role in supporting the sustainability of a newly developing area since transportation performance directly creates a strong bond between citizens' lives and business activities. In other words, transportation, if suitable, contributes to successful development and fostering of newly developing areas. The transportation services should therefore be carefully organized.

In most cases, the size of a newly developing area is not huge, but the population itself could be large. Thus, a relatively high frequency of transportation services rather than a high capacity per service is required. Transportation services shall be able to accommodate planned passenger numbers in expected passenger flows. The geographical features of a target site and the characteristics of the town planning will dictate specific transportation performance. It is not unusual to place newly developing areas in hilly terrain since easily cultivated land has probably already been used. Financial circumstances are likely to force transportation routing to take courses that do not require building a tunnel through a hill but instead laying tracks on hills, even if steep. Flexible track arranging hence responds to the restrictions of local policy-oriented conditions by placing ground tracks, underpasses or overpasses, viaducts and small curves alongside public roads.

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

Smart community infrastructures — Smart transportation for newly developing areas

1 Scope

This document specifies a procedure to arrange smart transportation for newly developing areas, including transportation services between the area and existing city centres. This document does not designate procedures for constructing smart transportation facilities.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 37154, *Smart community infrastructures — Best practice guidelines for transportation*

ISO 37157, *Smart community infrastructures — Smart transportation for compact cities*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 37154 and ISO 37157 and the following 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
newly developing area
area newly planned and developed for city life, including business activities, usually in virgin or desolate land, where public transportation services are required

Note 1 to entry: Newly developing areas are also known as “bedroom towns”, “new towns”, “satellite towns” and “edge cities” depending on where, when and for what purpose the development is planned.

Note 2 to entry: Newly developing areas could also be urban areas that have been reconverted or reconfigured or whose population density has suddenly increased as a result of other changes.

3.2
transportation for newly developing areas
services provided for travel inside a newly developing area and between it and the surrounding region, including existing city centres

4 Concept of smart transportation for newly developing areas

4.1 General

A newly developing area is commonly developed in virgin or desolate land, but still in a location commutable to existing city centres. It should have the facilities necessary for city life, including residential places, business activities, academic services and community organizations. Various needs and demands normally arise at the planning phase. Smart transportation for newly developing

areas generally satisfies some, if not all, of these with easy route arrangements. The sustainability of newly developing areas depends directly on the characteristics of transportation systems. Smart transportation shall be installed by optimizing the services for a development plan based on geographical conditions and specific local requests from town planners.

EXAMPLE In Brazil, municipalities in the metropolitan area should report the specifics of their plans, if related to integrated urban development, to the metropolitan government.

This smart transportation contributes to and aims to satisfy the United Nations Sustainable Development Goals, in particular goal 3, "Good health and well-being", goal 8, "Decent work and economic growth", goal 9, "Industry, innovation and infrastructure", goal 11, "Sustainable cities and communities", goal 15, "Life on land" and goal 17, "Partnerships for the goals".

4.2 Transportation modes for newly developing areas

4.2.1 General

When a newly developing area is planned, smart transportation should be applied as the main public transportation for passenger services inside the area and between the area and the surrounding region, including existing city centres. Smart transportation thus has two simultaneous purposes: to transport citizens inside a newly developing area and convey people to/from existing city centres outside this area.

4.2.2 Transportation modes applicable inside newly developing areas

For internal services inside a newly developing area, a transportation mode shall be selected that does not cause traffic issues after introduction. Internal services consist of basic bus networks and main transportation services in the form of BRT (bus rapid transit), LRT (light rail transit), AGT (automated guideway transit) and/or MRT (mass rapid transit), as shown in Figure A.1.

To select appropriate main transportation modes, besides bus networks, consider the following criteria and/or features of the respective transportation modes by carefully studying the town planning. However, the main transportation modes are normally selected as shown in Figure A.1, depending on both the planned population and planned population density of the newly developing area.

a) BRT

- relatively low initial costs;
- quick boarding/alighting when the fare is collected on a platform or in a station;
- limited transportation capacity, especially when tire housing reduces space within the bus;
- level traffic disturbance (e.g. pedestrians, other transportation modes) and other impacts (e.g. expropriation) if tracks are laid on viaducts.

b) LRT

- applicable to implement tracks at ground level, including when laying directly on roads;
- easy access for boarding/alighting;
- rail noise generated in small curves;
- limited transportation capacity.

NOTE 1 LRT is a transportation system using light rolling stock with steel tires on segregated tracks (e.g. elevated, at ground level and/or underground).

NOTE 2 Normally, trams run on a track laid on/alongside public roads and are not segregated.

c) AGT

— unmanned and on-time operation secured by dedicated tracks;

— low noise and vibration by using polymer tires;

— not applicable to tracks with level crossings;

— landscape disturbance if tracks are laid on viaducts.

d) MRT

— high transportation capacity;

— high capital cost;

— on-time operation;

— rail noise generated in small curves;

— interference with road traffic at level crossings.

4.2.3 Transportation modes applied between a newly developing area and the outside region

Transportation modes to connect a newly developing area and the outside region, including existing city centres, depend on the location and population of the newly developing area and the city formation of the territory including the area.

5 Adoption of smart transportation for newly developing areas

5.1 General

A newly developing area should be in a location which enables people to commute to existing city centres. This could result in the area having unfavourable conditions for transportation system installation, such as hilly or narrow ground.

As mentioned in 4.1, the sustainability of newly developing areas depends on transportation characteristics. Transportation modes to be applied to newly developing areas shall be selected to satisfy the conditions specified in 5.2, while taking into consideration the geographical conditions of the area and requests from town planning.

5.2 Conditions for transportation mode selection

5.2.1 General

Smart transportation for newly developing areas shall meet the conditions designated in 5.2.2 to 5.2.15, while basic transportation networks are provided with buses inside the area. Transportation modes to connect a newly developing area and the outside region shall also be selected by considering the conditions in 5.2.2 to 5.2.15. However, transportation connecting these two areas will be included in the city axil transportation system, or main transportation routes, where the newly developing area is located. Thus, other factors could affect transportation mode selection.

5.2.2 Transportation capacity

Transportation capacity shall be sufficient to transport passengers in a planned newly developing area and those travelling between the area and the outside region. The capacity of transportation modes is shown in ISO 37154:2017, Figure B.1.

5.2.3 Service frequency

Transportation services shall be provided every 10 min maximum during rush hour.

5.2.4 Stop/station interval

Stops or stations shall be placed at an average distance of 300 m or a minimum distance of 700 m apart for transportation inside a newly developing area. For transportation connecting a newly developing area and the outside region, the stop/station interval distance depends on the transportation mode selected by considering the city axil plan.

NOTE 1 Buses and LRT have stops where vehicles stop for passenger boarding and alighting, while BRT, AGT and MRT have stations.

NOTE 2 As designated in ISO 37157, the average stop/station interval is 300 m in smart transportation using buses and LRT for compact cities. Placing stations at an interval of less than 700 m increases travel time by BRT, AGT and MRT.

5.2.5 Geographical applicability

Transportation systems shall be adoptable in target land regardless of geographical conditions.

NOTE In many cases, the geographical conditions of the target land require the vehicles used for smart transportation to be able to climb hills.

5.2.6 Running performance

Vehicles shall have high acceleration to ensure time-saving travel inside a newly developing area and between the area and existing city centres.

5.2.7 Exclusive tracks and/or street lanes

Dedicated tracks and/or street lanes are recommended for a smart transportation system.

5.2.8 Promotion of environmentally friendly vehicles and life-cycle performance

Transportation systems producing low chemical emissions, vibration and noise levels shall be used. Environmentally friendly vehicle development and life-cycle performance enhancement should be promoted and positively applied in the transportation system.

5.2.9 Coach convenience and safety

Vehicles shall provide a comfortable ride for all, including children, the elderly and those with small children or disabilities, so that passengers are able to enter and exit with minimal or no assistance. Vehicles shall be equipped with handrails, hanging straps and non-slip floors for safety and installed with security provisions. Vehicles shall be air-conditioned and can include space devoted to bicycles or other large items.

5.2.10 Town value and attractiveness

Transportation shall enhance the value and attractiveness of a newly developing area.

NOTE This means that the value of the land as property is one of the key issues in successfully developing and maintaining a newly developing area over time. Otherwise, few citizens will buy the land or stay in a newly developing area and the area cannot be financially supported after development.

5.2.11 Emergency measures

Transportation shall have emergency routes for all passengers, especially children, the elderly and those with disabilities, to escape from vehicles to safe ground at times of emergency. Easy communication channels shall be facilitated and include work between the vehicles and dispatchers.

NOTE NFPA 130[9] and the EN 45545 series[2]-[8] provide useful information on protection of rail operation and services from fire disasters.

5.2.12 Energy saving

Transportation systems shall save energy consumption by, for example, using recovered braking energy or minimizing energy consumption through driving skill or optimizing operation schedules.

5.2.13 Driverless operation applicability

Driverless operation shall be applicable to transportation in order to secure reliable transportation services independently of staffing.

NOTE In the transportation business, staffing has been one of the most serious issues in developed countries since 2000.

5.2.14 On-time operation

Transportation shall be operated on time and enable punctual connection with other transportation services, besides smart transportation, to ensure reliable travel for citizens.

NOTE Punctual operation contributes to activate city life and business and attracts more passengers to the transportation services, thereby leading to financially stable transportation management.

5.2.15 Flexibility in track arrangements

Transportation should be implemented on tracks at any level (e.g. elevated, at ground level and underground). Tracks could be laid with small curves and installed alongside public roads, the space above which is available for installation in many cases, to reduce construction costs.

5.3 Installation of smart transportation

By using the transportation modes selected, a system of smart transportation shall be established in accordance with the requirements described in 5.2.

6 Sustainability in quality of smart transportation for newly developing areas

6.1 General

To maintain the intended performance of smart transportation, and to confirm its effectiveness, periodically observe the following parameters.

6.2 Parameters to be observed

The parameters for comparing smart transportation performance are as follows (use appropriate units for observation):

— changes in population in the target area where smart transportation was installed;

— changes in traffic flows from/to the target area;

— changes in the modal share of smart transportation in the target city/area;

— changes in passenger numbers using smart transportation;

— changes in city axes of the target city.

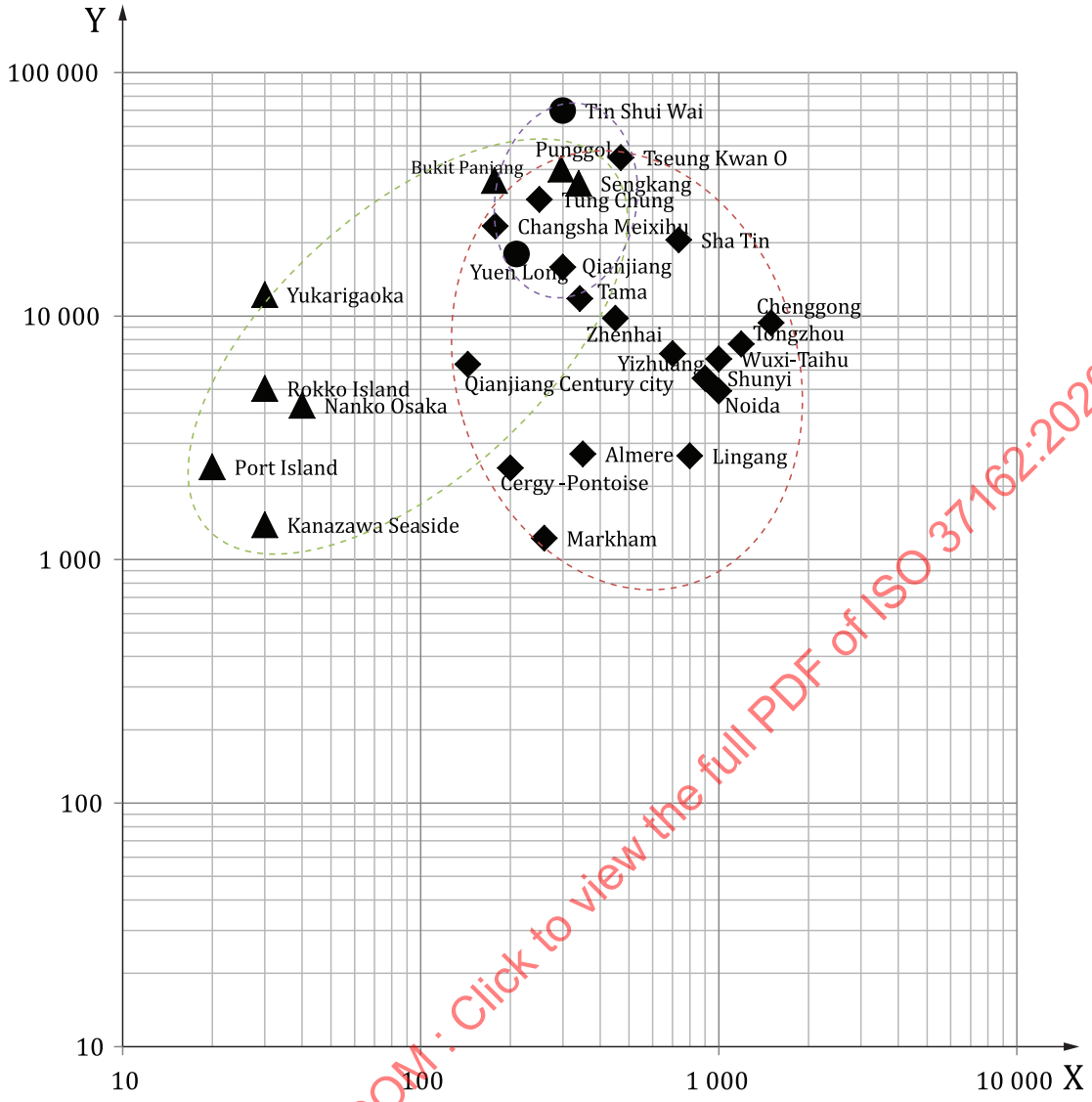
6.3 Re-optimization of smart transportation conditions

When no change is found in the value of parameters designated in 6.2, change the conditions of smart transportation in 5.2. To correct the transportation conditions, confirm anything unexpected at planning or anything irregular due to the specific situation of the area where smart transportation was installed. Modify the current conditions of the smart transportation system operated by making sure that the irregular conditions are acceptable. If modification is not successful, change the mode currently used for smart transportation to another mode listed in 4.2.2 or abandon it.

Annex A
(informative)

Transportation modes used in existing newly developing areas

Transportation modes used in already established newly developing areas have been selected by considering two parameters or the planned newly developing area population and population density (see Figure A.1). Buses are used for a basic transportation network inside a newly developing area. Besides the bus network, if a newly developing area is planned with a population fewer than 500 000 people, LRT or AGT can be chosen according to the requirements in 5.2. When an area with a population larger than 100 000 people is planned, MRT can be selected. There are no newly developing areas with a planned population density of less than 1 000 people/km^2. Such a site would be out of the concept of newly developing areas. Almost none of the newly developing areas already established in the world have yet completely grown to their final planned state. Thus, there is currently leeway in transportation capacity in all such newly developing areas. Figure A.2 shows the current situation in the areas that have not yet matured as planned. It would normally take 30 years at least for newly developing areas to reach the planned conditions.



Key

X planned population (1 000 people) of a newly developing area

Y planned population density (people/km^2)

◆ MRT

▲ LRT

● AGT

NOTE BRT is still one of the options for the main transportation service within newly developing areas but does not appear in this figure.

Figure A.1 — Transportation modes selected for planned newly developing areas according to population and population density