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### Smart community infrastructures — Smart transportation for newly- developing areas

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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](http://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

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

## Introduction

Even while the population in developed countries has already started decreasing, many cities are looking for more space to reside and locate business, since convenient places are normally limited in existing cities and people are localized therein. Thus, they still have demand for virgin or desolate land development. The same situation has happened also in developing countries due to the shortage of places for comfortable city life and effective business expansion.

A newly-developing area is a sort of district newly-planned and developed for residential purposes or business activities where the land has never been touched. It is located within distance commutable to the current main city centre. Once a typical newly-developing area has been developed as a small or medium-sized city near a metropolis, it would be fondly called a satellite city.

In order to set up a newly-developing area, passenger transportation services are indispensable for easy communication from place-to-place inside the area and between the area and conventional cities nearby. Transportation plays a key role in the sustainability of a newly-developing area since transportation performance directly affects citizens' lives and business activities. Transportation for newly-developing areas must therefore be implemented concurrently with the development itself.

In most cases, the size of a newly-developing area is not huge but the population could be large. Thus, high transportation capacity per service is not required but relatively high frequency. Transportation services should receive planned and expected passenger numbers and passenger flows. The geographical features of a target site and the characteristics of the town planning would dictate specific transportation performance. It is not seldom to place newly-developing areas in hilly terrain since easily cultivatable land has probably already been developed leaving the more difficult cultivatable land untouched. Financial conditions would likely force transportation routing to take courses that do not require building a tunnel through a hill but to lay tracks on hills, even if steep. Flexible track arrangements can hence enable responding to restrictions from social demands under local policy-oriented conditions by placing ground tracks, under-over passes, viaducts and small curves along public road formation.

This document describes a procedure to organize smart transportation for the development and retention of newly-developing areas that are normally planned and built in specific and complicated local situations.



# Smart community infrastructures — Smart transportation for newly- developing areas

## 1 Scope

This document specifies a procedure to arrange smart transportation for newly-developing areas. This smart transportation is to be applied to land where development is planned, or to routes between the land concerned and city centres currently existing. This document designates the conditions to organize smart transportation for newly-developing areas but not the procedures to construct facilities thereof.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purpose 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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### **Newly-developing area**

areas newly planned and developed in virgin or desolate land for utilization of citizens, where public transportation services are required

Note 1 to entry: Newly-developing areas have been fondly called “bedroom towns,” “new towns,” “satellite towns” and “edge cities” depending on where, when and for what purpose the development is planned.

### 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 location commutable to existing city centres and should have facilities necessary for city life, including residential purposes, business activities, academic services and community organization. Various needs and demands arise at the planning phase. Thus, smart transportation should have characteristics to satisfy them, if not all, with easy route arrangements. Basically, transportation systems affect the sustainability of newly-developing areas. Smart transportation is to be installed by making the services suitable to the development plan that includes local geographical conditions and specific requirements by town planners.

This smart transportation contributes to and aims at satisfying Sustainable Development Goals by United Nations, especially 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” and Goal 15 “Life on land.”

## 4.2 Applicable land

When a newly-developing area is planned with introduction of public transportation as a main mode for passenger services inside the area and between it and the surrounding region, including existing city centres, smart transportation should be applied.

## 4.3 Transportation modes for newly-developing areas

### 4.3.1 General

Transportation services to be used for newly-developing areas have two purposes or goals. One is to transport citizens inside a newly-developing area and the other to transport between the area and existing city centres.

### 4.3.2 Transportation modes applicable inside newly-developing areas

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

To select suitable main transportation modes besides bus networks, consider the following criteria and/or features of respective transportation modes by carefully studying the town planning. Basically, however, main transportation modes are normally selected as illustrated in [Figure A.1](#), which depend on both population and population density planned for the newly-developing area.

#### a) BRT

- Relatively lower initial costs;
- Short-time boarding/alighting when the fare is collected on a platform or in a station;
- Limited transportation capacity, especially when the tire houses reduce the space within the bus.

#### b) LRT

- Applicable to implement tracks on 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 (Light rail transit) means transportation system using light rolling stock with steel tires on segregated tracks (e.g. elevated, ground and/or underground).

Note 2 Normally, trams run on a track laid on/along with public roads, which is 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 by viaducts, if tracks are on viaducts.

d) MRT

- High transportation capacity;
- High construction cost;
- On-time operation;
- Rail noise generated in small curves;
- Interference with road running vehicles at level crossings.

#### 4.3.3 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 city axis of the territory including the area.

## 5 Adoption of smart transportation to develop newly-developing areas

### 5.1 Objectives

As mentioned in [4.1](#), transportation systems play a key role in the sustainability of newly-developing areas. The transportation services should meet geographical situations of the area and requests given at the town planning. Transportation modes to be applied to newly-developing areas should be selected to satisfy the conditions described in [5.3](#).

### 5.2 Target land for newly-developing areas

A newly-developing area should be located in order to be commutable to existing city centres and would commonly be located in land having unfavourable conditions for the installation of a transportation system, such as hilly areas and narrow ground, since easily developed land have probably already been used.

### 5.3 Conditions for selection of transportation modes

#### 5.3.1 General

Smart transportation for newly-developing areas meets the conditions designated from [5.3.2](#) to [5.3.15](#), while basic transportation networks are provided with bus inside the area. Transportation modes to connect a newly-developing area and the outside region should also be selected by considering the conditions from [5.3.2](#) to [5.3.15](#). However, transportation connecting therein will be included in the city axis transportation system where the newly-developing area is located. Thus, other factors could affect transportation mode selection.

#### 5.3.2 Transportation capacity

Transportation modes should be selected by confirming the transportation capacity required for a newly-developing area planned and comparing the capacity of transportation modes that is shown in Figure B.1 in ISO 37154: 2017 as illustrated as an example.

#### 5.3.3 Service frequency

Transportation services should be provided every 10-min maximum during rush hours.

#### **5.3.4 Stop/Station interval**

Stops or stations are placed in a distance of 300 m in average or 700 m minimum for transportation inside a newly-developing area. For transportation connecting between a newly-developing area and the outside region, the stop/station interval distance depends on the transportation mode selected by considering the city axial plan.

Note 1 Usually, bus 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 bus and LRT for compact cities. Commonly, when placing stations at an interval less than 700 m, travel time by BRT, AGT and MRT will be increased.

#### **5.3.5 Geographical applicability**

Transportation systems should be used which can be adopted in target land independently of geographical conditions.

Note The geographical conditions in target land would likely require hill-climbing performance of the vehicle to be used for smart transportation in many cases.

#### **5.3.6 Running performance**

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

#### **5.3.7 Exclusive tracks and/or street lanes**

Tracks and/or street lanes dedicated should be recommended for a smart transportation system.

#### **5.3.8 Promotion of environmentally-friendly vehicles and life-cycle performance**

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

#### **5.3.9 Coach convenience and safety**

Vehicles should provide a comfortable ride for all, including children, the elderly and people with disabilities. Entry and exit from the transportation vehicle should be easy and accessible for everyone. The users with disabilities should be able to enter and exit with minimal or no assistance. Vehicles should be equipped with handrails, hanging straps and non-slip floors for safety, installed with security provisions and air-conditioned. Vehicles may also include space devoted to bicycles or other large items.

#### **5.3.10 Town value and attractiveness**

Transportation modes should be selected which enhance the value and attractiveness of a newly-developing area.

Note This means that the value of the land as property is absolutely one of the key issues to successfully develop and retain a newly-developing area for a long time. Otherwise, few citizens will buy the land or stay in a newly-developing area resulting in difficulties in maintaining it.

#### **5.3.11 Emergency measures**

Transportation modes should be selected which secure emergency routes for all passengers, especially children, the elderly and people with disabilities, to escape from vehicles to safe ground at time of

emergency. Easy communication channels should be facilitated and include work between the vehicles and dispatchers.

Note NFPA 130: 2017, “Standard for Fixed Guideway Transit and Passenger Rail Systems”<sup>[3]</sup>, and EN 45545 series, “Fire Test to railway components”<sup>[4]</sup> to,<sup>[10]</sup> will provide useful information on protection of rail operation and services from fire disasters.

### 5.3.12 Energy saving

Transportation systems should be used which can save energy by, for example, using recovered braking energy, minimizing energy consumption, including driving skill and optimizing operation schedules.

### 5.3.13 Driver-less operation applicability

Transportation modes should be selected in which driver-less operation is applicable in order to secure steady transportation services independently of staffing.

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

### 5.3.14 On-time operation

Transportation modes should be selected to keep on-time operation and punctual connection with other transportation services besides smart transportation to assure steady travel for citizens.

Note Punctual operation contributes to activating city life and business resulting in attracting more passengers to the transportation services, thereby leading to financially-stable transportation management.

### 5.3.15 Flexibility in track arrangements

Transportation modes should be selected which can be implemented on tracks at any level (e.g. elevated, ground and underground). Tracks would be laid with small curves and installed along public roads in many cases to reduce construction costs. In this case, the space above roads still works for installation.

## 5.4 Installation of smart transportation

With the transportation modes selected, a transportation system should be set up by satisfying the conditions described in [5.3](#).

## 6 Sustainability in quality of smart transportation for newly-developing areas

### 6.1 General

To keep the performance of smart transportation for newly-developing areas in conditions planned and confirm the effectiveness thereof, periodically observe the parameters indicated below. If effectiveness of smart transportation is not confirmed or not clear, modify the current services by smart transportation by changing the transportation conditions described in [5.3](#).

### 6.2 Parameters to be observed

To make sure of smart transportation performance, observe parameters indicated below for comparison:

- 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 the passenger numbers of smart transportation;
- changes in city axes of the target city.

### 6.3 Re-optimization of smart transportation conditions

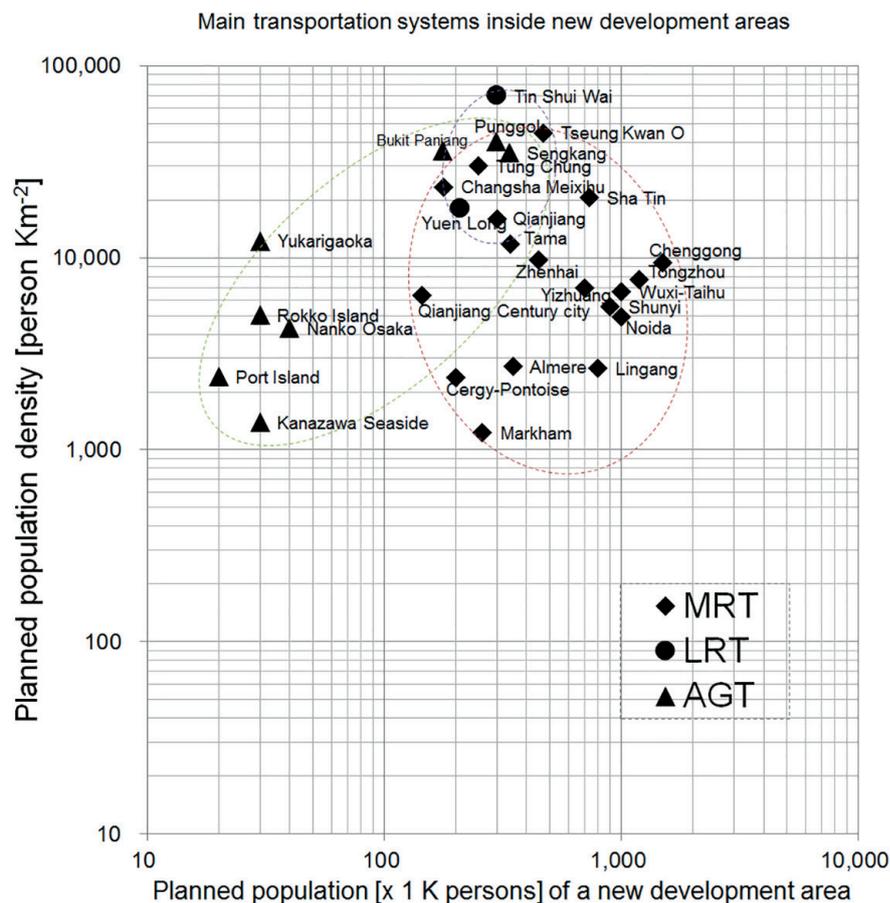
When finding no changes or decreases in the value of parameters designated in [6.2](#), change the conditions of smart transportation in [5.3](#). To correct the transportation conditions, confirm anything unexpected at planning or irregular due to specific local situations taking place to the area where smart transportation is installed. Modify the current conditions of smart transportation operation by making sure that the irregular conditions are acceptable. In case modification is not successful, change the mode currently used for smart transportation to another mode listed in [4.3.1](#) or abandon.

Note [Figure A.2](#) in [Annex A](#) shows the current situation taking place in newly-developing areas that are already built up. Almost all of the newly-developing areas have not yet been matured as planned. Thus, the pictures of [Figures A.1](#) and [A.2](#) are different from each other. The former indicates transportation modes selected based on a population and population density determined when planning the newly-developing areas while the latter shows a current population and population density of the same newly-developing areas which have not yet been fostered or matured to the final picture as planned. It would normally take 30 years at least for newly-developing areas to reach the planned conditions.

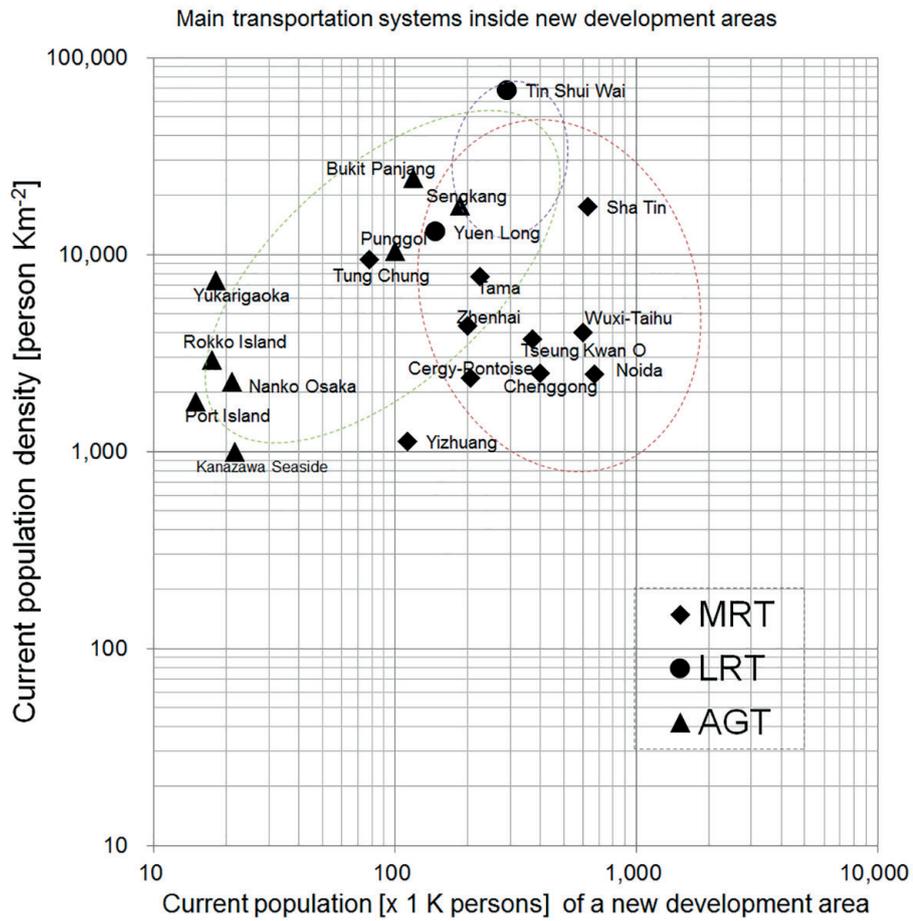
## Annex A (informative)

### Transportation modes used in existing newly-developing areas

Transportation modes used in newly-developing areas already built up have been selected by considering two parameters or a newly-developing area population and population density that were planned (See [Figure A.1](#)). Basically, bus is used as a basic transportation network inside a newly-developing area. Besides the bus network, if a newly-developing area has a population planned smaller than 500,000 persons, LRT or AGT can be chosen referring to the requirements in [5.3](#). When a population planned is larger than 100,000 persons, MRT can be selected. There are no newly-developing areas having planned population density less than 1,000 persons/km<sup>2</sup>. Such a site would be out of the concept of newly-developing areas, if existing. Almost all newly-developing areas already built up in the world have not yet been completely fostered or matured to their final picture as planned. Thus, there is currently leeway in transportation capacity even in all such newly-developing areas, as is seen in [Figure A.2](#)).



**Figure A.1 — Transportation modes selected for newly-developing areas when planned. BRT is still one of the options as main transportation service within newly-developing areas but does not appear in this Figure.**



**Figure A.2 — Current population and population density of existing newly-developing areas as of 2017 that have transportation, the mode of which was chosen based on the population and population density that were planned.**

## Bibliography

- [1] ISO 37154, *Smart community infrastructures — Best practice guidelines for transportation*
- [2] ISO 37157, *Smart community infrastructures — Smart transportation for compact cities*
- [3] NFPA 130, *Standard for Fixed Guideway Transit and Passenger Rail Systems*
- [4] EN 45545-1, *Fire Protection of railway Vehicles — Part 1: General*
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