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Smart community infrastructures — Smart transportation for new towns

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Foreword

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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 place business. This is because convenient locations are normally limited in existing cities and people are localized therein. Thus, there are still more demand for the development of new towns in virgin or desolate areas. The same thing has happened also in developing countries due to the shortage of places used for comfortable city life and effective business expansion.

A new town is a sort of district newly-planned and built for residential purposes or business activities in areas that have never been touched. They are located within a distance commutable to the current main city center. Once a typical new town has been developed as a small or medium-sized city near a metropolis, which would be fondly called a satellite city.

To develop a new town, transportation services are indispensable for easy communication from-place-to place within a new town and between it and conventional cities nearby.

Transportation for a new town is to be implemented concurrently with the development of the new town. It works as the main means to convey passengers. Transportation has a key role in the sustainability of a new town as it directly affects citizens' lives and business activities.

In most cases, the size of a new town is not huge but the population could be large. Thus, high transportation capacity per service is not necessary but relatively high frequent services. To develop a new town successfully, transportation services are to be organized to satisfy requirements given when planning a new town; for example, the expected passenger numbers and passenger flow.

Transportation for a new town should also meet two other requirements; one is given by the geographical features of a target site and the other by the characteristics of the town planning thereof. For the former, if the area has steep, hilly terrain and a route plan is not allowed under financial, environmental or geographical conditions to drill mountains for tunnels, it is expected that the transportation system be laid on steep slopes. For the latter, if route planning is forced to overcome restrictions from social demands, flexible track arrangements are required, which may include a combinations of ground tracks, under-over passes, viaducts and small curves along public road formation. A variety of combination of respective track sections in different types will satisfy town planning having a variety of kinds of requests to be responded under the local policy-oriented conditions.

This document describes a way to organize smart transportation for the development and retention of new towns.

Smart community infrastructures — Smart transportation for new towns

1 Scope

This document specifies a procedure to organize smart transportation for new towns. This smart transportation is to be applied to an area where the development is planned, or routes between the area concerned and currently existing city centers. This document designates the conditions to organize smart transportation for new towns 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 New town

town developed in a virgin or desolate area to introduce citizens for residential purposes and/or business activities

3.2 Transportation for new towns

services provided for travel within a new town and between it and the surrounding areas including existing city centers

4 Concept of smart transportation for new towns

4.1 General

A new town is to be developed in virgin or desolate areas but still in location commutable to an existing city center. New towns have facilities required for city life, including residential purposes, business activities, academic services and community organization.

Smart transportation for new towns is to be arranged and also implemented from a viewpoint of environmental issues. It should be provided with flexibilities to cope with various needs at the planning phase.

Smart transportation is expected as a function of main transportation measures for the residents and workers therein. Basically, transportation systems affect the sustainability of new towns. Then, installation of smart transportation is to be achieved in order to make the services suitable to the development plan, which meets local geographical conditions and specific requirements from town planners.

4.2 Applicable towns

When a new town is planned with introduction of public transportation as a main mode for passenger services in a new town and between it and surrounding areas, including existing city centers, this smart transportation should be applied.

4.3 Transportation modes for new towns

Transportation services to be used for new towns have two purposes or goals to transport citizens within a new town and between it and existing city centers.

4.3.1 Transportation modes applicable within new towns

For internal services in a new town, a transportation mode should be selected so as not to cause traffic issues after application. Internal services consist of basic networks by bus and main transportation services by BRT, LRT, AGT and/or MRT as shown in Figure A.1 in Annex A.

To select suitable main transportation modes to be used besides bus networks, consider the following criteria and/or features of respective transportation modes by checking town planning. Basically, however, main transportation modes are normally selected as illustrated in Figure A.1, which depend on the population and population density planned for the new town.

4.3.1.1 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.

4.3.1.2 LRT

- Applicable to implement tracks on the 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 systems 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.

4.3.1.3 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.

4.3.1.4 MRT

- High transportation capacity;

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

4.3.2 Transportation modes applied between a new town and outside areas

Transportation modes to be applied to connect a new town and outside areas, including existing city centers, depend on the location and population of the new town and city axes of the area, including the new town.

5 Adoption of smart transportation to develop new towns

5.1 Objectives

As mentioned in 4.1, transportation systems play a key role in the sustainability of new towns. They are required to meet geographical situations of the area for a new town and requests of the town planning. Transportation modes to be applied to new towns should be selected to meet the conditions described in 5.3.

5.2 Target area

A new town should be located so as to be commutable to the existing city center. It would commonly be developed in an area having unfavorable conditions for the installation of transportation systems, such as hilly land and narrow ground, since easily developed areas have already been used.

5.3 Selection of transportation modes

5.3.1 General

Transportation modes should be selected which meet the conditions designated from 5.3.2 to 5.3.20, while basic networks are provided with bus. Transportation modes to connect a new town and outside areas should also be selected by considering the conditions from 5.3.2 to 5.3.20. However, connecting transportation will be included in the city axil transportation system where the new town is located. Thus, other factors could affect the selection of the transportation mode.

5.3.2 Transportation capacity

Transportation modes should be selected by confirming the transportation capacity required for the targeted new town and comparing the capacity that is shown in Figure B.1 in ISO 37154 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 new town. For connecting transportation, distance depends on transportation mode selected by considering the city axil 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 a target area independently of geographical conditions.

NOTE The geographical conditions in a target area would call for hill-climbing performance of the vehicle to be used for smart transportation.

5.3.6 Running performance

Vehicles should have high acceleration to ensure time-saving for travel within a new town and between it and existing city centers.

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 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 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. Vehicles may also include space devoted to bicycles or other large items. Vehicles should be air-conditioned. Vehicles should be installed with security provisions.

5.3.10 Town value and attractiveness

Transportation modes should be selected which enhance the value and attractiveness of a new town.

NOTE This means that the value of the land as property is absolutely one of the key issues to successfully develop and retain a new town for a long time. Otherwise, few citizens will buy the land or stay in a new town 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 the safe ground at emergency. There should be easy communication channels in case of emergency between the vehicle and dispatchers.

NOTE NFPA 130: 2017, “Standard for Fixed Guideway Transit and Passenger Rail Systems” [3], and EN 45545 series, “Fire Test to railway components” [4] to [10], 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 activate city life and business resulting in attracting more passengers to the transportation services leading to financially-stable transportation management.

5.3.15 Flexibility in track planning

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 to install 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

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

6 Sustainability in quality of smart transportation for new towns

6.1 General

To keep the performance of smart transportation for new towns in conditions planned and confirm the effectiveness thereof, periodically observe the parameters listed 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 Modification of smart transportation

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 if the irregular conditions are acceptable. In case modification is not successful, changes and abundance of the mode currently used for smart transportation is one of the options to provide transportation services for the new town.

NOTE Figure A.2 in Annex A shows the current situation taking place in new towns that are already developed. Almost all of the new towns 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 population and population density planned when planning the new towns while the latter shows current population and population density of the same new towns, which have not yet been fostered or matured to the final pictures as planned. It would normally take 30 years at least for new towns to reach the planned conditions.

Annex A
(informative)

Transportation modes used in existing new towns

Transportation modes used in new towns already developed have been selected by considering two parameters or a new town population and population density that were planned. Basically, bus is used as a basic transportation network inside a new town. Besides the bus network, if a new town has population planned smaller than 500,000 persons, LRT or AGT can be chosen referring to the requirements in 5.3. When the population planned is larger than 100,000 persons, MRT can be selected. There are no new towns having planned population density less than 1,000 persons/km^2. Such a site would be out of the concept of new towns, if existing. Almost all new towns already developed 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 new towns.

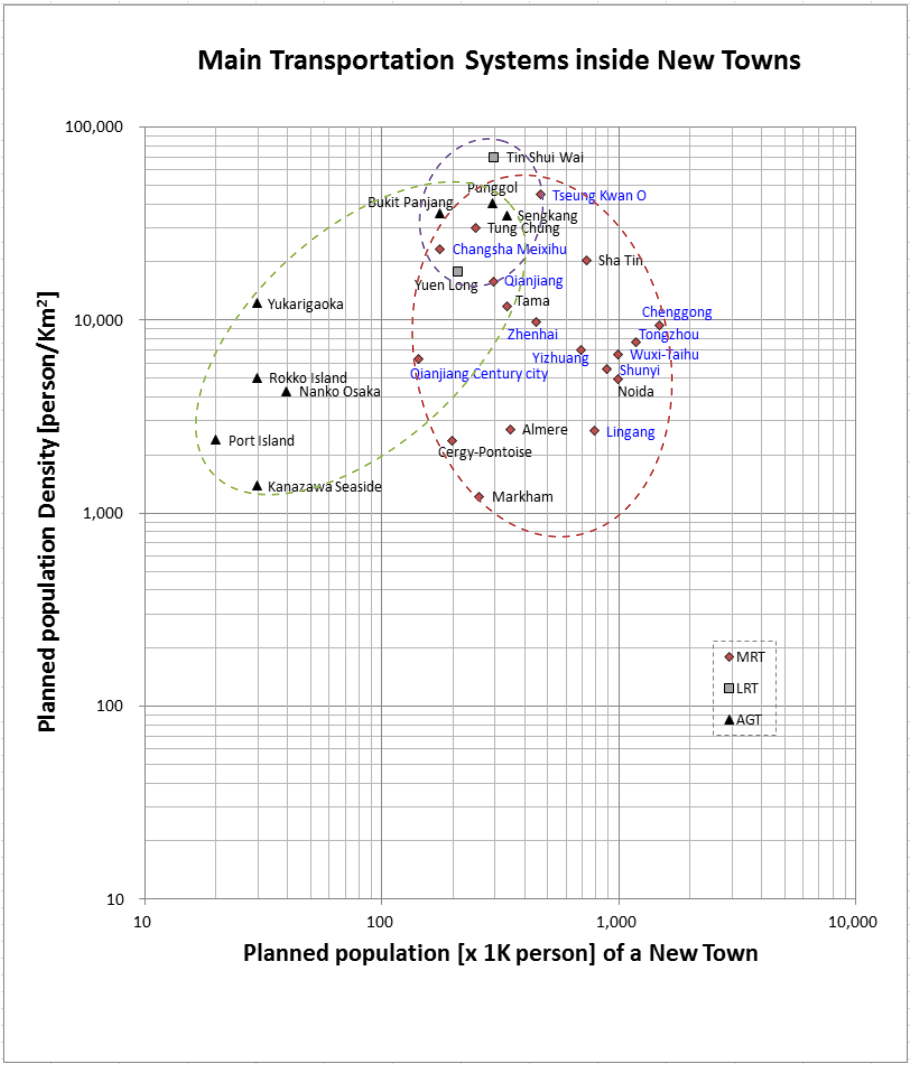

Figure A.1 — Transportation modes selected for new towns when planned. BRT is still one of the options as main transportation service within new towns but does not appear in this Figure.

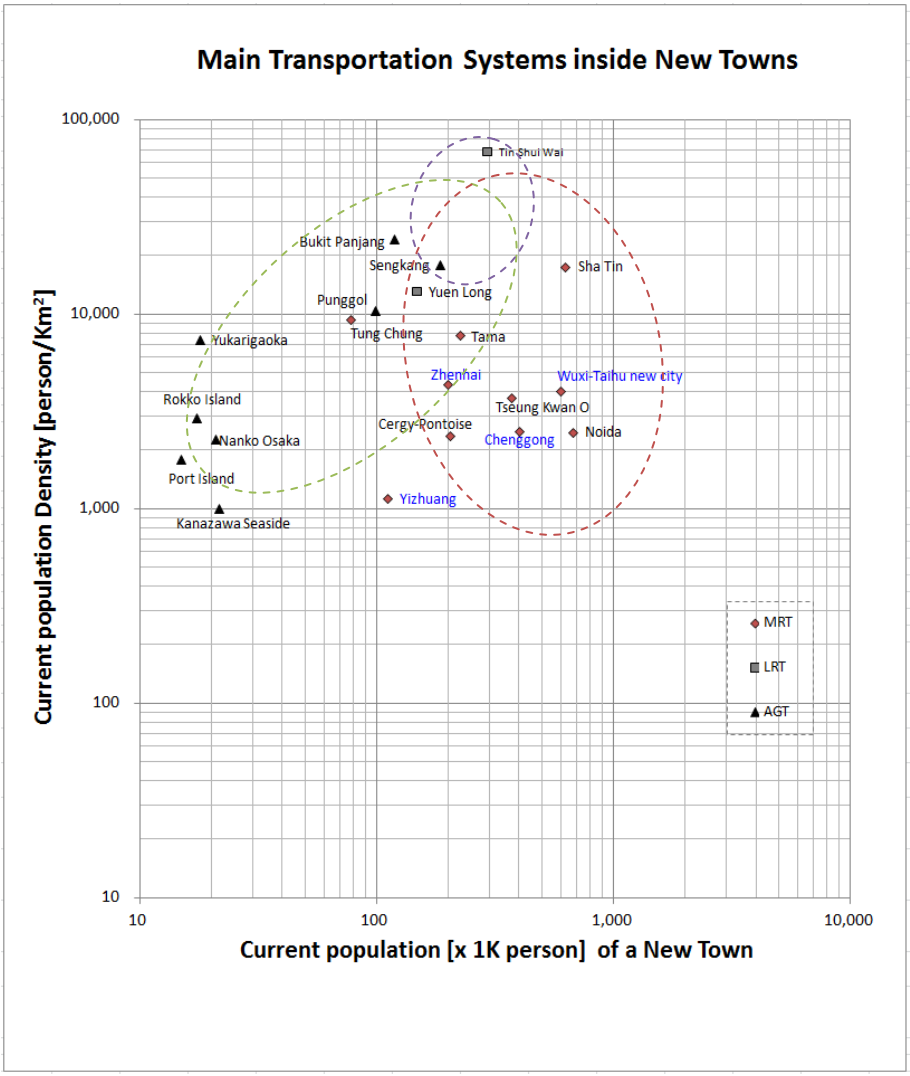

Figure A.2 — Current population and population density of existing new towns as of 2017 that have transportation, the mode of which was chosen based on the population and population density that were planned.

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*

[5] EN 45545-2, *Requirement for fire behaviour of materials and components*

[6] EN 45545-3, *Fire resistance requirements for fire barriers and partitions*

[7] EN 45545-4, *Fire safety requirements for railway rolling stock design*

[8] EN 45545-5, *Fire safety requirements for electrical equipment*

[9] EN 45545-6, *Fire control and management system*

[10] EN 45545-7, *Flammable liquid and flammable gas installations*