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Sustainable urban development

The Key Performance Indicators on Smart Sustainable Cities to address the achievement of the Sustainable Development Goals

Note by the secretariat

Summary

In 2013, the UNECE Committee on Housing and Land Management (CHLM) decided to include the topic of "smart cities" as one of its priority activities in the Committee's programme of work 2014–2015 (ECE/HBP/173). A project on "United Smart Cities" was launched in May 2014.

In 2014, the Committee, at its seventy-fifth session (ECE/HBP/179), requested the secretariat to prepare a set of smart cities indicators. In 2015, the UNECE/ITU Smart Sustainable City (SSC) Indicators were developed, and were presented at the Committee' seventy-sixth session. The Committee endorsed the Indicators (ECE/HBP/184 Annex I) and recommended amending them taking into account the Sustainable Development Goals (SDG) indicators. The Committee further recommended elaborating SSC Standards and developing SSC profiles.

The Committee secretariat, in cooperation with its partners, including the International Telecommunication Union (ITU), the Environment Agency Austria and others, amended the Indicators, which have been renamed Key Performance Indicators on SSCs to address the achievement of the Sustainable Development Goals (KPIs), and continued working on the development of the standard.

The Committee is invited to endorse the updated KPIs and take note of the progress of the development of the standard.

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I. Introduction

1. The topic of smart cities is considered very important among the member States of the ECE region. In the "Challenges and priorities in housing and land management in the ECE region" survey (ECE/HBP/2013/2), respondents from member States ranked the "smart cities initiative, which addresses information, communication and technology in urban planning", second among the activities in the "sustainable urban development" area.[1]

2. This document provides an update of the definition of SSCs, describes the objectives and benefits of using smart cities indicators and standards, gives the history of the development of the SSC indicators, and provides a description of the indicators.

3. Annex I presents the visual structure of the KPIs, and Annex II provides a list of them.

II. The UNECE-ITU definition of SSCs

4. The SSC definition elaborated by the ITU Focus Group on Smart Sustainable Cities (FG-SSC) reads: "A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, and environmental aspects as well as cultural aspects". This definition was endorsed by the Committee at its seventy-sixth session (ECE/HBP/184 Annex I).[2] The UNECE and the ITU are disseminating this definition among their member States and partner organizations, as well as cities.

III. History of the preparation of the KPIs

5. The main objective of the "United Smart Cities" project[3], within which the KPIs on Smart Sustainable Cities to address the achievement of the SDGs have been elaborated, is to support cities, in particular in developing countries and in countries with economies in transition, to improve their sustainable growth while focusing on a more transparent and efficient use of their resources. Sustainable growth can be achieved through the higher performance of cities. Monitoring cities' performance by means of indicators is necessary to improving their performance.

6. In 2013, the CHLM decided to include the topic of SSCs as a priority activity in its programme of work 2014–2015 (ECE/HBP/2013/10)[4] under the "Sustainable urban development" cluster and, in May 2014, launched a project called "United Smart Cities"[5].

7. At its seventy-fifth session, the Committee requested the secretariat (ECE/HBP/179)[6] to prepare a set of Smart City Indicators for its consideration and endorsement at its seventy-sixth session.

[1] More information can be found at www.unece.org/fileadmin/DAM/hlm/documents/2013/ece.hbp.2013.02.e.pdf, p.15.
[2] http://www.unece.org/fileadmin/DAM/hlm/documents/2015/ECE_HBP_184.en.pdf
[3] More information on the project is available at www.unece.org/housing/smartcities.html
[4] Information is available at www.unece.org/fileadmin/DAM/hlm/documents/2013/ECE_HBP_2013_10.pdf, p.5.
[5] More information is available at www.unece.org/housing/smartcities.html

8. Cooperation on smart cities was established with the ITU through Study Groups 5 and 20 of its Telecommunication Standardization Sector (ITU-T). The Study Groups are groups of technical experts on specific topics from around the world who work together to develop international standards known as ITU-T Recommendations. The ITU-Ts are ITU bodies which develop ITU indicators and standards. The UNECE/ITU SSC Indicators were developed in cooperation with ITU-T Study Group 5 on Environment and Climate Change.

9. The Committee endorsed the UNECE/ITU SSC Indicators (ECE/HBP/184 Annex I) at its seventy-sixth session in December 2015, and recommended developing SSC Standards and further activities on the preparation of SSC profiles, with a possible amendment of the Indicators once the SDG indicators were approved.

10. In January 2016, the Committee secretariat, in cooperation with the ITU secretariat and the ITU-T Study Group 5, and in consultation with relevant stakeholders, updated the Indicators, aligned them with the SDGs, and started to work on the draft standard named Recommendation on KPIs on Smart Sustainable Cities to address the achievement of the SDGs (Recommendation). The number of the indicators increased to 91, compared to 72 UNECE/ITU Indicators. The topic "Public sector" has been added to the "Economy" pillar of the KPIs. Furthermore, a new column has been added with the number of the SDG target of reference for each indicator, where available, and the description (namely either the name, or the measure or the description itself) of some indicators has changed. A list of the updated indicators is available in Annex II to this document.

11. The Recommendation will go through a thorough procedure of expert and stakeholder consultation and review before being endorsed.

12. Several in-person and electronic consultations with stakeholders, which were also attended by the UNECE secretariat, were organized by the ITU and Study Group 5, and the Recommendation was approved "with revisions" by the Study Group 5 on 20-27 April 2016, in Kuala Lumpur, Malaysia.

13. At the UNECE, the Committee's Real Estate Market Advisory Group (REM) joined the work on the development of the indicators and standards. The Committee, the REM and the ITU jointly organized a forum "Shaping Smarter and More Sustainable Cities: Striving for Sustainable Development Goals" in Rome on 18-19 May 2016.[7]

14. At the forum, the UNECE and the ITU launched the global UN initiative "United for Smart Sustainable Cities" (U4SSC). Participation is open to all UN system organizations and other external stakeholders. It will build on several activities clustered into three main pillars: connecting cities; setting the framework; and enhancing smart governance. The basic structure of the initiative and the text of the brochure are presented in Informal Note 5. As a part of this initiative, an Advisory Board, composed of representatives of UN agencies and experts sent by them, was established. The Board will support the further development of the Recommendation.

15. The draft standard will be amended and further developed until October 2016. At the ITU, the ITU-T Study Group 20 on the Internet of Things and Smart Cities, which was mandated in April to deal with this standard, will be invited to approve it.

16. At the UNECE, the Committee and its REM will be invited to discuss the draft standard. It is expected to be endorsed by the Committee at its seventy-eight session.

[6] Information is available at www.unece.org/fileadmin/DAM/hlm/documents/2014/ece.hbp.179.en.pdf
[7] http://www.unece.org/housing/rome-smartcities.html#/

IV. The KPIs on SSCs to address the achievement of the SDGs

(a) Objectives of the development and benefits of the indicators

17. The objectives of using the indicators or KPIs are the following. First, they represent a tool to evaluate the performance of a city so that concrete measures can be recommended and then implemented by the city. Second, they can be used as a tool to monitor cities' progress towards sustainable urban development in the global framework of the SDGs.

18. These KPIs are also expected to be used by the ECE for its "United Smart Cities" project, to draft cities' profiles and support cities in improving their sustainable development.

19. The benefits of using indicators are several. First of all, they can help assess the strengths and weaknesses of a city. By analysing the performance of a city against the indicators, it is easier to recognize which areas are most critical or in which areas the city is performing well. Second, they can be used to set priorities. Once the strengths and weaknesses of a city are identified, the indicators can help to prioritize, i.e. to choose the most critical issues for the sustainable growth of the city, and to define measures to address them. Lastly, they can also be a good monitoring tool to evaluate the changes in the city's performance over a certain period of time and after several actions have been implemented.

(b) Description of the KPIs

20. A list of the KPIs, a total of 91 indicators, is provided in Annex II. The current set of indicators has been structured according to:

- Area
- Topic, and
- Typology.

21. The area represents the more generic dimensions which provide a framework for the set of indicators. It corresponds to the three pillars of sustainability: economy; environment; and society and culture. Culture has been added to the society pillar, in line with the UNECE/ITU SSC definition and the principles of the Geneva UN Charter on Sustainable Housing.

22. The topic indicates a group of specific indicators which describe an area of potential development. Nineteen (19) major topics were identified and each indicator was assigned to one specific topic. Some topics include specific sub-topics, which can be considered as keywords that more thoroughly define the nature of the indicators. The topics are:

23. Economy, including the following topics:

- ICT infrastructure
- Innovation
- Employment
- Trade (sub-topics: e-commerce and export/import)
- Productivity
- Physical infrastructure (sub-topics: piped water, health, electricity, transport, and buildings)
- Public sector

24. Environment, including the following topics:

- Air quality
- Water
- Noise
- Environmental quality
- Biodiversity
- Energy

25. Society, including the following topics:

- Education
- Health
- Safety (sub-topics: disaster relief, emergency, and ICT)
- Housing
- Culture
- Social inclusion

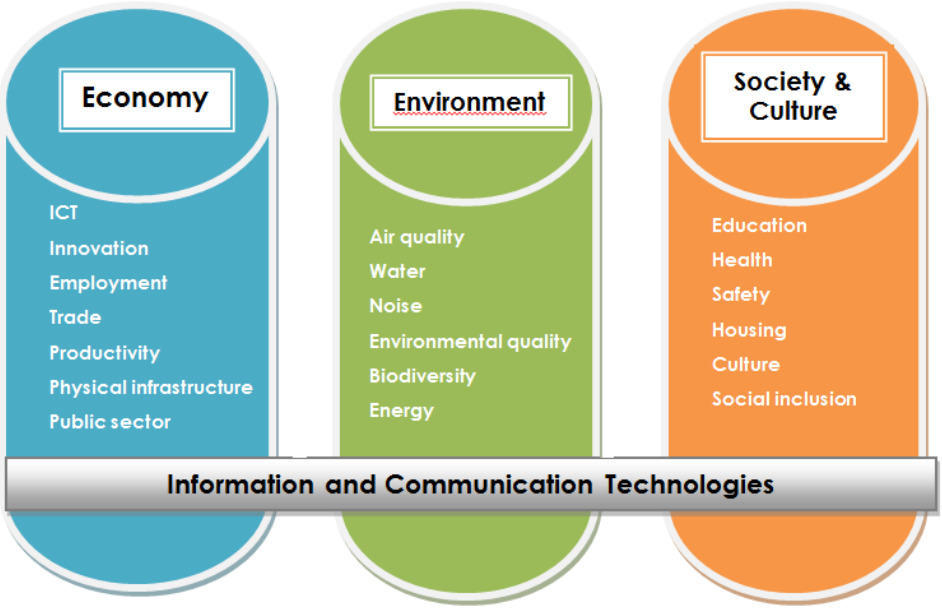
26. The typology indicates the "applicability" of the indicator itself. In total, two indicator types, core and additional, are defined and explained below.

27. The core indicators can be used by all cities globally. They represent the main body of the international standard.

28. The additional indicators may be used by some cities according to their economic capacity, population growth, geographic situation, etc. Also, some additional indicators are very "smart" and can be addressed by "smarter" cities. These indicators are optional, especially for self-benchmarking, and will be put in the appendix of the international standard which is not normative.

29. Using the area, the topic, and the typology, the indicators are assigned a unit which indicates how they are measured; a definition which gives information about what they describe; a number; and the respective SDG target they are most aligned with.

Annex I: KPIs on SSCs to address the achievement of the SDGs - visual representation



Annex II: KPIs on SSCs to address the achievement of the SDGs

Area	*Topic*	*No.*	*Indicator*	*Typology*	*Mapping to SDGs goals and targets*
Economy	*T1.1 ICT infrastructure*	*C1.1.1*	*Internet access in households*	*core*	*9.c* *17.8*
		C1.1.2	*Households with a computer*	*core*	*9.c*
		A1.1.1	*Wireless broadband subscriptions*	*additional*	*9.c* *5.b*
		A1.1.2	*Fixed broadband subscriptions*	*additional*	*9.c*
		A1.1.3	*Households with a mobile device*	*additional*	*9.c*
	T1.2 Innovation	*C1.2.1*	*R&D expenditure*	*core*	*9.5*
		C1.2.2	*Patents*	*core*	*9.b*
		A1.2.1	*SMEs*	*additional*	*9.3* *8.3*
	T1.3 Employment	*C1.3.1*	*Employment rate*	*core*	*8.5*
		A1.3.1	*Creative industry employment*	*additional*	
		A1.3.2	*Tourism industry employment*	*additional*	*8.9*
	T1.4 Trade – e-commerce	*A1.4.1*	*e-commerce purchase ratio*	*additional*	
		A1.4.2	*Electronic and mobile payment*	*additional*	
	T1.4 Trade – Export/import	*A1.4.3*	*Knowledge-intensive export/import*	*additional*	
	T1.5 Productivity	*C1.5.1*	*Labour productivity*	*core*	*8.2* *2.3*

Area	*Topic*	*No.*	*Indicator*	*Typology*	*Mapping to SDGs goals and targets*
		A1.5.1	*Companies providing online services*	*additional*	
	T1.6 Physical infrastructure – Water supply	*C1.6.1*	*Availability of smart water meters*	*core*	*9.1*
		A1.6.1	*Water supply loss*	*additional*	*9.1* *9.4*
		A1.6.2	*Water supply ICT monitoring*	*additional*	
	T1.6 Physical infrastructure – Electricity	*C1.6.2*	*Availability of smart electricity meters*	*core*	*9.1*
		C 1.6.3	*Electricity system outage frequency*	*core*	*7.b*
		C 1.6.4	*Electricity system outage time*	*core*	*7.b*
		A 1.6.3	*Electricity supply management using ICT*	*additional*	
	T1.6 Physical infrastructure – Health infrastructure	*A1.6.4*	*Sporting facilities*	*additional*	
	T1.6 Physical infrastructure – Transport	*C1.6.5*	*Public transport network*	*core*	*11.2*
		C1.6.6	*Road traffic efficiency*	*core*	*11.2*
		C1.6.7	*Real-time public transport information*	*core*	*11.2*
		A1.6.5	*Share of EVs*	*additional*	
		A1.6.6	*Traffic monitoring*	*additional*	*9.1*

Area	*Topic*	*No.*	*Indicator*	*Typology*	*Mapping to SDGs goals and targets*
		A 1.6.7	*Pedestrian infrastructure*	*additional*	
	T1.6 Physical infrastructure – Building	*A1.6.8*	*Public building sustainability*	*additional*	*11.c*
	T1.6 Physical infrastructure – Urban planning and public spaces	*A1.6.9*	*Urban development and spatial planning*	*additional*	*11.3* *11.a*
	T1.7 Public sector	*A1.7.1*	*Open data*	*additional*	
		A1.7.2	*e- public services adoption*	*additional*	
Environment	*T2.1 Air quality*	*C2.1.1*	*Air pollution*	*core*	*11.6* *12.4*
		A2.1.1	*Air pollution monitoring system*	*additional*	*11.6* *12.4*
		C2.1.2	*GHG emissions*	*core*	*7.a* *11.6*
	T2.2 Water and sanitation	*C2.2.1*	*Quality of drinking water*	*core*	*6.3* *6.4*
		A2.2.1	*Water saving in households*	*additional*	*6.4*
		C2.2.2	*Access to improved water source*	*core*	*6.1* *1.4*
		C2.2.3	*Water consumption*	*core*	*6.1* *1.4*
		A2.2.2	*Drainage system management*	*additional*	*6.5* *6.4*
		A2.2.3	*ICT drainage system monitoring*	*additional*	
		C2.2.4	*Wastewater treated*	*core*	*6.3* *12.4*
		C2.2.5	*Wastewater collection*	*core*	*6.3* *1.4*
		C2.2.6	*Household*	*core*	*6.2*

Area	*Topic*	*No.*	*Indicator*	*Typology*	*Mapping to SDGs goals and targets*
			sanitation		*1.4*
	T2.3 Noise	*C2.3.1*	*Exposure to noise*	*core*	
		A2.3.1	*ICT noise monitoring*		
	T2.4 Environmental quality	*C2.4.1*	*Compliance with WHO-endorsed exposure guidelines*	*core*	
		C2.4.2	*Adoption of a consistent planning approval process with respect to EMF*	*core*	
		C2.4.3	*Availability of EMF information*	*core*	
		C2.4.4	*Solid waste collection*	*core*	*11.6* *12.4* *1.4*
		C2.4.5	*Solid waste treatment*	*core*	*11.6* *12.4* *1.4*
		C2.4.6	*Green areas and public spaces*	*core*	*11.7*
		A2.4.1	*Recycling of solid waste*	*additional*	*12.4* *1.4*
	T2.5 Biodiversity	*C2.5.1*	*Native species monitoring*	*core*	*2.5* *15.5*
		A2.5.1	*Protected natural area*	*additional*	*11.4*
	T2.6 Energy	*C2.6.1*	*Access to electricity*	*core*	*7.1* *1.4*
		C2.6.2	*Renewable energy consumption*	*core*	*7.2*
		C2.6.3	*Electricity consumption*	*core*	

Area	*Topic*	*No.*	*Indicator*	*Typology*	*Mapping to SDGs goals and targets*
		A2.6.1	*Energy saving in households*	*additional*	*7.3*
		A2.6.2.	*Public buildings energy consumption*	*additional*	
Society and Culture	*T3.1 Education*	*C3.1.1*	*Students ICT access*	*core*	*4.4*
		C3.1.2	*Adult literacy*	*core*	*4.6*
		C3.1.3	*School enrolment*	*core*	*4.1*
		C3.1.4	*Higher education ratio*	*core*	*4.3*
		A3.1.1	*e learning systems*	*additional*	*4.3*
	T3.2 Health	*C3.2.1*	*Electronic health records*	*core*	*3.8*
		C3.2.2	*Sharing of medical resources*	*core*	*3.8*
		C3.2.3	*Life expectancy*	*core*	
		C3.2.4	*Maternal mortality*	*core*	*3.1*
		C3.2.5	*Doctors*	*core*	*3.c*
		A3.2.1	*Adoption of telemedicine*	*additional*	*3.8*
		A3.2.2	*In-patient hospital beds*	*additional*	
		A3.2.3	*Health insurance*	*additional*	*3.8*
	T3.3 Safety - Disaster relief	*C3.3.1*	*Resilience plans*	*core*	*11.b* *13.1* *13.2* *13.3*
		A3.3.1	*Natural disaster-related deaths*	*additional*	*1.5* *11.5* *13.1*

Area	*Topic*	*No.*	*Indicator*	*Typology*	*Mapping to SDGs goals and targets*
		A3.3.2	*Disaster-related economic losses*	*additional*	*11.5*
		A3.3.3	*Disaster and emergency alert*	*additional*	*13.3* *13.1* *11.b*
	T3.3 Safety – Emergency	*C3.3.2*	*Emergency service response times*	*core*	
	T3.3 Safety – ICT	*A3.3.4*	*Child Online Protection (COP)*	*additional*	*1.3*
		C3.3.3	*Information security and privacy protection*	*core*	
	T3.4 Housing	*C3.4.1*	*Housing expenditure*	*core*	*11.1*
		C3.4.2	*Informal settlements*	*core*	*11.1*

T3.5 Culture	*C3.5.1*	*Connected libraries*	*core*	*9.c* *4.4*
	C3.5.2	*Cultural infrastructure*	*core*	*8.9* *11.4*
	C3.5.3	*Cultural resources online*	*core*	*11.4*
	A3.5.1	*Protected cultural heritage sites*	*additional*	*11.4*
T3.6 Social inclusion	*C3.6.1*	*Public participation*	*core*	*16.7*
	C3.6.2	*Gender income equity*	*core*	*8.5* *10.4* *5.1*
	C3.6.3	*Opportunities for people with special needs*	*core*	*11.2* *11.7* *1.3* *4.5* *4.a* *8.5* *10.2*
	A3.6.1	*Gini coefficient*	*core*	*10.4*