

# Standards for Smart and Sustainable Cities

Saturday, 6<sup>th</sup> October 2018



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**SmartStatistics4SmartCities**

# Defining a smart city

Smart city is an **ecosystem**

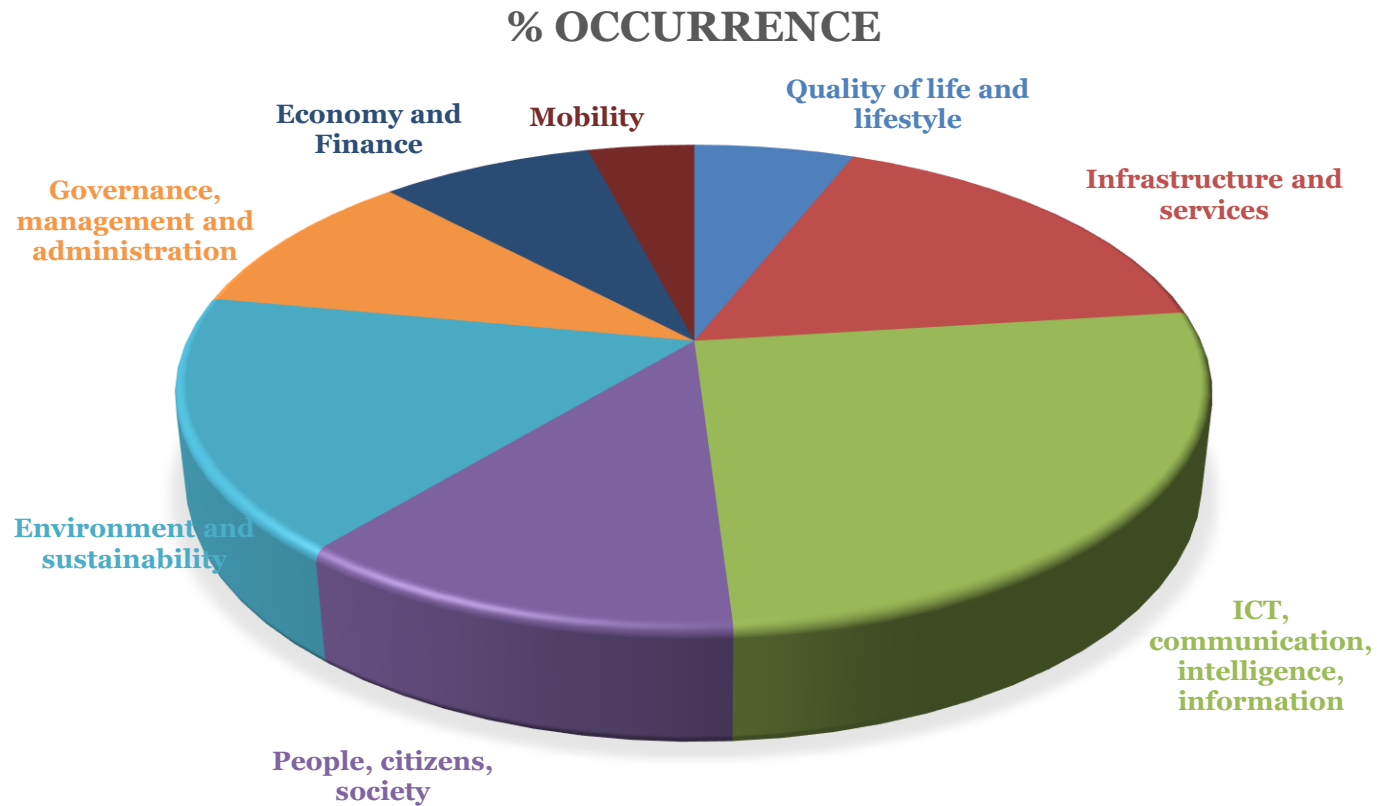
- Offers a **variety of services** to citizens
- Ensure **information exchange between subsystems**
- Enables **analysis of information, creation of statistics** for optimizing resource utilization

## Defining a **Sustainable** Smart City (SSC)

A Smart Sustainable City (SSC) 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.

*ITU-T Focus Group on Smart Sustainable Cities*

# Key themes of SSC

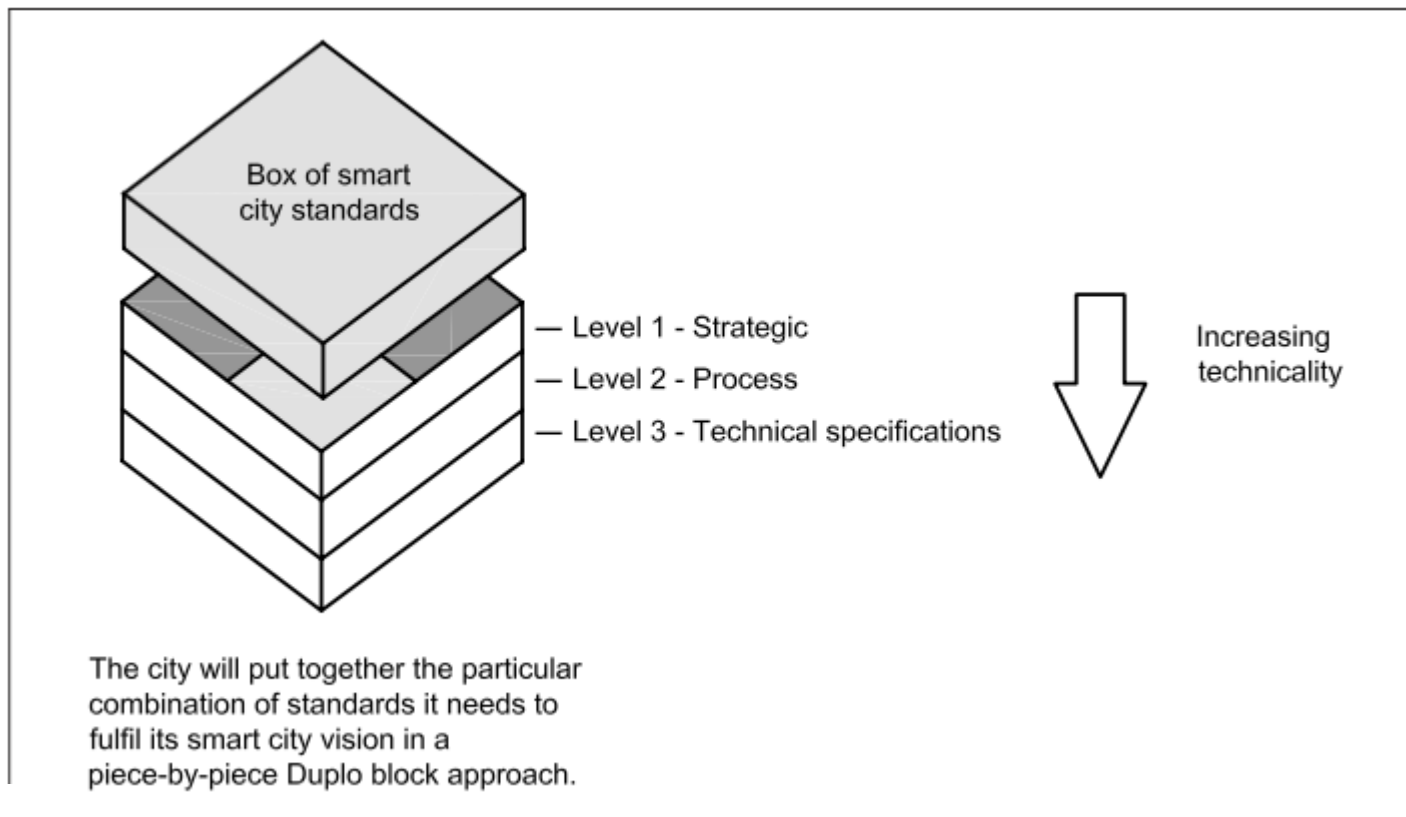


*ITU-T Focus Group on Smart Sustainable Cities*

## Key priorities identified with standards strategy

- How will City Authorities set their objectives for Sustainable Smart Cities and measure progress?
- How can cities create the shared understanding to deliver the vision?
- How will information be captured and shared between infrastructure and services?

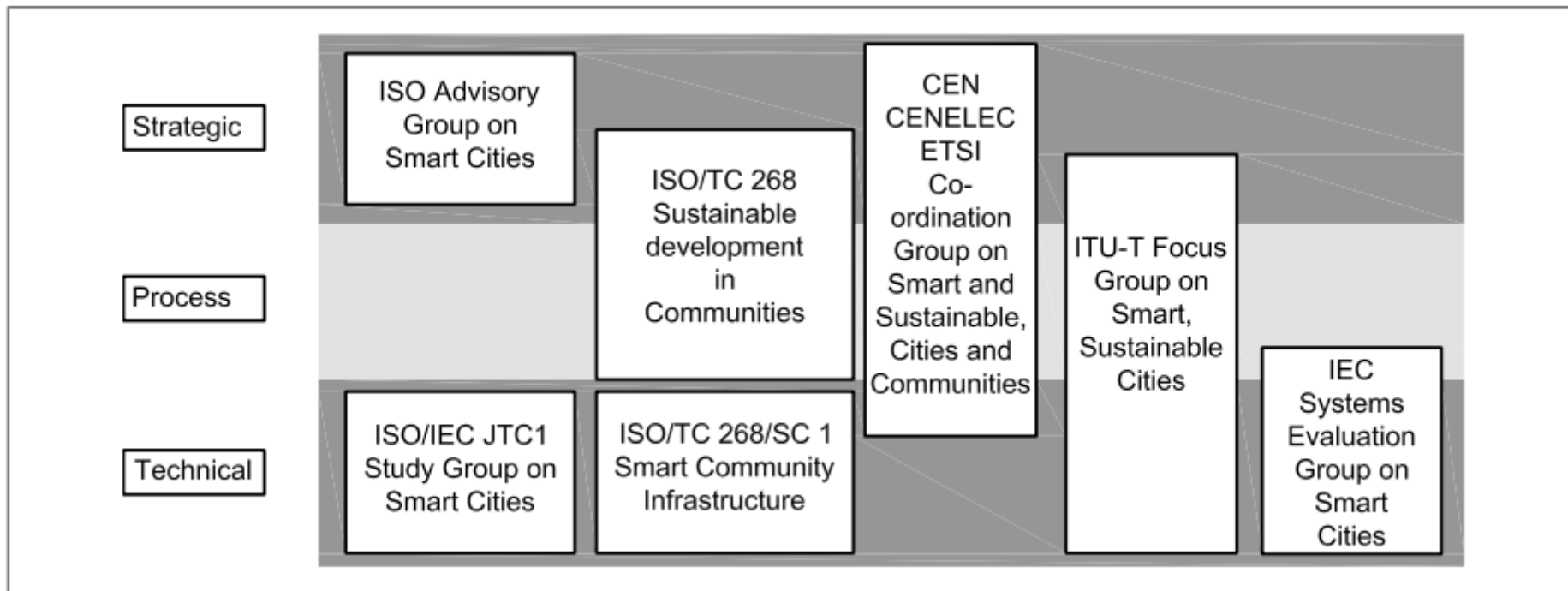
# Need of standards at various levels



# International standardrization organizations

- **European bodies**
  - CEN - European Committee for Standardization (CEN),
  - CENELEC - European Committee for Electrotechnical Standardization
  - ETSI - European Telecommunications Standards Institute
- **ISO: International Organization for Standards** . The main global body that national standards bodies work with and with which many of us are familiar with via “ISO certified”
- **ITU: ITU is the United Nations specialized agency for information and communication technologies – ICTs**
- **IEC: Founded in 1906, the IEC (International Electrotechnical Commission) is the world’s leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies. These are known collectively as “electrotechnology”.**

# Standardization activities at international level





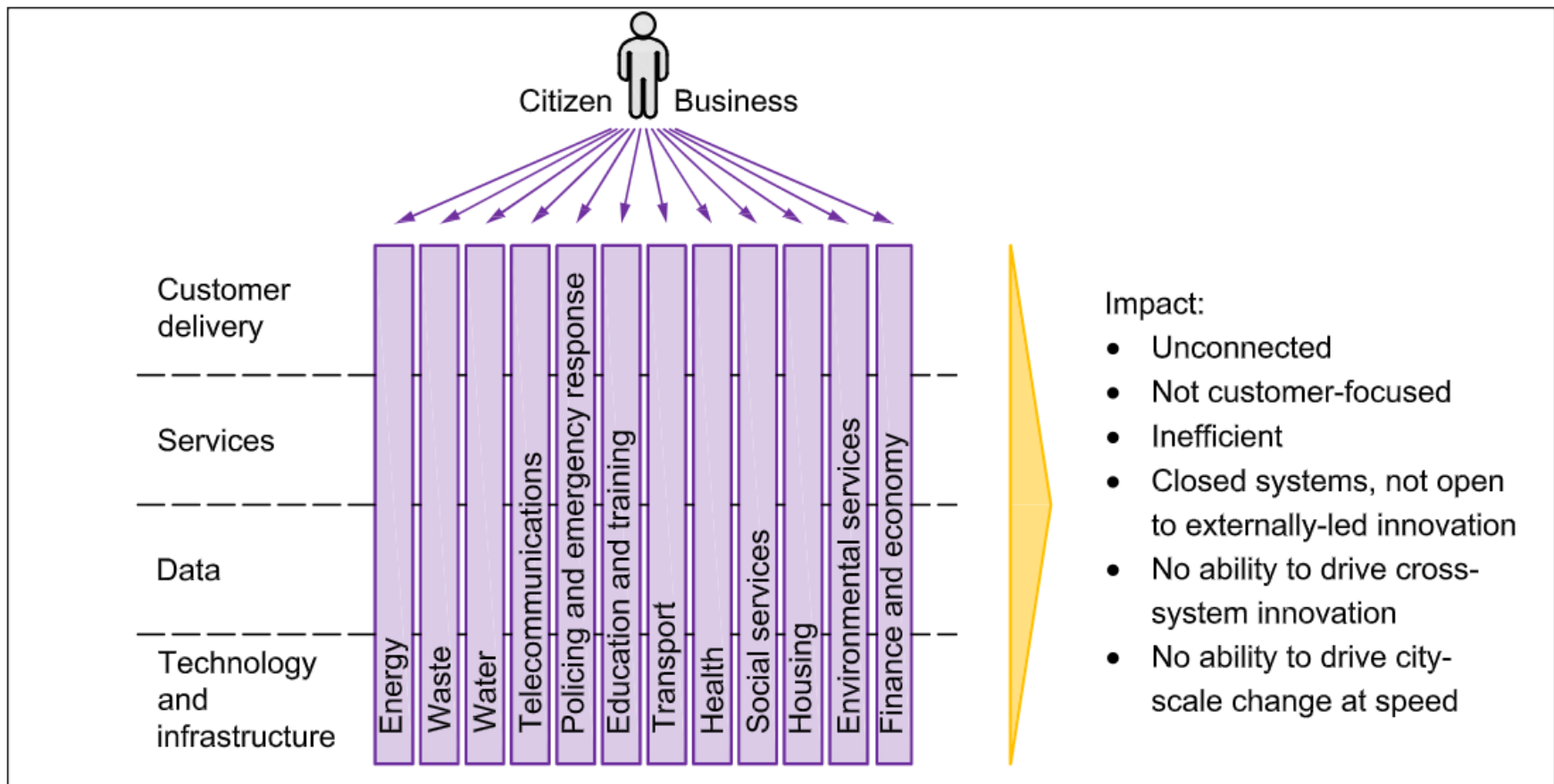
# Major standards **at strategic level**

- [ISO 37101](#): Sustainable development & resilience of communities – Management systems – General principles & requirements
- [ISO 37120](#) Sustainable development of communities – Indicators for city services and quality of life.
- [ISO 37102](#): Sustainable development & resilience of communities – Vocabulary.
- [ISO 37123](#): Indicators for resilient cities (under development)
- ELOT 1457 standard (Greek)
- [BS 8904](#) has a focus on sustainable communities and “provides a framework as recommendations and guidance that assist communities to improve.

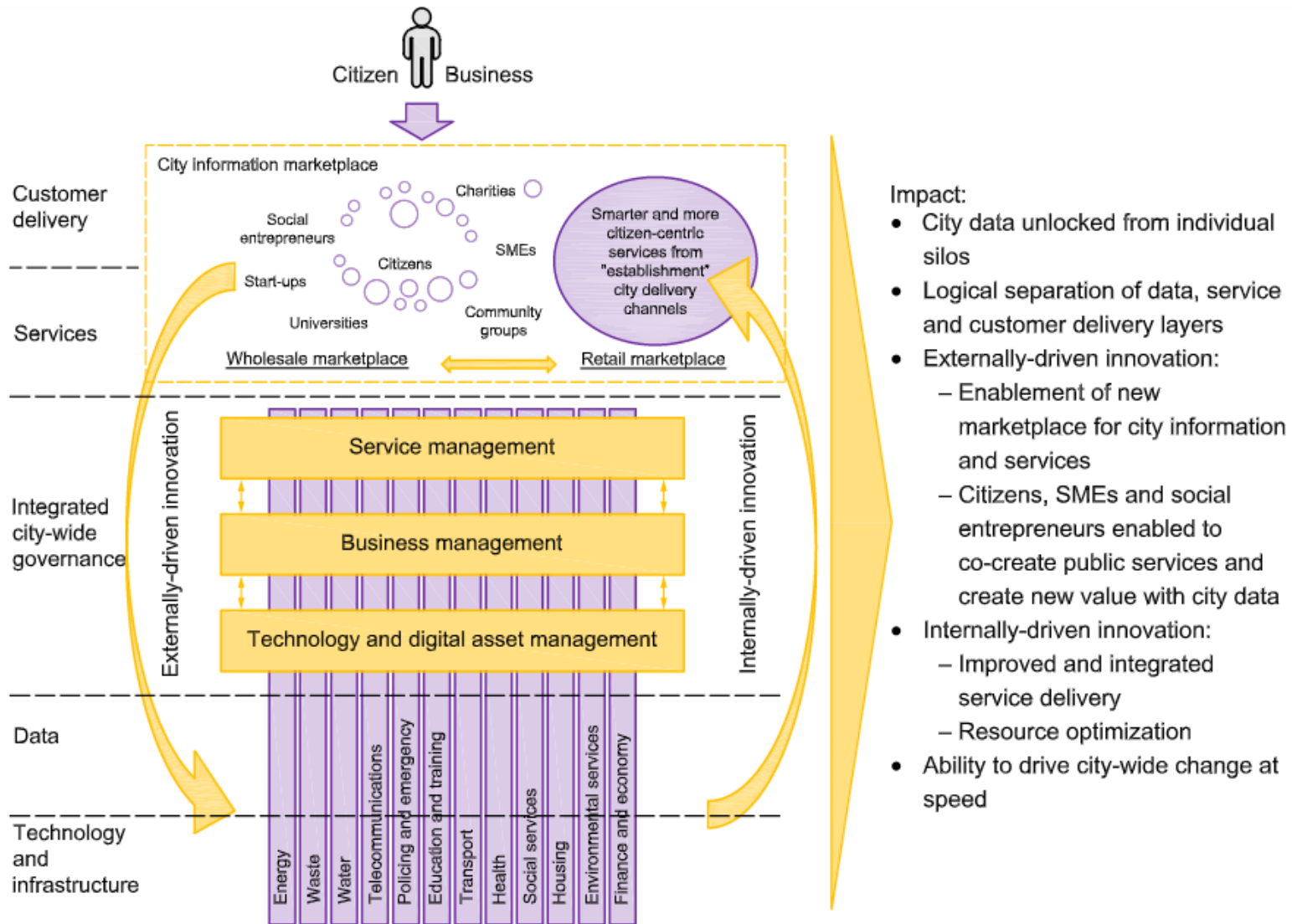
## Standards for process – Procuring and managing smart city projects

- Smart city framework standard (PAS 181). It provides practical, ‘how-to’ advice, reflecting current good practice as identified by a broad range of public, private and voluntary sector practitioners engaged in facilitating UK smart cities
- Data concept model for smart cities (PAS 182).

# PAS 181 – Transforming smart cities **from**



# PAS 181 – Transforming smart cities to ...



## Technical standards – Implementing Smart cities projects

- ISO/IEC AWI 30145 Information technology – Smart city ICT reference framework
- ISO/IEC AWI 30146 Information technology – Smart city ICT indicators
- IEEE P2413 (<http://standards.ieee.org/develop/project/2413.html>) is a developing standard for an architectural framework for the Internet of Things (IoT) and many more...

# Family of City Indicators Standards

SUSTAINABLE DEVELOPMENT OF COMMUNITIES  
[ISO 37101](#)

ISO 37120  
Indicators for City Services & Quality of Life

ISO 37122  
Indicators for  
Smart Cities

ISO 37123  
Indicators for  
Resilient Cities



# ISO 37101:2016

Sustainable development in communities —  
Management system for sustainable  
development



# ISO 37101:2016 objectives

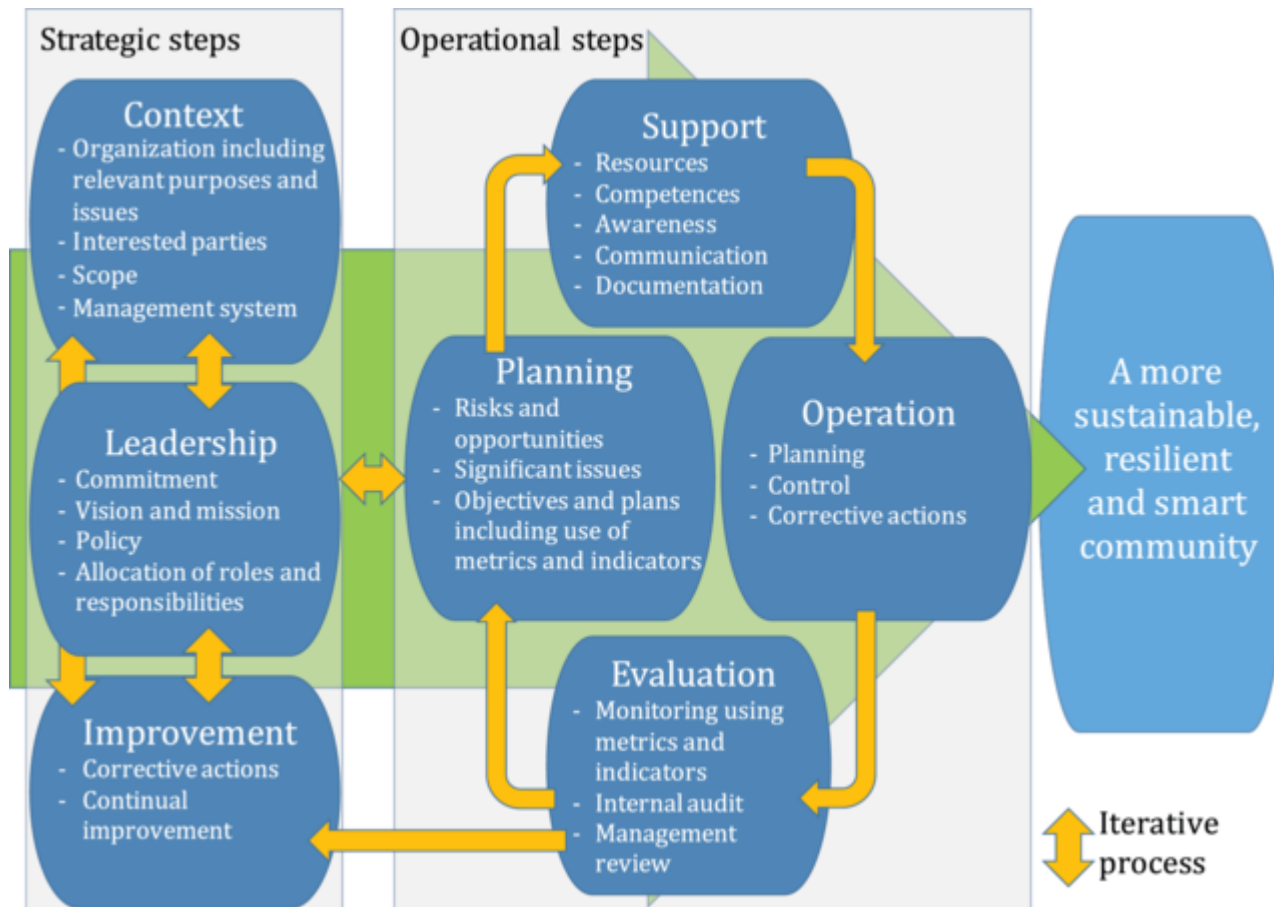
- Successful implementation of this International Standard can:
  - help to **build consensus on sustainable development** within communities;
  - improve **the sustainability, smartness and resilience** of strategies, programmes, projects, plans and services conducted under the direct responsibility of communities, or on the territory they relate to;
  - **evolve cross-sector, multidisciplinary, life cycle value** and total costing approaches;
  - **foster synergies** between several actors through a holistic approach;
  - **increase the efficiency and attractiveness** of communities.



# ISO 37101:2016 Model

- This International Standard is based on the Plan-Do-Check-Act (PDCA) model, which can be briefly described as follows:
  - **Plan**: establish objectives and processes necessary to deliver results in accordance with community purposes;
  - **Do**: implement processes and achieve objectives;
  - **Check**: monitor and measure processes against community policy, objectives and commitments, and report the results;
  - **Act**: take necessary actions to improve performance.

# Relationship between PDCA model and ISO 37101:2016

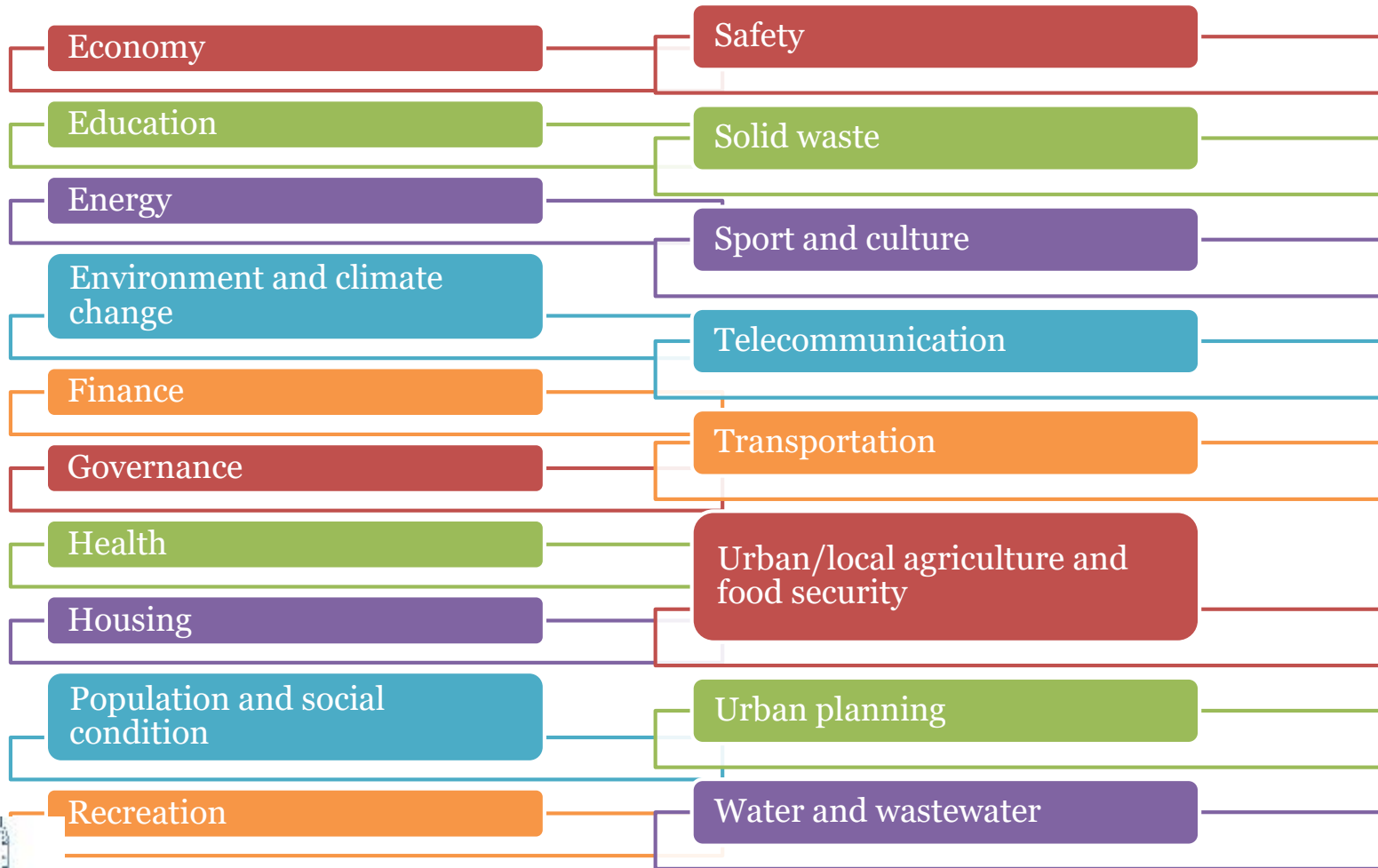




ISO 37120:2014 Sustainable development of communities

ISO 37120:2018 Sustainable cities and communities - Indicators for city services and quality of life

# ISO 37120:2018 Indicators across 19 themes



# ISO 37120:2018 Indicators structure

**Core indicators:** demonstrate performance in the delivery of city services and quality of life.

**Supporting indicators:** demonstrate performance in the delivery of city services and quality of life. Selected according to city objectives.

**Profile indicators:** indicators that are recommended to provide basic statistics and background information to help cities determine which cities are of interest for peer comparisons.

# ISO 37120:2018 Indicators' selection criteria

- The list of indicators is based on the following criteria:
  - Completeness: indicators have to measure all relevant aspects for evaluation of the smart city.
  - Technology neutral: not favouring one technology over another, existing or future.
  - Simplicity: indicators can be expressed and presented in an understandable and clear way.
  - Validity: indicators are an accurate reflection of the facts and data can be collected using scientific techniques.
  - Verifiable: indicators are verifiable and reproducible. Methodologies are rigorous enough to give certainty to the level of implementation of the criteria.
  - Availability: quality data is available or it is feasible to initiate a monitoring process that will make it available in the future.

# ISO 37120 Indicators/1

Theme	Core Indicator	Supporting Indicator
ECONOMY	<ul style="list-style-type: none"> <li>• City's unemployment rate</li> <li>• Assessed value of commercial and industrial properties as a % of total assessed value of all properties</li> <li>• % of city population living in poverty</li> </ul>	<ul style="list-style-type: none"> <li>• % of persons in full-time employment</li> <li>• Youth unemployment rate</li> <li>• Number of businesses per 100 000 population</li> <li>• Number of new patents per 100 000 population per year</li> </ul>
EDUCATION	<ul style="list-style-type: none"> <li>• % of female school-aged population enrolled in schools</li> <li>• % of students completing primary education: survival rate</li> <li>• % of students completing secondary education: survival rate</li> <li>• Primary education student/teacher ratio</li> </ul>	<ul style="list-style-type: none"> <li>• % of male school-aged population enrolled in schools</li> <li>• % of school-aged population enrolled in schools</li> <li>• Number of higher education degrees per 100 000 population</li> </ul>
ENERGY	<ul style="list-style-type: none"> <li>• Total residential electrical energy use per capita (kWh/year)</li> <li>• % of city population with authorized electrical service</li> <li>• Energy consumption of public buildings per year (kWh/m<sup>2</sup>)</li> <li>• % of total energy derived from renewable sources, as a share of the city's total energy consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Total electrical energy use per capita (kWh/year)</li> <li>• Average number of electrical interruptions per customer per year</li> <li>• Average length of electrical interruptions</li> </ul>
ENVIRONMENT	<ul style="list-style-type: none"> <li>• Fine particulate matter (PM2.5) concentration</li> <li>• Particulate matter (PM10) concentration</li> <li>• Greenhouse gas emissions measured in tonnes per capita</li> </ul>	<ul style="list-style-type: none"> <li>• Nitrogen dioxide (NO<sub>2</sub>) concentration</li> <li>• Sulphur dioxide (SO<sub>2</sub>) concentration</li> <li>• Ozone (O<sub>3</sub>) concentration</li> <li>• Noise pollution</li> <li>• % change in number of native species</li> </ul>

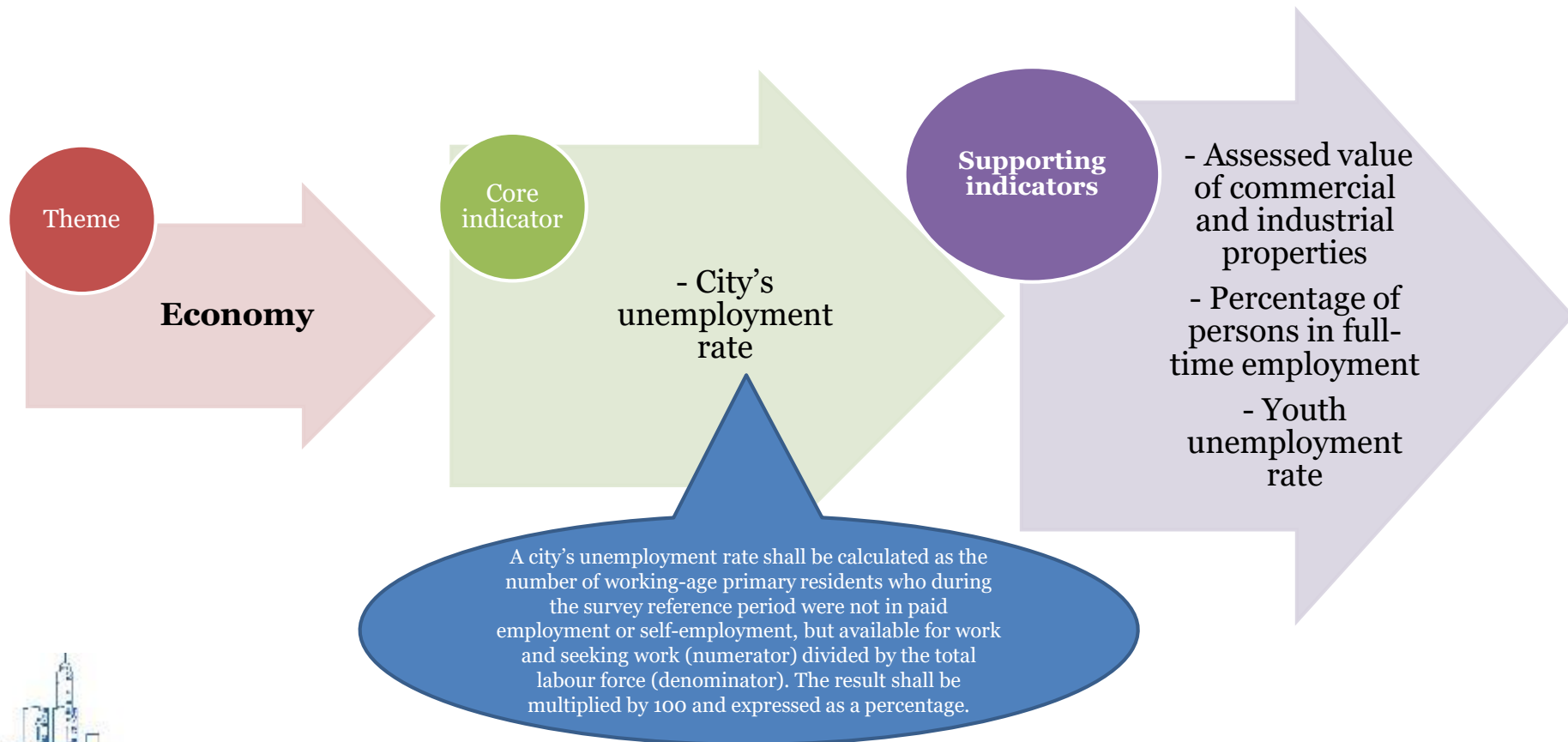


# ISO 37120 Indicators/2

Theme	Core Indicator	Supporting Indicator
FINANCE	<ul style="list-style-type: none"> <li>Debt Service ratio (debt service expenditure as a % of a municipality's own-source revenue)</li> </ul>	<ul style="list-style-type: none"> <li>Capital spending as a percentage of total expenditures</li> <li>Own-source revenue as a percentage of total revenues</li> <li>Tax collected as a percentage of tax billed</li> </ul>
FIRE AND EMERGENCY RESPONSE	<ul style="list-style-type: none"> <li>Number of firefighters per 100 000 population</li> <li>Numbers of fire related deaths per 100 000 population</li> <li>Number of disaster related deaths per 100 000 population</li> </ul>	<ul style="list-style-type: none"> <li>Number of volunteer and part-time firefighter per 100 000 population</li> <li>Response time for emergency response services from initial call</li> <li>Response time for fire department from initial calls</li> </ul>
GOVERNANCE	<ul style="list-style-type: none"> <li>Voter participation in last municipal election (as % of eligible voters)</li> <li>Women as a % of total elected to city-level office</li> </ul>	<ul style="list-style-type: none"> <li>% of women employed in the city government workforce</li> <li>Number of convictions for corruption and/or bribery by city officials per 100 000 population</li> <li>Citizen's representation: number of local officials elected to office per 100 000 population</li> <li>Number of registered voters as a % of the voting age population</li> </ul>
HEALTH	<ul style="list-style-type: none"> <li>Average life expectancy</li> <li>Number of in-patient hospital beds per 100 000 population</li> <li>Number of physicians per 100 000 population</li> <li>Under age five mortality per 1 000 live births</li> </ul>	<ul style="list-style-type: none"> <li>Number of nursing and midwifery personnel per 100 000 population</li> <li>Number of mental health practitioners per 100 000 population</li> <li>Suicide rate per 100 000 population</li> </ul>



# ISO 37120:2018 An example of an indicator



# Mapping of indicators to United Nations Sustainable Development Goals (SDGs)



Sustainable Development Goal (2015)	Indicators
Goal 1: End poverty in all its forms everywhere	<p><a href="#">13.1</a> Percentage of city population living below the international poverty line (core indicator)</p> <p><a href="#">13.2</a> Percentage of city population living below the national poverty line (supporting indicator)</p>
Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	<p><a href="#">20.1</a> Total urban agricultural area per 100 000 population (core indicator)</p> <p><a href="#">20.2</a> Amount of food produced locally as a percentage of total food supplied (supporting indicator)</p> <p><a href="#">20.3</a> Percentage of city population undernourished (supporting indicator)</p> <p><a href="#">20.4</a> Percentage of city population that is overweight or obese—Body Mass Index (BMI) (supporting indicator)</p>

# Data for cities (ISO 37120)

<http://www.dataforcities.org/>



WCCD

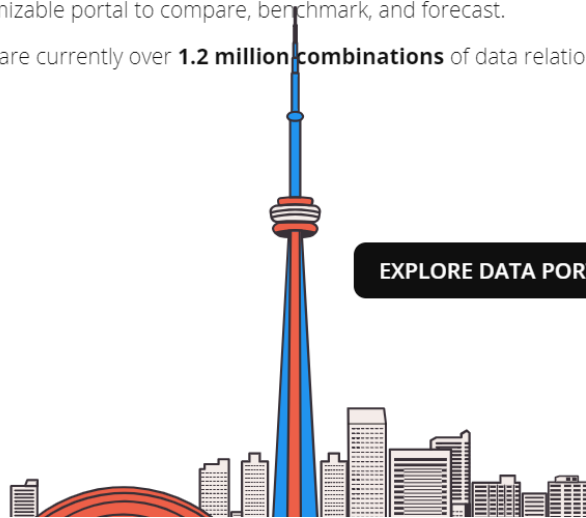
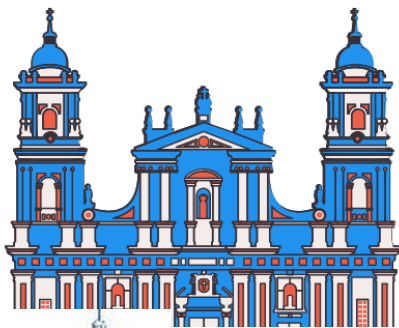
[HOME](#) [ABOUT](#) [DATA PORTAL](#) [GLOBAL CITIES REGISTRY™](#) [JOIN](#) [CITIES PORTAL](#) [PARTNERS](#) [CONNECT](#) [NEWS & UPDATES](#) [PUBLICATIONS](#) [FR](#)

## Compare Cities Worldwide

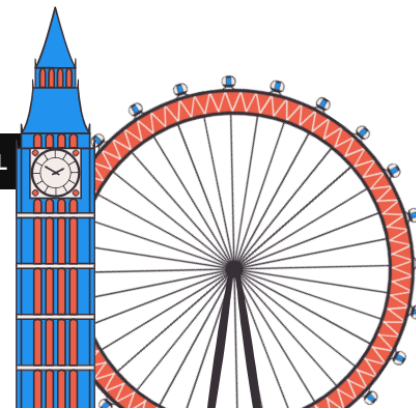
A worldwide first, the WCCD **Open Data Portal** showcases data for WCCD ISO 37120 certified cities of all sizes, from around the world.

Using cutting-edge visualizations and tailored trend analyses, everyone from students to city leaders can use our customizable portal to compare, benchmark, and forecast.

There are currently over **1.2 million combinations** of data relationships to explore.



EXPLORE DATA PORTAL



SmartStatistics4SmartCities



**WCCD**  
**ISO 37120**

## Created by Cities, for Cities

Discovering solutions for our rapidly urbanizing planet, the World Council on City Data (WCCD) is the global leader in standardized city data - creating smart, sustainable, resilient, and prosperous cities.

The WCCD hosts a network of innovative cities committed to improving services and quality of life with open city data and provides a consistent and comprehensive platform for standardized urban metrics. The WCCD is a global hub for creative learning partnerships across cities, international organizations, corporate partners, and academia to further innovation, envision alternative futures, and build better and more liveable cities.

As a global leader on standardized metrics, the WCCD is implementing **ISO 37120 Sustainable Development of Communities: Indicators for City Services and Quality of Life**, the new international standard; created by cities, for cities. The WCCD has developed the first ISO 37120 certification system and the Global Cities Registry™.

**BECOME CERTIFIED**



**SmartStatistics4SmartCities**

# World Council on City data – Dubai → Education

## DUBAI (2015)

### HEALTH



ISO 37120 indicators can be used to track and monitor a city's progress in delivering city services and ensuring quality of life. These performance indicators assist cities in setting targets and monitoring achievements. In order to achieve sustainable development, the whole city needs to be taken into consideration.

As outlined in the ISO 37120 standard, performance indicators have been grouped into core and supporting and grouped by themes according to the different sectors and services within a city. This classification has no hierarchical significance and indicators are organized according to how they appear in the ISO 37120 standard.

Profile indicators are also included that provide basic statistics and

## 6 EDUCATION

6.1 PERCENTAGE OF FEMALE SCHOOL-AGED POPULATION ENROLLED IN SCHOOL (CORE)

98.66 % (2014)



6.2 PERCENTAGE OF STUDENTS COMPLETING PRIMARY EDUCATION: SURVIVAL RATE (CORE)

125.14 % (2014)



6.3 PERCENTAGE OF STUDENTS COMPLETING SECONDARY EDUCATION: SURVIVAL RATE (CORE)

99.26 % (2014)







# ISO 37123

Indicators for resilient cities



# Definition of resilient city

A **Resilient City** is a city that is able to manage, adapt, maintain and ensure city services and enhance quality of life in the face of hazards, shocks and stresses.

This includes the capacity to resist, absorb, accommodate, adapt to, transform, and recover from the effects of hazards and disasters in a timely and efficient manner, including through the preservation and restoration of essential basic structures and services in a sustainable way, and through risk management practices.

# An example from ISO 37123 on safety indicators

- Percentage of **population covered by multi-hazard early warning system**
  - Remember that disaster at Mati, Athens this year was mainly a failure of this time
  - 100 people died.
- Percentage of emergency responders that have received disaster response training to manage worst case scenarios  
Percentage of emergency responders able to communicate during a disaster event via professional mode radio, satellite telephony, or privileged-access mobile communication networks
- Percentage of local hazard warnings or forecasts issued by national agencies that are received in timely fashion by city emergency responders
- Number of health and educational facilities destroyed or damaged by natural hazards per 100 000 population



## Percentage of population covered by multi-hazard early warning system

This indicator refers to the specific warning of an imminent threat. Early warnings of that threat are essential to reduce human and economic losses from disasters. Warning systems prevent loss of life and mitigate the economic and material impacts of disasters.

It is the **responsibility of municipal governments** to ensure that its citizens are effectively covered by some form of early warning system, enabling better preparedness for (and response to) disaster events. Warnings should be reliable and specific to the hazard threats of a city, and should allow ample time for preparation and response (as far as technology permits).

# In Greece



- ELOT developed ELOT 1457 standard
  - Currently under consultation (18/10/2018)
- ELOT 1457 defines indicators for
  - Sustainable and Smart Cities
  - Specific ICT indicators
  - Indicators are aligned with Sustainable Development Goals of UN.

Available for download at [http://www.elot.gr/1427\\_ELL\\_HTML.aspx](http://www.elot.gr/1427_ELL_HTML.aspx)

# ELOT 1457 - Sample

6.

**Τηλεπικοινωνίες και  
Τεχνολογίες  
Πληροφορικής και  
επικοινωνιών**

- 6.1 Ποσοστό νοικοκυριών με τουλάχιστον έναν υπολογιστή ή παρόμοια συσκευή
- 6.2 Αριθμός smart phones και tablets ανά 100 κατοίκους
- 6.3 Συνδρομές κινητής τηλεφωνίας ανά 100 κατοίκους
- 6.4 Ποσοστό νοικοκυριών με τουλάχιστον smartphone ή παρόμοια συσκευή
- 6.5 Ποσοστό νοικοκυριών με πρόσβαση στο Διαδίκτυο για οποιοδήποτε μέλος μέσω σταθερού ή κινητού δικτύου σε οποιαδήποτε χρονική στιγμή
- 6.6 Σταθερές (ενσύρματες) ευρυζωνικές συνδρομές ανά 100 κατοίκους
- 6.7 Ποσοστό νοικοκυριών με πρόσβαση σε συρρευματικές ταχύτητες ίσες ή μεγαλύτερες από 30 Mbits/s σύμφωνα με την Ψηφιακή Ατζέντα 2020
- 6.8 Μέση συρρευματική ταχύτητα (σταθερή)
- 6.9 Ασύρματες ευρυζωνικές συνδρομές ανά 100 κατοίκους
- 6.10 Επίδοση άκρου κινητής τηλεφωνίας
- 6.11 Ποσοστό αστικής περιοχής που παρέχει πρόσβαση σε συρρευματικές ταχύτητες ίσες ή μεγαλύτερες από 10 Mbits/s.
- 6.12 Εύρος ζώνης διεθνούς Διαδικτύου (bit/s) ανά χρήστη Διαδικτύου
- 6.13 Ποσοστό κατοίκων που χρησιμοποιούν Διαδίκτυο
- 6.14 Ποσοστό ψηφιακού δικτύου ευρυεκπομπής που καλύπτουν νοικοκυριά στην πόλη

# Conclusions:

## Implementation of Smart and Sustainable cities requires





Thank you for your attention

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