

الهيئة السعودية للمواصفات والمقاييس والجودة
Saudi Standards, Metrology and Quality Org. (SASO)



SASO FDS 33657

المدن الذكية - مؤشرات أداء ذكاء المدن السعودية

Smart Cities - Saudi Smart Cities Indicators

ICS : 13.020.20

Foreword

Saudi Standards, Metrology and Quality Organization (SASO) has prepared "name of standard" based on relevant ADMO, International and National Foreign Standards and references.

FOR STUDY

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Saudi Smart City Indicators

1 Scope

This Saudi Standard specifies the indicators for smart cities in Saudi Arabia and measures the performance of city services and quality of life.

Each indicator's value is determined based on a set of criteria outlined in the standard to ensure ease of measurement.

This document applies to any city, regardless of its size or location.

2 Normative References

ISO 37120, sustainable cities and communities — Indicators for city services and quality of life

ISO 37122, Sustainable cities and communities — Indicators for smart cities

3 Terms and Definitions

3.1 city municipality local government

urban community falling under a specific administrative boundary.

3.2 city population

number of residents living in a particular city or municipality, typically determined by census every 5 or 10 years

3.3 community

group of people with an arrangement of responsibilities, activities and relationships

3.4 indicator

quantitative, qualitative or descriptive measure

3.5 full-time enrolment

enrolment in an education programme whose intended study load amounts to at least 75 % of the normal full-time annual study load

3.6 labour force workforce

all employable persons within a specified geographic area

3.7 natural hazard

geological or meteorological phenomena that can cause damage to physical infrastructure or loss of life in cities

3.8 part-time enrolment

enrolment in school for at least every half-day in a week over the entire school year or equivalent on a weekly basis

EXAMPLE A student is counted as enrolled part-time if he/she is enrolled in school for every half-day in a week, but is not counted as enrolled if he/she is only enrolled for 0,25 of a day.

3.9 primary education

elementary school education that is considered to be the first stage of “basic education”

3.10 secondary education

education that is considered to be the second stage of basic education and marks the end of compulsory education where it exists

3.11 tertiary education

education provided by universities and other higher education institutions following secondary education

3.12 hazardous waste

waste that is potentially harmful to human beings, property or the environment

3.13 solid waste

non-soluble, discarded solid materials, including sewage sludge, municipal garbage, industrial wastes, agricultural refuse, demolition wastes and mining residues

3.14 vascular plant tracheophyte

plant that can internally transport water and food

3.15 per 100 000 population

in 100 000 of the city's population

3.16 United States dollar USD

national currency for the United States of America

3.17 public building

government owned or leased building that functions as a municipal and administrative office, library, recreation centre, hospital, school, fire station or police station

3.18 gigajoule

measure of the energy that is equivalent to 1 billion joules (J), where 1 J is the amount of energy required to send an electrical current of one ampere through a resistance of one ohm for one second

Note 1 to entry: One gigajoule (GJ) is equivalent to 277,8 kilowatt hours (kWh)

3.19 per 100 000 population

For every 100 000 of the city's population

3.20 smart city

City that increases the pace at which it provides social, economic and environmental sustainability outcomes and responds to challenges such as climate change, rapid population growth, and political and economic instability by fundamentally improving how it engages society, applies collaborative leadership methods, works across disciplines and city systems, and uses data information and modern technologies to deliver better services and quality of life to those in the city (residents, businesses, visitors), now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment.

3.21 biosolid

mixture of water and solids separated from various types of waste as a result of natural or artificial processes

4 Saudi smart city indicators evaluation

4.1 Criteria of indicators

The criteria for indicators are defined according to the following:

- 1- Relevance to Vision 2030, 3 points.
- 2- Relevant to ISCS(Integrated Smart City Strategy) , 2 points.
- 3- Relevant to sectorial strategy , 2 points
- 4- Relevance to Global indices: , 2 points
 - ITU U4SSC KPIs
 - IESE Cities in Motion
 - IMD Smart Cities Index
 - Economist EIU
 - Mercer Quality of life
- 5- Ease of Measure , 1 point

4.2 Tiers of indicators

The indicators are categorized into three Tiers:

- 1- Tier 1: If the indicator is present in the Kingdom's vision or global indicators or both
- 2- Tier 2: If, according to the degree of indicators criteria, it is more than 3 points and is not present in the Kingdom's vision or global indicators or both
- 3- Tier 3: If, according to the degree of indicators criteria, it is less than 3 and does not exist in the Kingdom's vision or global indicators or both.

5 Economy

5.1 Tier 1: high priority

- | | |
|---|----------|
| 1- City product per capita | 8 points |
| 2- Percentage of the labour force employed in occupations in the information and communications technology (ICT) sector | 8 points |
| 3- City's unemployment rate | 7 points |
| 4- Youth unemployment rate (above the legal working age and under 24 years) | 5 points |
| 5- Number of new patents per 100 000 population per year | 5 points |
| 6- Annual inflation rate based on the average of the past five years | 4 points |
| 7- Percentage of service contracts providing city services which contain an open data policy | 4 points |
| 8- Survival rate of new businesses per 100 000 population | 4 points |

5.2 Tier 2: medium priority

- | | |
|---|----------|
| 1- Percentage of the labour force employed in occupations in the education and research and development sectors | 4 points |
| 2- Coverage rate of population having access to employment information service | 4 points |

5.3 Tier 3: low priority

- | | |
|--|----------|
| 1- Number of businesses per 100 000 population | 3 points |
| 2- Average household income | 3 points |
| 3- Usage of online delivery of employment services | 2 points |
| 4- Percentage of online cross-border trading | 2 points |
| 5- Percentage of persons in full-time employment | 1 points |

- | | |
|---|----------|
| 6- Annual number of visitor stays (overnight) per 100 000 population | 1 points |
| 7- Commercial air connectivity (number of non-stop commercial air destinations) | 1 points |
| 8- Percentage of online retail | 1 points |

6 Education

6.1 Tier 1: high priority

- | | |
|---|----------|
| 1- Percentage of students completing primary education: | 5 points |
| 2- Percentage of students completing secondary education: | 5 points |
| 3- Number of higher education degrees per 100 000 population | 5 points |
| 4- Number of computers, laptops, tablets or other digital learning devices available per 1 000 students | 4 points |

6.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Number of science, technology, engineering and mathematics (STEM) higher education degrees per 100 000 population | 5 points |
|--|----------|

6.3 Tier 3: low priority

- | | |
|--|----------|
| 1- Primary education student–teacher ratio | 1 points |
| 2- Percentage of school-aged population enrolled in schools | 2 points |
| 3- Percentage of schools with wireless access | 2 points |
| 4- Percentage of female school-aged population enrolled in schools | 1 points |

7 Governance

7.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Annual number of online visits to the municipal open data portal per 100,000 population | 7 points |
| 2- Percentage of city services accessible and that can be requested online | 9 points |

7.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Government-citizen cooperation for city promotion | 2 points |
|--|----------|

7.3 Tier 3: low priority

- | | |
|---|----------|
| 1- Women as a percentage of total elected to city-level office | 1 points |
| 2- Average response time to inquiries made through the city's non-emergency inquiry system (days) | 2 points |

8 Smart Telecommunication/ICT

8.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Number of internet connections per 100,000 population | 8 points |
| 2- Number of mobile phone connections per 100,000 population | 9 points |
| 3- number of household fixed broadband access users | 8 points |

- | | |
|---|-----------|
| 4- Fiber to the home (FTTH) penetration rate, (number of FTTH users/number of fixed broadband access users) | 9 points |
| 5- Mobile broadband access ability, (number of 4G and above mobile users/ number of permanent residents) | 10 points |
| 6- Internet access in households | 10 points |
| 7- household with a computer | 7 points |
| 8- Wireless broadband subscriptions | 9 points |

8.2 Tier 2: medium priority

- | | |
|---|----------|
| 1- Percentage of the city population with access to sufficiently fast broadband | 8 points |
| 2- Percentage of city area under a white zone/dead spot/not covered by telecommunication connectivity | 5 points |
| 3- Percentage of the city area covered by municipally provided Internet connectivity | 7 points |
| 4- Fixed broadband subscriptions | 6 points |
| 5- Number of households covered by a fixed wired network | 9 points |
| 6- Mobile sites providing 2G services | 6 points |
| 7- Mobile sites providing 3G services | 7 points |
| 8- Mobile sites providing 4G services | 8 points |
| 9- Mobile sites providing 5G services | 8 points |
| 10- Number of public WiFi access points | 7 points |
| 11- Spectrum used for the provision of mobile services with 2G/3G/4G/5G technologies | 8 points |

8.3 Tier 3: low priority

- | | |
|--|----------|
| 1- Household with a mobile device | 2 points |
| 2- Mobile sites providing cellular LPWA services (NB-IoT, LTE-M) | 3 points |

9 Smart Solid Waste

9.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Hazardous waste generation per capita (tones) | 9 points |
| 2- Hazardous waste generation as amount for health sector | 9 points |
| 3- Hazardous waste generation as amount for industrial sector | 9 points |
| 4- percentage of Final exclusion rate for landfills | 9 points |
| 5- Percentage of the city's electrical and electronic waste that is recycled | 7 points |

9.2 Tier 2: medium priority

- | | |
|---|----------|
| 1- Percentage of the city's hazardous waste that is recycled | 5 points |
| 2- Percentage of total amount of plastic waste recycled in the city | 4 points |

10 Smart Health

10.1 Tier 1: high priority

- | | |
|---|----------|
| 1- Average life expectancy | 7 points |
| 2- Number of in-patient hospital beds per 100 000 population | 7 points |
| 3- Number of physicians per 100 000 population | 7 points |
| 4- Percentage of the city's population with an online unified health file accessible to health care providers | 9 points |
| 5- Annual number of medical appointments conducted remotely per 100 000 population | 8 points |
| 6- Percentage of the city population with access to real-time public alert systems for air and water quality advisories | 7 points |

10.2 Tier 2: medium priority

- | | |
|---|----------|
| 1- Under age five mortality per 1 000 live births | 4 points |
| 2- Number of nursing and midwifery personnel per 100 000 population | 6 points |
| 3- Suicide rate per 100 000 population | 4 points |

10.3 Tier 3: low priority

- | | |
|---|----------|
| 1- Proportion of population using safely managed drinking water services | 2 points |
| 2- Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water | 2 points |

11 Housing

11.1 Tier 1: high priority

- | | |
|---|----------|
| 1- Vacancy rate (residential) | 7 points |
| 2- Percentage of city population living in inadequate housing | 7 points |
| 3- Percentage of city population living in inadequate housing | 7 points |
| 4- Total number of households | 8 points |
| 5- Residential rental dwelling units as a percentage of total dwelling units | 7 points |
| 6- Decrease in energy consumption in smart houses (%) | 7 points |
| 7- Level of satisfaction of citizens with the sense of community created from Smart housing & community solutions | 8 points |

11.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Persons per unit | 7 points |
| 2- Living space (square metres) per person | 6 points |
| 3- Secondary residence rate | 4 points |

11.3 Tier 3: low priority

- | | |
|--|----------|
| 1- Percentage of households that exist without registered legal titles | 1 points |
| 2- Percentage of households with smart energy meters | 3 points |
| 3- Percentage of households with smart water meters | 3 points |

12 Safety & Security

12.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Number of homicides per 100 000 population | 7 points |
| 2- Number of volunteer and part-time firefighters per 100 000 population | 6 points |
| 3- Response time for emergency response services from initial call | 7 points |
| 4- Crimes against property per 100 000 population | 9 points |
| 5- Number of firefighters per 100 000 population | 3 points |
| 6- Number of violent crimes against women per 100 000 population | 7 points |

12.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Percentage of the city area covered by digital surveillance cameras | 4 points |
|--|----------|

12.3 Tier 3: low priority

- | | |
|---|----------|
| 1- Number of fire-related deaths per 100 000 population | 3 points |
| 2- Number of natural-hazard-related deaths per 100 000 population | 2 points |
| 3- Number of police officers per 100 000 population | 2 points |
| 4- Number of deaths caused by industrial accidents per 100 000 population | 2 points |

13 Smart Social

13.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Percentage of city population living below the international poverty line | 7 points |
| 2- Percentage of city population living below the national poverty line | 7 points |
| 3- Annual population change | 8 points |
| 4- Percentage of city population that are non-citizens | 7 points |
| 5- Number of university students per 100 000 population | 7 points |
| 6- Number of cultural institutions and sporting facilities per 100 000 population | 7 points |
| 7- Annual number of cultural events per 100 000 population (e.g. exhibitions, festivals, concerts) | 8 points |
| 8- Percentage of marked pedestrian crossings equipped with accessible pedestrian signals | 7 points |
| 9- Percentage of municipal budget allocated to cultural and sporting facilities | 7 points |

13.2 Tier 2: medium priority

- | | |
|---|----------|
| 1- Percentage of population that are foreign born | 7 points |
| 2- Population demographics | 8 points |
| 3- Percentage of municipal budget allocated for the provision of mobility aids, devices and assistive technologies to citizens with special needs | 4 points |
| 4- Percentage of public buildings that are accessible by persons with special needs | 7 points |
| 5- Percentage of municipal budget allocated for provision of programmes designated for bridging the digital divide | 7 points |
| 6- Square metres of public indoor recreation space per capita | 5 points |
| 7- Square metres of public outdoor recreation space per capita | 5 points |
| 8- Percentage of public recreation services that can be booked online | 7 points |

13.3 Tier 3: low priority

- | | |
|---|----------|
| 1- Gini coefficient of inequality | 3 points |
| 2- Percentage of population that are new immigrants | 2 points |

14 Urban planning

14.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Green area (hectares) per 100 000 population | 7 points |
| 2- Jobs–housing ratio | 7 points |
| 3- Population density (per square kilometre) | 7 points |
| 4- Percentage of the city population living in medium-to-high population densities | 7 points |
| 5- Share of cities with overarching city code (%) | 8 points |
| 6- Citizen satisfaction with urban scenery (%) | 9 points |
| 7- Citizen satisfaction on city planning (%) | 9 points |

14.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Areal size of informal settlements as a percentage of city area | 7 points |
| 2- Basic service proximity | 8 points |

14.3 Tier 3: low priority

- | | |
|---|----------|
| 1- Number of trees per 100 000 population | 3 points |
| 2- Annual number of citizens engaged in the planning process per 100 000 population | 2 points |
| 3- Average time for building permit approval (days) | 1 points |
| 4- Share of municipal areas that were planned using Smart spatial planning tools | 2 points |
| 5- Number of high priority areas with detailed design guidelines per city (%) | 3 points |
| 6- Share of MoMRAH services integrated in | 3 points |
| 7- Municipal GIS system (%) | |

15 Smart Energy

15.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Total end-use energy consumption per capita (GJ/year) | 7 points |
| 2- Percentage of total end-use energy derived from renewable sources | 4 points |
| 3- Final energy consumption of public buildings per year | 4 points |

15.2 Tier 2: medium priority

- | | |
|---|----------|
| 1- Percentage of street lighting managed by a light performance management system | 5 points |
| 2- Percentage of buildings in the city with smart energy meters | 5 points |

15.3 Tier 3: low priority

- | | |
|---|----------|
| 8- Percentage of city population with authorized electrical service (residential) | 3 points |
| 9- Average annual hours of electrical service interruptions per household | 2 points |

16 Smart Mobility

16.1 Tier 1: high priority

- | | |
|--|----------|
| 1- Kilometres of public transport system per 100 000 population | 7 points |
| 2- Annual number of public transport trips per capita | 8 points |
| 3- Percentage of commuters using a travel mode to work other than a personal vehicle | 8 points |
| 4- Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods | 7 points |
| 5- Average commute time | 7 points |
| 6- Percentage of city streets and thorough fares covered by real-time online traffic alerts and information | 7 points |
| 7- Percentage of the city's public transport services covered by a unified payment system | 7 points |
| 8- Percentage of public parking spaces equipped with e-payment systems | 7 points |
| 9- Percentage of public parking spaces equipped with real-time availability systems | 8 points |
| 10- Percentage of traffic lights that are intelligent/smart | 8 points |
| 11- City area mapped by real-time interactive street maps as a percentage of the city's total land area | 7 points |

16.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Transportation deaths per 100 000 population | 5 points |
| 2- Number of bicycles available through municipally provided bicycle-sharing services per 100 000 population | 5 points |

16.3 Tier 3: low priority

- | | |
|---|----------|
| 1- Kilometres of bicycle paths and lanes per 100 000 population | 3 points |
| 2- Number of users of sharing economy transportation per 100 000 population | 2 points |

- | | |
|---|----------|
| 3- Percentage of vehicles registered in the city that are low-emission vehicles | 2 points |
| 4- Percentage of vehicles registered in the city that are autonomous vehicles | 1 points |
| 5- Percentage of public transport routes with municipally provided and/or managed Internet connectivity for commuters | 1 points |
| 6- Percentage of roads conforming with autonomous driving systems | 1 points |
| 7- Percentage of the city's bus fleet that is motor-driven | 1 points |

17 Environment

17.1 Tier 1: high priority

- | | |
|---|----------|
| 1- Noise pollution | 8 points |
| 2- Percentage of buildings built or refurbished within the last 5 years in conformity with green building | 8 points |
| 3- Number of real-time remote air quality monitoring stations per square kilometre (km ²) | 8 points |

17.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Fine particulate matter (PM _{2.5}) concentration | 6 points |
| 2- Particulate matter (PM ₁₀) concentration | 6 points |
| 3- Percentage of areas designated for natural protection | 5 points |
| 4- NO ₂ (nitrogen dioxide) concentration | 6 points |
| 5- SO ₂ (sulfur dioxide) concentration | 6 points |
| 6- O ₃ (ozone) concentration | 6 points |
| 7- Percentage of public buildings equipped for monitoring indoor air quality | 5 points |

17.3 Tier 3: low priority

- | | |
|---|----------|
| 1- Greenhouse gas emissions measured in tonnes per capita | 2 points |
| 2- Percentage change in number of native species | 2 points |

18 Finance

18.1 Tier 1: high priority

- | | |
|---|----------|
| 1- Debt service ratio (debt service expenditure as a percentage of a city's own-source revenue) | 8 points |
| 2- Capital spending as a percentage of total expenditures | 8 points |
| 3- Own-source revenue as a percentage of total revenues | 8 points |
| 4- Gross operating budget per capita | 7 points |
| 5- Gross capital budget per capita | 7 points |
| 6- Percentage of payments to the city that are paid electronically based on electronic invoices | 7 points |

18.2 Tier 2: medium priority

- | | |
|--|----------|
| 1- Tax collected as a percentage of tax billed | 6 points |
|--|----------|

18.3 Tier 3: low priority

- 1- sharing economy as a percentage of own-source revenue 3 points

19 water

19.1 Tier 1: high priority

- 1- Percentage of city population with potable water supply service 8 points
- 2- Percentage of city population with sustainable access to an improved water source 8 points
- 3- Total domestic water consumption per capita (litres/day) 8 points
- 4- Percentage of buildings in the city with smart water meters 8 points
- 5- Compliance rate of drinking water quality 8 points
- 6- Percentage of water loss (unaccounted for water) 7 points
- 7- Percentage of drinking water tracked by real-time water quality monitoring station 7 points
- 8- Number of real-time environmental water quality monitoring stations per 100,000 population 7 points

19.2 Tier 2: medium priority

- 1- Percentage of the city's water distribution network monitored by a smart water system 6 points
- 2- Total water consumption per capita (litres/day)

19.3 Tier 3: low priority

- 3- Average annual hours of water service interruptions per household 3 points

20 Wastewater

20.1 Tier 1: high priority

- 1- Percentage of city population served by wastewater collection 8 points
- 2- Percentage of city's wastewater receiving centralized treatment 8 points
- 3- Percentage of population with access to improved sanitation 8 points
- 4- Compliance rate of wastewater treatment 8 points
- 5- Percentage of treated wastewater being reused 8 points

20.2 Tier 2: medium priority

- 1- Energy derived from wastewater as a percentage of total energy consumption of the city 6 points
- 2- Percentage of the wastewater pipeline network monitored by a real-time data-tracking sensor system 5 points

20.3 Tier 3: low priority

- 1- Percentage of total amount of wastewater in the city that is used to generate energy 3 points
- 2- Percentage of biosolids that are reused (dry matter mass) 3 points

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