

CITYkeys



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CITYkeys list of project indicators

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1. CITYKEYS INDICATORS FOR SMART CITY PROJECTS

The tables of indicators include the title, the unit, a short description, the source framework(s) and the type of indicator.

- The title of the project indicator is phrased as ‘improving’ something, whether increasing something you want to stimulate, or decreasing something less favourable, comparing the before (or business-as-usual) and after (or expected results) situation.
- Important in the choice for the unit of the indicator is the comparability of indicators across a variety of projects differing in type, size, etc. Absolute values, like kg CO₂ emitted, are therefore not suitable. Consequently, most project indicators are defined as ‘% change’, for instance, % reduction in CO₂-emissions, or use a Likert scale¹. It follows that these indicators will require some understanding of the context in which the project is taken place, or the reference situation against which the project should be assessed.
- The short description explains the indicator into more detail. Many indicators are aggregated indicators, inherently combining various elements. The description will provide some examples of elements that can be taken into account at the evaluation phase.
- As far as possible, existing indicators of already developed frameworks have been used for the CITYkeys framework. For these indicators, the original frameworks are mentioned in the description as the ‘source framework’. In addition, new indicators have been developed by the consortium members when they felt this was necessary for performing a complete evaluation of smart city projects.

In total, 99 project indicators have been defined. Not every indicator will be relevant for each type of project: i.e. air quality indicators may typically apply to transport projects. The sector scope of the indicator can be found in the more elaborate descriptions of the project indicators in the report “CITYkeys the indicators”.

1.1 People

1.1.1 Health

Indicator title	Indicator unit	Definition	Source
Improved access to basic health care services	Likert	The extent to which the project has increased accessibility to basic health care	Rotterdam SCP; SCI
Encouraging a healthy lifestyle	Likert	The extent to which the project encourages a healthy lifestyle	
Waiting time	% in hours	Percentage reduction in waiting time due to project	

1.1.2 Safety

Indicator title	Indicator unit	Definition	Source
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¹ A Likert scale is a five (or seven) point scale which is used to allow the individual to express how much they agree or disagree with a particular statement. In the CITYkeys evaluation Likert scales are used to express the analyst or independent expert estimate on the indicator.

Reduction of traffic accidents	% of fatalities	Percentage reduction of transportation fatalities due to the project	Civitas; 2DECIDE
Reduction in crime rate	% of crimes	Percentage reduction in number of violences, annoyances and crimes due to the project	Rotterdam SCP; Smart city Wheel; European Smart Cities v1.0 (2007); SCI
Improved cybersecurity	Likert	The extent to which the project ensures cybersecurity	ITU
Improved data privacy	Likert	The extent to which data collected by the project is protected	ITU

1.1.3 Access to (other) services

Indicator title	Indicator unit	Definition	Source
Access to public transport	Likert scale	The extent to which public transport stops are available within 500m	Eurbanlab; Rotterdam SCP; Covenant of mayors; OECD; LEED; DGNB
Quality of public transport	Likert scale	The perception of users on the quality of the public transport service	
Improved access to vehicle sharing solutions	Likert scale	Improved accessibility to vehicle sharing solutions	LEED; DGNB
Extending the bike route network	% in km	Percentage increase of the length of cycling roads	FIN Indicators; Transform; OECD; UNECE; Covenant of Mayors; European Green Capital Award study
Access to public amenities	Likert scale	The extent to which public amenities are available within 500m	Smart city Profiles; RFSC; FIN indicators; Eurbanlab; 2000Watt; SCI; Rotterdam SCP; Eco-Districts
Access to commercial amenities	Likert scale	The extent to which commercial amenities are available within 500m	Eurbanlab, OECD; Rotterdam SCP
Increase in online government services	Likert scale	The extent to which access to online services provided by the city was improved by the project	Triple Helix Model, Smart city Wheel
Improved flexibility in delivery services	Likert scale	The extent to which flexibility in delivery services was improved by the project.	

1.1.4 Education

Indicator title	Indicator unit	Definition	Source
Improved access to educational resources	Likert	The extent to which the project improves accessibility to educational resources	ITU
Increased environmental awareness	Likert	The extent to which the project has used opportunities for increasing environmental awareness and educating about sustainability and the environment	
Improved digital literacy	Likert	The extent to which the project has attempted to increase digital	

literacy

1.1.5 Diversity and social cohesion

Indicator title	Indicator unit	Definition	Source
People reached	% of people	Percentage of people in the target group that have been reached and/or are activated by the project	
Increased consciousness of citizenship	Likert	The extent to which the project has contributed in increasing consciousness of citizenship	ITU
Increased participation of vulnerable groups	Likert	The extent to which project has led to an increased participation of groups that are not well represented in the society	

1.1.6 Quality of housing and the built environment

Indicator title	Indicator unit	Definition	Source
Diversity of housing	Simpson Diversity Index/Social Housing	Simpson Diversity Index of total housing stock in the project area OR Percentage of social dwellings as share of total housing stock in the project area	Eurbanlab; LEED
Connection to the existing cultural heritage	Likert scale	The extent to which making a connection to the existing cultural heritage was considered in the design of the project	Eurbanlab; LEED; DGNB
Design for a sense of place	Likert scale	The extent to which a 'sense of place' was included in the design of the project	Eurbanlab
Increased use of groundfloors	% in m2	Increase in ground floor space for commercial or public use due to the project as percentage of total ground floor surface	
Increased access to urban public outdoor recreation space	m2	Increase in public outdoor recreation space (m2) within 500m	OECD; Rotterdam SCP
Increased access to green space	m2	Increase in green space (m2) within 500m	LEED; DGNB; Smart city Wheel; Triple Helix Model; ISO 37151

1.2 Planet

1.2.1 Energy & mitigation

Indicator title	Indicator unit	Definition	Source
Reduction in annual final energy consumption	% in kWh	Percentage change in annual final energy consumption due to the project for all uses and forms of energy	Eurbanlab; Concerto; CIVIS, DGNB
Reduction in lifecycle energy use	% in kWh	Reduction in life cycle energy use achieved by the project (%)	Eurbanlab
Reduction of embodied energy of products and services used in the project	Likert	The extent to which measures have been taken to reduce the embodied energy of products used in the project	Eurbanlab
Increase in local renewable energy production	% in kWh	Percentage increase in the share of local renewable energy due to the project	Eurbanlab; Eco-Districts, Concerto; LEED: CIVIS; IDEAS
Carbon dioxide emission reduction	% in tonnes	Percentage reduction in direct (operational) CO2 emissions achieved by the project.	Eurbanlab; CIVIS; Concerto; 2 Decide; DGNB
Reduction in lifecycle CO2 emissions	% in tonnes	Percentage reduction in lifecycle CO2 emissions achieved by the project	CIVIS; DGNB
Maximum Hourly Deficit	MHDx	The maximum yearly value of how much the hourly local demand overrides the local renewable supply during one single hour	IDEAS
Local freight transport fuel mix	% in kms	The ratio of renewable fuels in the local freight transport fuel mix in the project.	CIVITAS 2DECIDE

1.2.2 Materials, water and land

Indicator title	Indicator unit	Definition	Source
Materials			
Increased efficiency of resources consumption	% in tonnes	Percentage reduction in material consumption of the project	Eurbanlab; ISO 37151; DGNB

Share of recycled input materials	% in tonnes	Share of recycled and re-used materials used by the project	Eurbanlab; LEED
Share of renewable materials	% in tonnes	Share of renewable materials used by the project	Eurbanlab
Share of materials recyclable	% in tonnes	Share of materials used by the project that are practically retrievable for recycling after the life time	Eurbanlab
Life time extension	Likert	The extent to which the project attempted to prolonge the service lifetime of products	
<u>Water</u>			
Reduction in water consumption	% in m3	Percentage reduction in water consumption brought about by the project	
Increase in water re-used	% in m3	Increase in percentage of rain and grey water re-used to replace potable water	LEED; OECD
Self-sufficiency - Water	% in m3	Increased share of local water resources	
<u>Land</u>			
Increase in compactness	% of people or workplaces	Percentage increase in the number of people or workplaces situated in the project area	FIN Indicators
Self-sufficiency - Food	% in tonnes	Increase in the share of local food production due to the project	

1.2.3 Climate resilience

Indicator title	Indicator unit	Definition	Source
Climate resilience measures	Likert scale	The extent to which adaptation options have been considered in the project	Eurbanlab

1.2.4 Pollution & waste

Indicator title	Indicator unit	Definition	Source
Decreased emissions of Nitrogen oxides (NOx)	% in tonnes	Percentage reduction in NOx emissions (NO and NO2) achieved by the project	Eurbanlab; Civitas; 2Decide

Decreased emissions of Particulate matter (PM2,5)	% in tonnes	Percentage reduction in PM2,5 emissions achieved by the project	Eurbanlab; Civitas
Reduced exposure to noise pollution	% in dB	Percentage reduction of noise level at night measured at the receiver	ISO 37120; FIN Indicators; Rotterdam SCP; OECD; ClimateCon; European Green Capital Award study; DGNB
Reduction in the amount of solid waste collected	% in tonnes	Percentage reduction in the amount of waste collected due to the project	Siemens Green City Index; Smart city Profiles; Rotterdam SCP; Transform; Desire; OECD; ClimateCon; SCI; European Green Capital Award study; City Protocol

1.2.5 Ecosystem

Indicator title	Indicator unit	Definition	Source
Increase in green and blue space	% in m2	Percentage increase of green and blue spaces due to the project	
Increased ecosystem quality and biodiversity	Likert	The extent to which ecosystem quality and biodiversity aspects have been taken into account	

1.3 Prosperity

1.3.1 Employment

Indicator title	Indicator unit	Definition	Source
Increased use of local workforce	% in euros	Share in the total project costs that has been spent on local suppliers, contractors and service providers.	Eurbanlab
Local job creation	# of jobs	Number of jobs created by the project	

1.3.2 Equity

Indicator title	Indicator unit	Definition	Source
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Fuel poverty	%-points in euros	Change in percentage points of (gross) household income spent on energy bills	Eurbanlab
Costs of housing	% in euros	The percentage of gross household income spent on housing	Eurbanlab; LEED

1.3.3 Green economy

Indicator title	Indicator unit	Definition	Source
Certified companies involved in the project	% of companies	Share of the companies involved in the project holding an ISO 14001 certificate	
Green public procurement	Likert scale	The extent to which GPP criteria were taken into account for the procurement processes related to the project	
CO2 reduction cost efficiency	€/ton CO2 saved/year	Costs in euro's per ton of CO2 saved per year	Eurbanlab

1.3.4 Economic performance

Indicator title	Indicator unit	Definition	Source
Financial benefit for the end-user	€/household/yr	Total cost savings in euros for end-users per household per year	DGNB; Eurbanlab
Net Present Value (NPV)	€	The Net Present Value of the project calculated over the lifetime	Urbgrade; Eurbanlab; Concerto; 2DECIDE
Internal rate of return (IRR)	% (interest)	The interest rate at which the NPV of the investment is zero	Urbgrade; 2DECIDE
Payback Period	Yrs	The number of years at which the net present value of costs (negative cash flows) of the investment equals the net present value of the benefits (positive cash flows) of the investment	Urbgrade, Eurbanlab; Concerto
Total cost vs. subsidies	% in euros	The percentage of subsidies as share of total investment of the project	Eurbanlab

1.3.5 Innovation

Indicator title	Indicator unit	Definition	Source
Involvement of extraordinary professionals	Likert	The extent to which the project involved professionals normally not encountered in these type of projects	Smart city Wheel
Stimulating an innovative environment	Likert scale	The extent to which the project is part of or stimulates an innovative environment	
Quality of open data	# stars	The extent to which the quality of the open data produced by the project was increased	
New startups	# of startups	The number of startups resulting from the project	Smart city Wheel
Improved interoperability	Likert scale	The extent to which the project has increased interoperability between systems	ISO 37151

1.3.6 Attractiveness & competitiveness

Indicator title	Indicator unit	Definition	Source
Decreased travel time	% in hours	Percentage decrease in travel time due to the project	2DECIDE

1.4 Governance

1.4.1 Organisation

Indicator title	Indicator unit	Definition	Source
Leadership	Likert scale	The extent to which the leadership of the project is successful in creating support for the project.	Eurbanlab
Balanced project team	Likert scale	The extent to which the project team included all relevant experts and stakeholders from the start	Eurbanlab; DGNB
Involvement of the city administration	Likert scale	The extent to which the local authority is involved in the development of the project, other than financial, and how many departments are contributing	
Clear division of responsibility	Yes/no	Has the responsibility for achieving the social and sustainability targets been clearly assigned to (a) specific actor(s) in the project?	Eurbanlab; LEED
Continued monitoring and reporting	Likert scale	The extent to which the progress towards project goals and compliance with requirements is being monitored and reported	Eurbanlab
Market orientation	Likert scale	The extent to which the project was planned on the basis of a market analysis	DGNB

1.4.2 Community involvement

Indicator title	Indicator unit	Definition	Source
Professional stakeholder involvement	Likert scale	The extent to which professional stakeholders outside the project team have been involved in planning and execution	Eurbanlab; Green Digital Charter
Bottom-up or top-down initiative	Yes/no	Has the project idea originated from the local community?	
Local community involvement in planning phase	Likert scale	The extent to which residents/users have been involved in the planning process	Eurbanlab; Green Digital Charter

Local community involvement in implementation phase	Likert scale	The extent to which residents/users have been involved in the implementation process
Participatory governance	% of people	Share of population participating in online platforms

1.4.3 Multi-level governance

Indicator title	Indicator unit	Definition	Source
Smart city policy	Likert scale	The extent to which the project has benefitted from a governmental smart city policy	Eurbanlab
Municipal involvement - Financial support	Likert scale	The extent to which the local authority provides financial support to the project	DGNB

1.5 Propagation

1.5.1 Replicability & scalability

Indicator title	Indicator unit	Definition and extensive description	Source
Social compatibility	Likert scale	The extent to which the project's solution fits with people's 'frame of mind' and does not negatively challenge people's values or the ways they are used to do things.	Eurbanlab
Technical compatibility	Likert scale	The extent to which the smart city solution fits with the current existing technological standards/infrastructures	Eurbanlab
Ease of use for end users of the solution	Likert scale	The extent to which the solution is perceived as difficult to understand and use for potential end-users	Eurbanlab
Ease of use for professional stakeholders	Likert scale	The extent to which the innovation is perceived as difficult to understand, implement and use for professional users of the solution	Eurbanlab
Trialability	Likert scale	The extent to which the solution can be experimented with on a limited basis in the local context before full implementation	Eurbanlab
Advantages for end users	Likert scale	The extent to which the project offers clear advantages for end users	Eurbanlab; 2DECIDE; CIVITAS; ISO 37151; Civitas
Advantages for stakeholders	Likert scale	The extent to which the project offers clear advantages for stakeholders	Eurbanlab
Visibility of Results	Likert scale	The extent to which the results of the project are visible to external actors	Eurbanlab
Solution(s) to development issues	Likert scale	The extent to which the project offers a solution to problems which are common to European cities	Eurbanlab
Market demand	Likert scale	The extent to which there is a general market demand for the solution	Eurbanlab

1.5.2 Factors of success

Indicator title	Indicator unit	Definition and extensive description	Source
Changing professional norms	Likert scale	The extent to which the project changes the professional 'state of the art'	Eurbanlab
Changing societal norms	Likert scale	The extent to which the project changes the norms and values of the society	Eurbanlab
Diffusion to other locations	Likert scale	The extent to which the project is copied in other cities and regions	Eurbanlab
Diffusion to other actors	Likert scale	The extent to which the project is copied by other parties	Eurbanlab
Change in rules and regulations	Likert scale	The extent to which the project has contributed to, or inspired, changes in rules and regulations	Eurbanlab
Change in public procurement	Likert scale	The extent to which the project has contributed to, or inspired, new forms of public procurement procedures	Eurbanlab
New forms of financing	Likert scale	The extent to which the project has contributed to, or inspired, the development of new forms of financing	Eurbanlab
Smart city project visitors	# of visitors	The number of visitors to the physical project site or to the website hosting the smart city project	