CITYkeys

Performance measurement of smart cities

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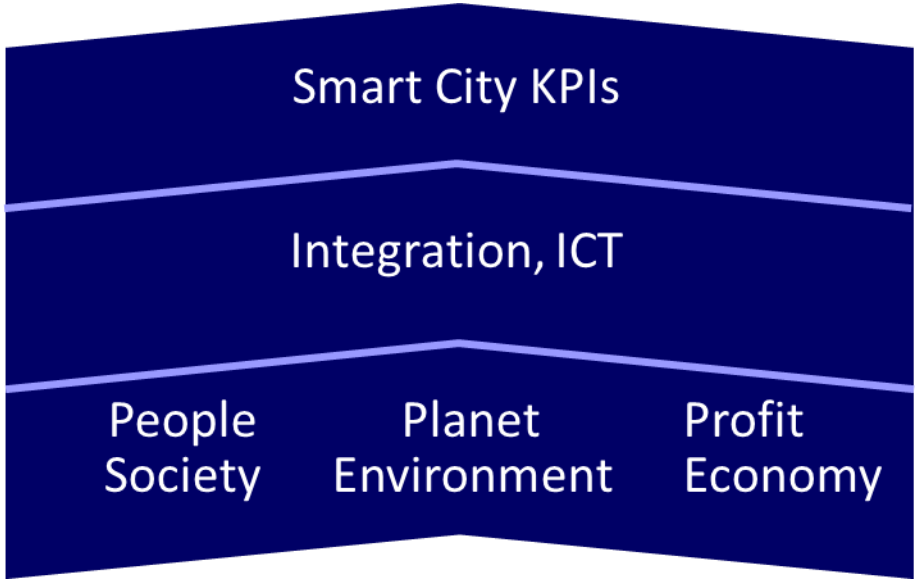
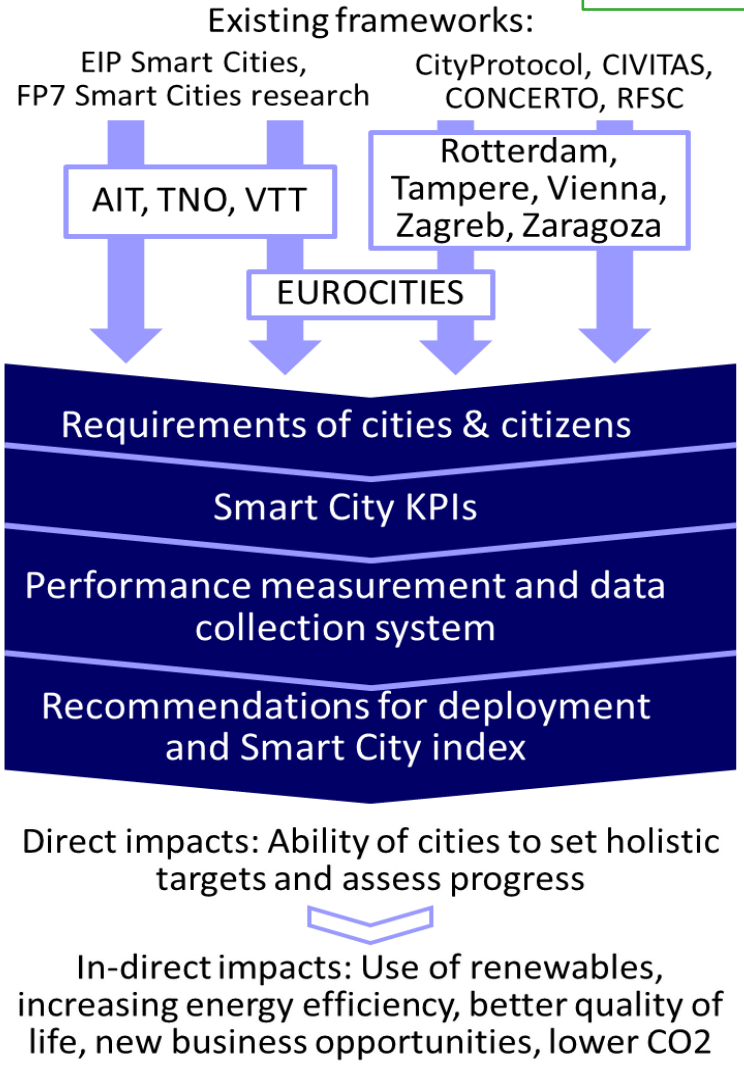
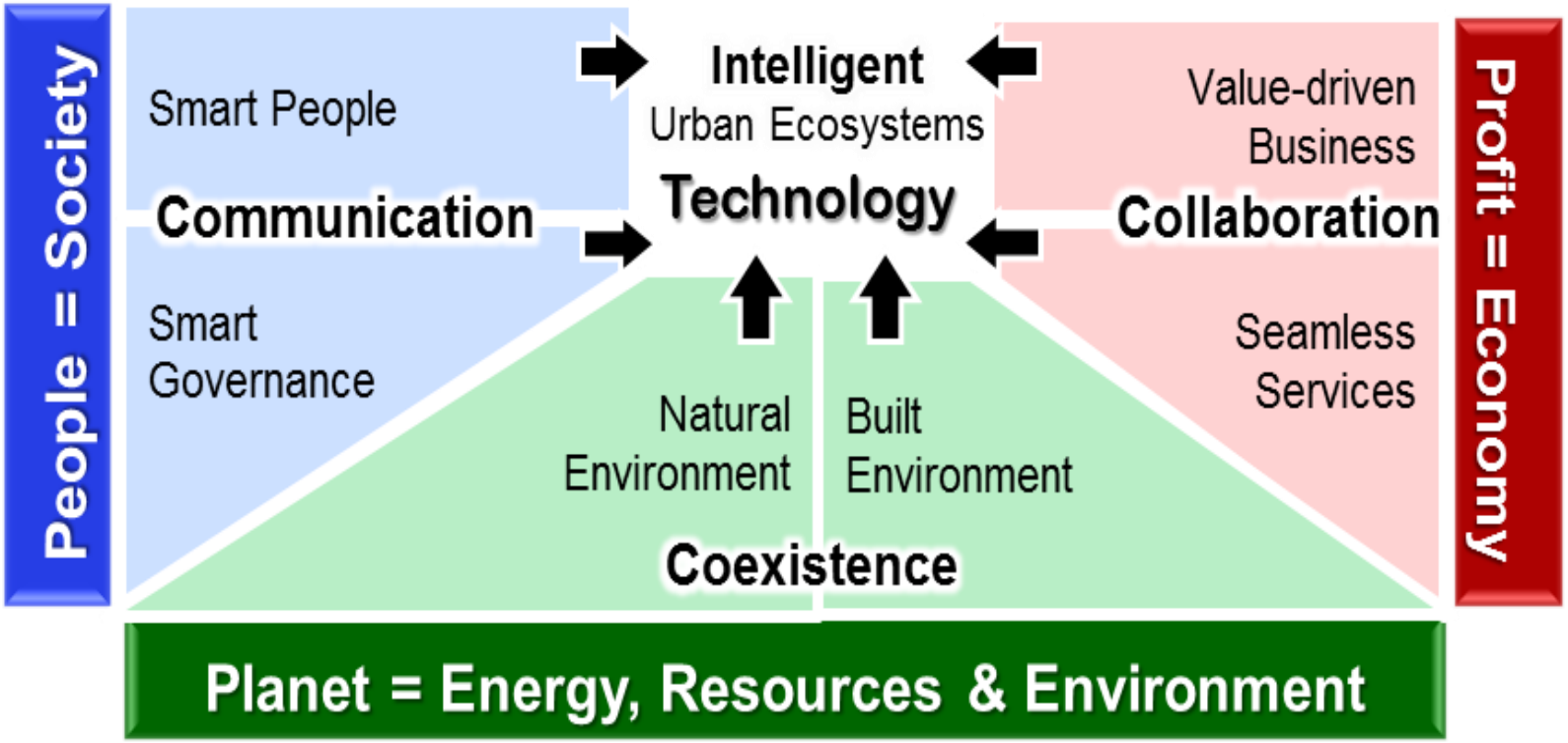
The goal of CITYkeys is to provide a validated, holistic performance measurement framework for monitoring and comparing the implementation of Smart City solutions.




Existing frameworks:
EIP Smart Cities,
FP7 Smart Cities research
CityProtocol, CIVITAS,
CONCERTO, RFSC
AIT, TNO, VTT
Rotterdam,
Tampere, Vienna,
Zagreb, Zaragoza
EUROCITIES
Requirements of cities & citizens
Smart City KPIs
Performance measurement and data collection system
Recommendations for deployment and Smart City index
Direct impacts: Ability of cities to set holistic targets and assess progress
In-direct impacts: Use of renewables, increasing energy efficiency, better quality of life, new business opportunities, lower CO2

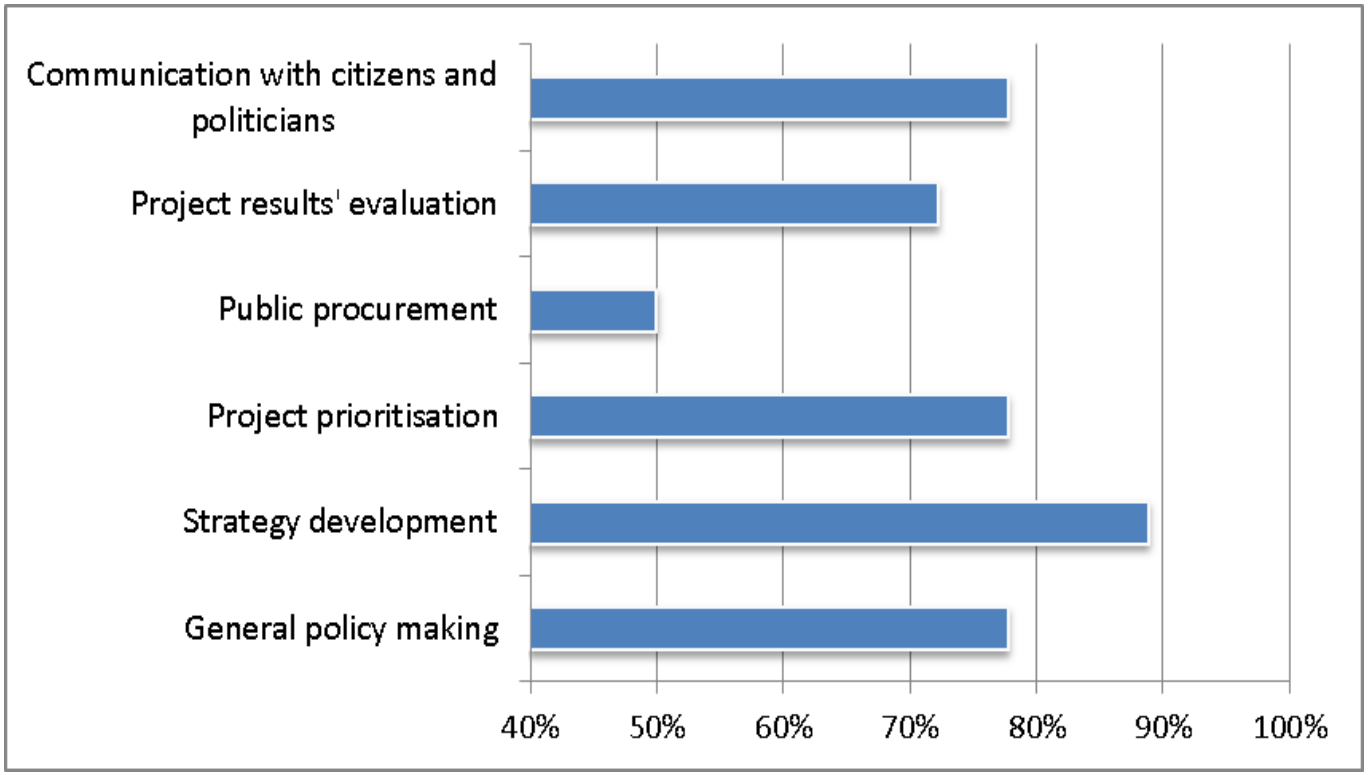


- Existing frameworks; Concerto, ITU etc.

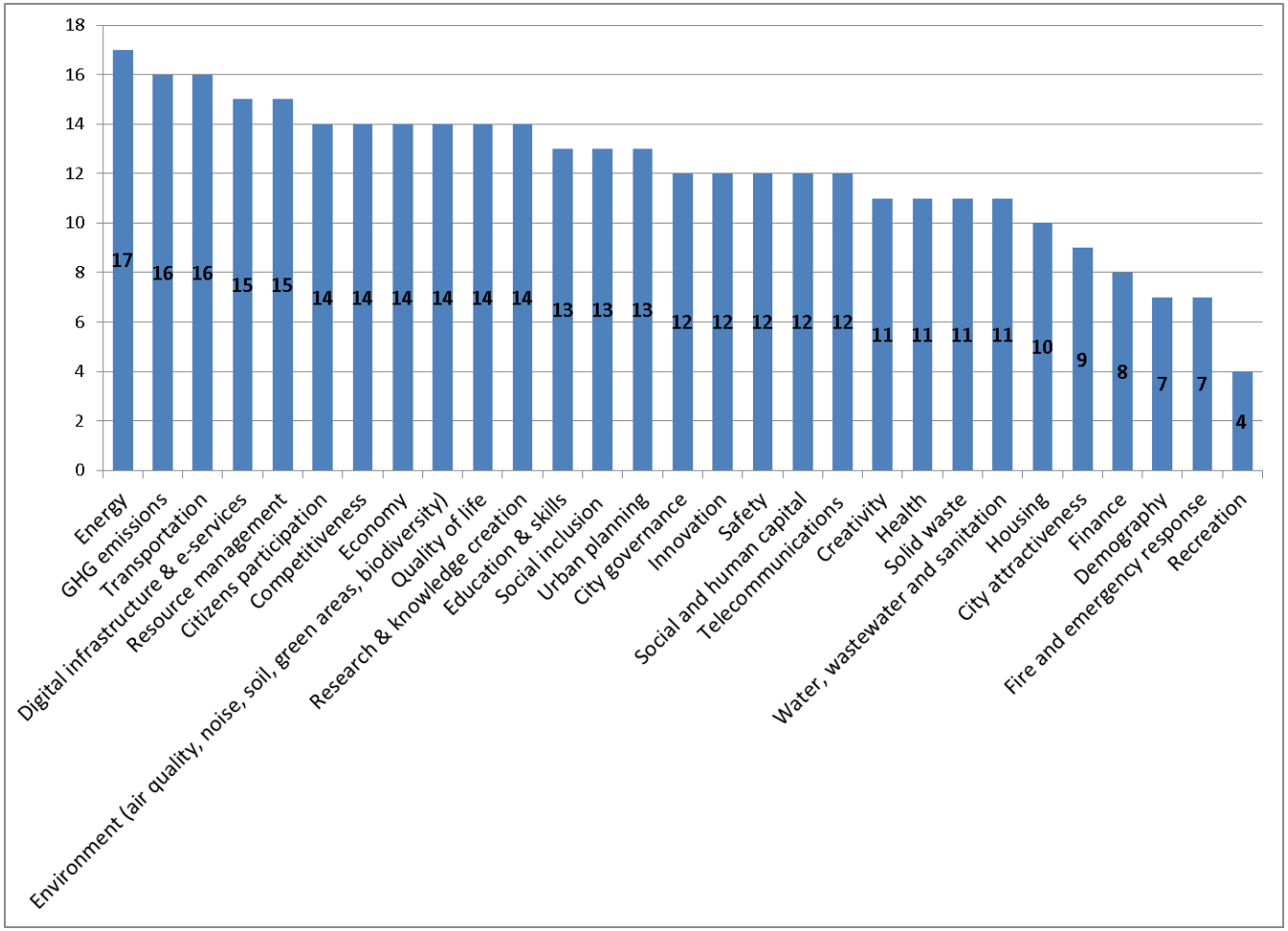
Citykeys goal and strategy

Cities and citizens needs

For what kind of decisions would you need performance measurement for?



Cities need to measure performance



Mapped existing frame works

- European frameworks
- International and European Standards
- Neighborhood certification schemes
- Relevant FP7 and H2020 projects
- Selected country frameworks
- Other international frameworks

Mapping existing frameworks

European Initiatives

1 - Concerto
2 - Smart City Information System (in development)
3 - Civitas
4 - Green Digital Charter
5 - RFSC Reference framework for sustainable cities
6 - Covenant of Mayors
7 - European Smart City Index

International and European Standards

1 - ISO 37120 Sustainable Development of Communities
2 - ISO 37151
3 - ITU FG-SSC

Neighborhood Certification Schemes

1 - DGNB / OEGNI for urban districts
2 - BREEAM Communities
3 - LEED v4 for Neighborhood Development
4 - CASBEE Cities
5 - CASBEE Urban Development
6 - 2000-Watt-Site

Other relevant indicator frameworks

1 - ClimateCon
2 - Global City Indicators Facility
3 - OECD Green growth in cities
4 - UN Habitat City Prosperity index
5 - UNECE United Smart Cities
6 - CITY PROTOCOL

Relevant FP7 and Horizon 2020 Projects

1 - CITINES (in development)
2 - CIVIS
3 - DESIRE
4 - ECODISTR-ICT
5 - EURBANLAB
6 - IDEAS
7 - PLEEC
8 - READY
9- TRANSFORM
10 - URB-GRADE
11 - URBES
12 - 2DECIDE

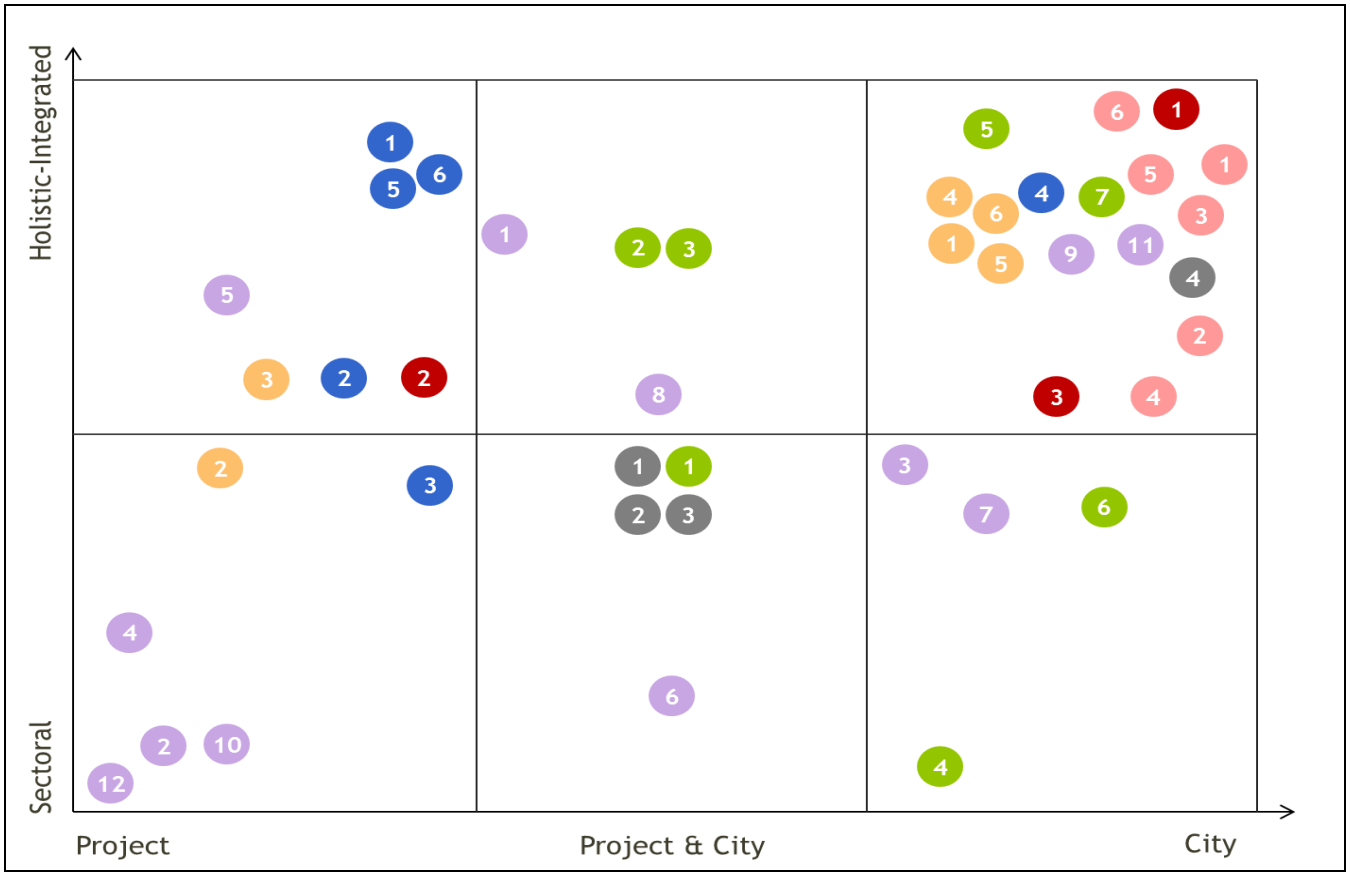
Relevant National Initiatives

Dutch
1 - SCP Rotterdam
2 - GPR-Stedenbouw
3 - IVAM - DPL (/Duurzaamheidsindex)
4 - Telos: European Green Capital Award
Austrian
5 - Smart City Profiles
Finnish
6 - Common indicators for sustainable development in 6 Finnish cities

Other indicator systems mentioned in the proposal

1 - Siemens Green City Index
2 - Smart City Wheel
3 - Triple Helix

Mapping existing frameworks



Preliminary structure

- **People** *(e.g. safety, health, diversity, quality of built environment)*
- **Planet** *(environment, ecosystem, energy and other resources)*
- **Prosperity** *(employment, economic performance, Innovation)*
- **Process** *(multilevel governance, organisation, co-creation, engagement)*
- **Propagation** *(scalability, replicability)*

Preliminary sub themes

People - Quality of life

Health (eg heat stress; noise; air quality; sanitation, access to health services)

Safety

Access to services/resources/amenities/networks

Culture and leisure (later included in "access to services)

Education & skills (high level education; early classes of technology)

Creativity (later included in "education")

Diversity & Social inclusion

Quality of housing and of the built environment

Planet - Resource efficiency

Energy and mitigation (performance, savings, efficiency, renewable energy, CO_2/GHG emission / savings)

Climate resilience

Resources

Water (later included in "resources")

Environment (later rephrased as "Pollution and Waste")

Ecosystems

Red is (also) recognized as important and/or necessary by at least 50% of the cities participating in the survey
Green is (also) considered priority by citizens

Preliminary structure

Prosperity

Economic Performance / GDP

Equity

Employment

City attractiveness

Innovation

Process

Policy & Organisation (later rephrased as "Organisation")

Community engagement

Citizen participation (later rephrased as "Co-creation")

Multilevel governance

Propagation (only at project level)

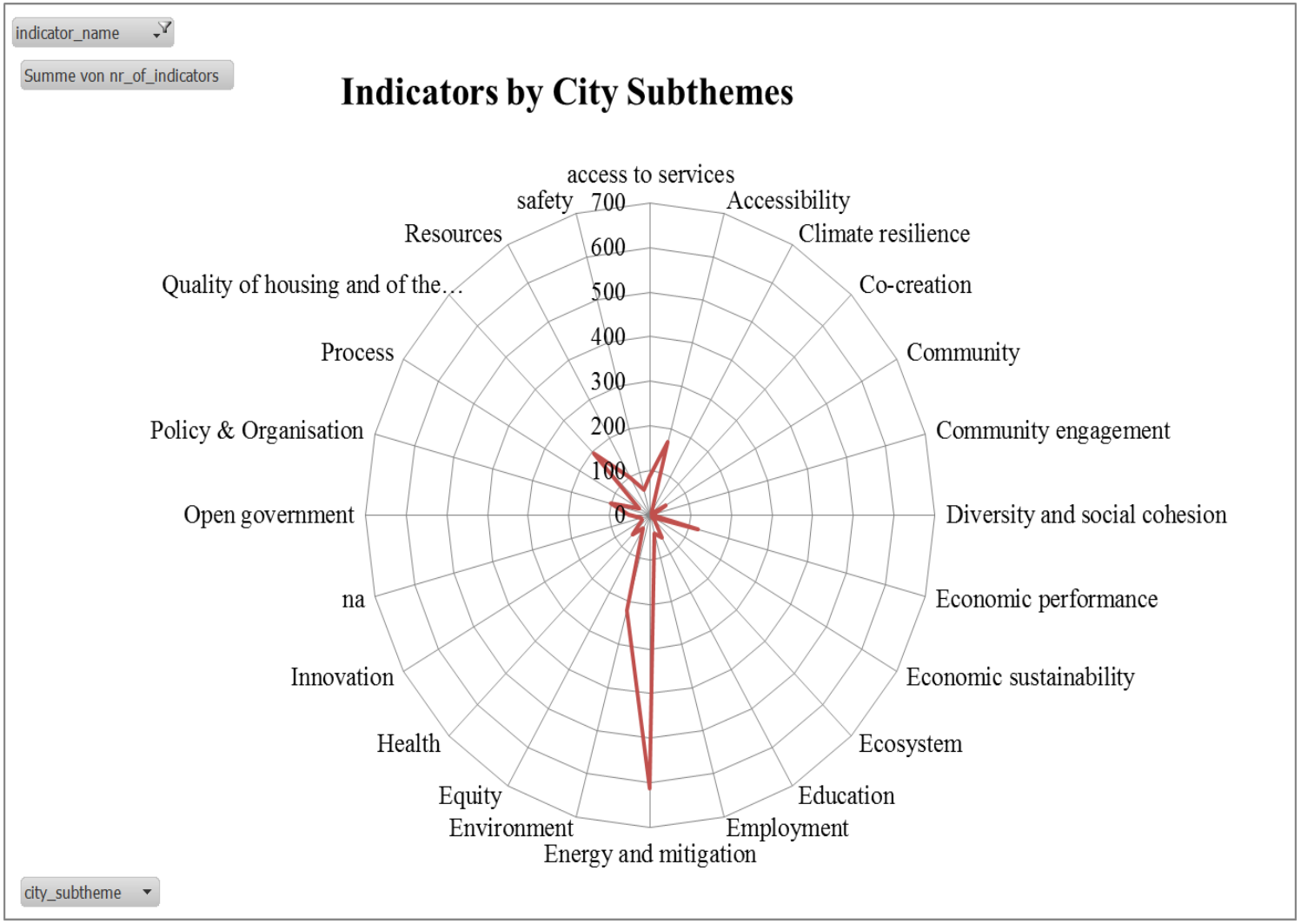
Scalability

Replicability

Red is (also) recognized as important and/or necessary by at least 50% of the cities participating in the survey
Green is (also) considered priority by citizens

Preliminary structure

People	Planet	Prosperity	Process	Propagation
• Education	• Energy & mitigation	• Employment	• Multilevel governance	• Scalability
• Diversity & social cohesion	• Other resources	• Equity	• Organisation	• Replicability
• Safety	• Climate resilience	• Green economy	• Co-creation	
• Health	• Environment	• Economic performance	• Community engagement	
• Quality of housing and of the built environment	• Ecosystem	• Accessibility		
• Access to (other) services		• Innovation		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Summe von nr_of_indicators
Indicators by City Subthemes
access to services
Accessibility
Climate resilience
Co-creation
Community
Community engagement
Diversity and social cohesion
Economic performance
Economic sustainability
Ecosystem
Education
Employment
Energy and mitigation
Environment
Equity
Health
Innovation
na
Open government
Policy & Organisation
Process
Quality of housing and of the…
Resources
safety
700
600
500
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100
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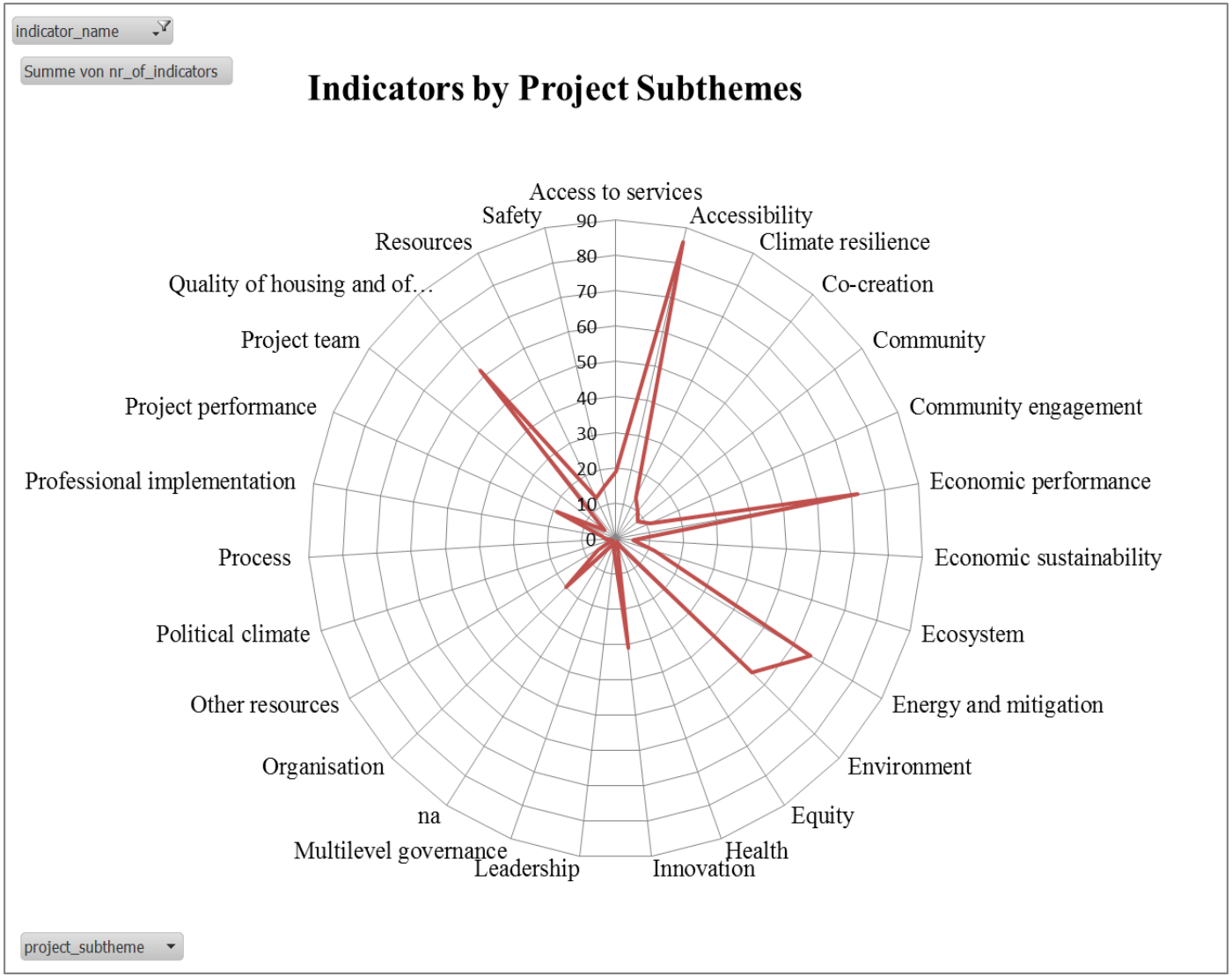
city_subtheme


indicator_name
Summe von nr_of_indicators
Indicators by Project Subthemes
Access to services
Accessibility
Climate resilience
Co-creation
Community
Community engagement
Economic performance
Economic sustainability
Ecosystem
Energy and mitigation
Environment
Equity
Health
Innovation
Leadership
Multilevel governance
na
Organisation
Other resources
Political climate
Process
Professional implementation
Project performance
Project team
Quality of housing and of…
Resources
Safety
90
80
70
60
50
40
30
20
10
0
project_subtheme

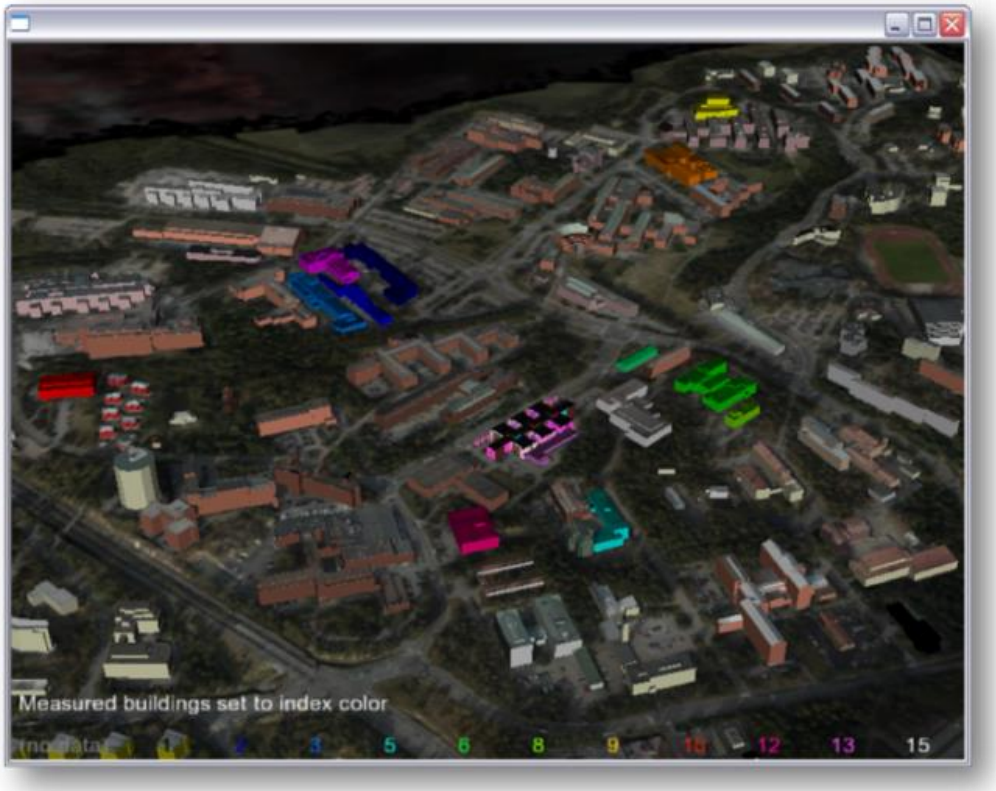
Gap analyse

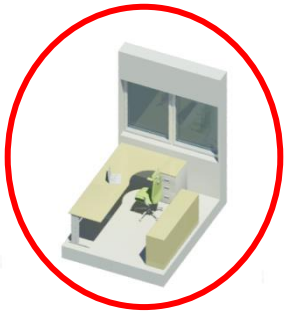
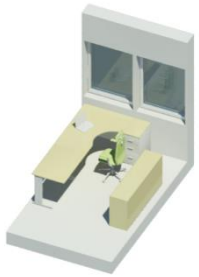
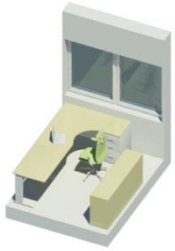
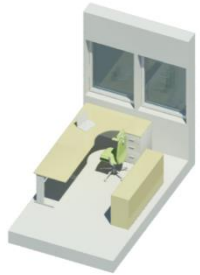
- There are in principle indicators available for each of the subthemes. However, there are significant variations in the coverage of the subthemes
- Best covered are People, Planet and Prosperity

People	Planet	Prosperity	Process	Propagation
• Education	• Energy & mitigation	• Employment	• Multilevel governance	• Scalability
• Diversity & social cohesion	• Other resources	• Equity	• Organisation	• Replicability
• Safety	• Climate resilience	• Green economy	• Co-creation	
• Health	• Environment	• Economic performance	• Community engagement	
• Quality of housing and of the built environment	• Ecosystem	• Accessibility		
• Access to (other) services		• Innovation		

KPIs

- What you measure is what you get



	7 m²/person 6 h/d	7 m²/person 8 h/d	7 m²/person 12 h/d	10 m²/person 12 h/d	15 m²/person 6 h/d
kWh/m²					
kWh/m², occupied hours					

Sources: Airaksinen et al. 2014, Effects of building occupancy on indicators of energy efficiency
VTT Ingrid Innovation program. http://www.vtt.fi/research/innovation_ingrid.jsp.

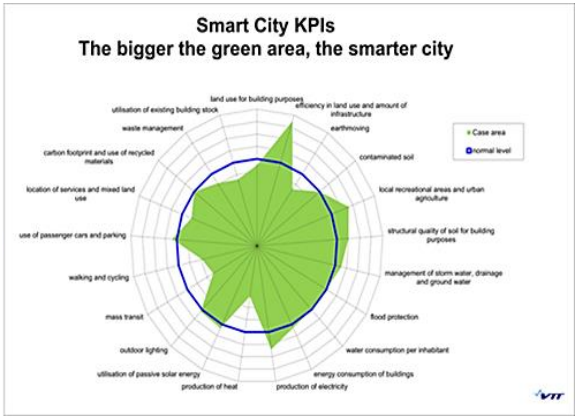
Examples

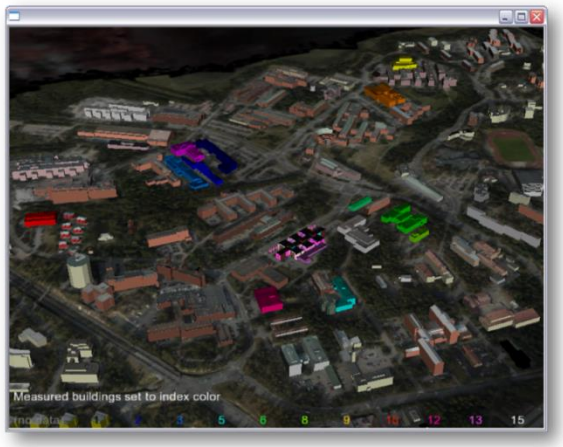
- Access to services (e.g. xx m2), Likert scale
- Reduction in energy consumption, (e.g. compared to base line kWh/m2), percentage %

- What kind of indicators are useful and is the data available/easy to access?

Performance monitoring

- Decision-support based on:
  - reliable real-time monitoring on smart city performance
  - holistic key performance indicators framework and a city index
- The implementation of a common performance measurement framework is based on a set of **relevant indicators**, **open data applications** and **decision-support user-interfaces**
  - enables stakeholders to learn from each other, create trust in solutions and monitor progress.

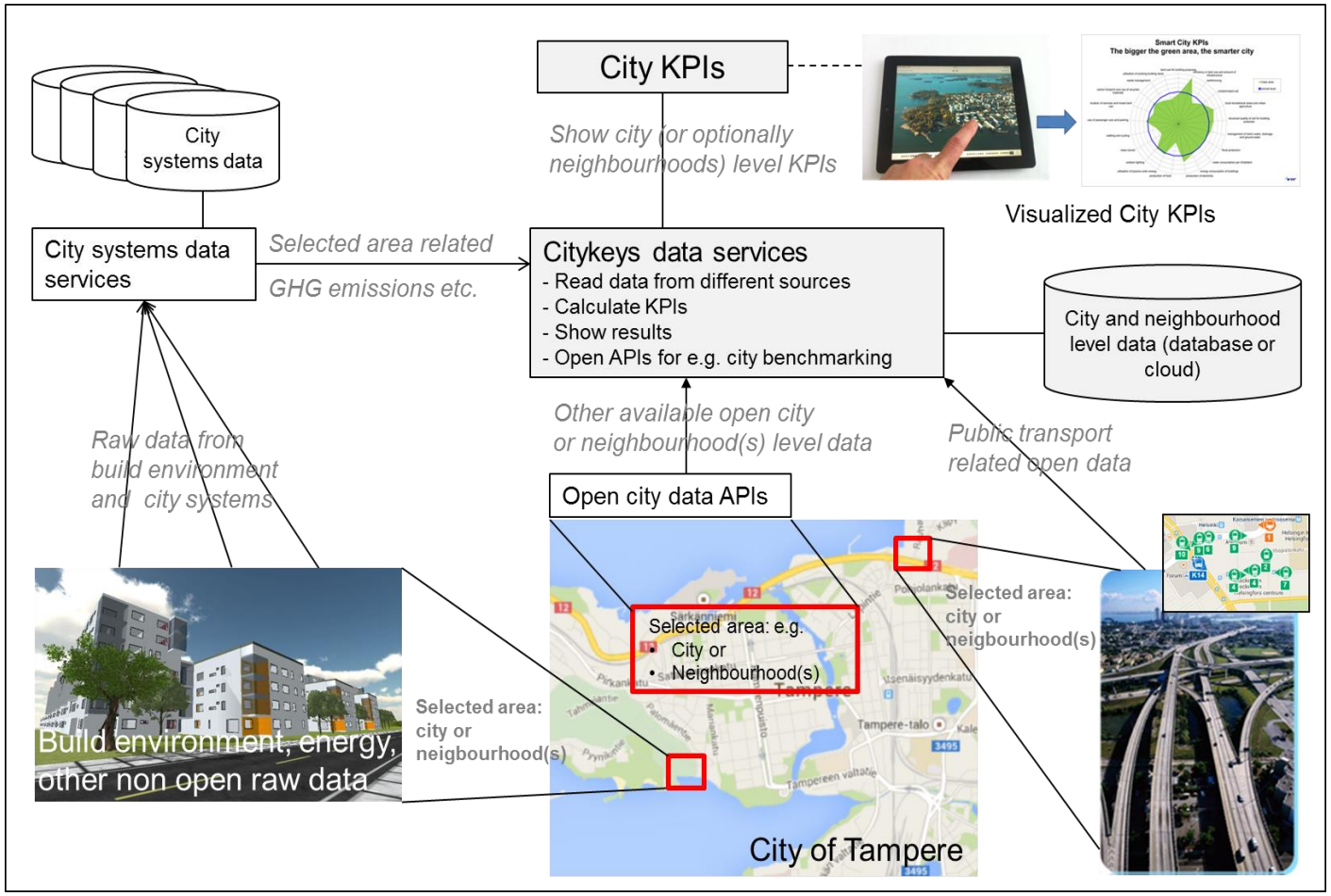




City performance monitoring

- Performance analysis is an important tool in plan or project assessment, but also in assessing cities.
  - Help in setting goals and strategies for the future
- The goal function is to combine city level operation with co-operation between local different systems in order to monitor performance
  - Intelligence and interoperable interfaces are added between separate systems
- “Raw” information is collected with help of fused sensing, data monitoring technologies, and the Internet-of-things (IoT) from various sources
  - These are enriched to information through KPIs calculation and further developed to decision making services.

City Monitoring system - System concept



Sources: VTT Pro-IoT spearhead program. http://www.vtt.fi/research/spearhead_iot.jsp.
VTT Ingrid Innovation program. http://www.vtt.fi/research/innovation_ingrid.jsp.

CITYKEYS in nutshell

- The project focuses on developing and validating, together with cities, performance indicators and data collection procedures that will be used for the common and transparent monitoring of Smart City projects (initiatives/actions) and solutions across European cities.
- The key results are:
  - Key performance indicators for smart city projects
  - Performance measurement framework, Data sets & data collection
  - Policy making recommendations
  - Business models & opportunities
  - Smart city index recommendations

- Thank you

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