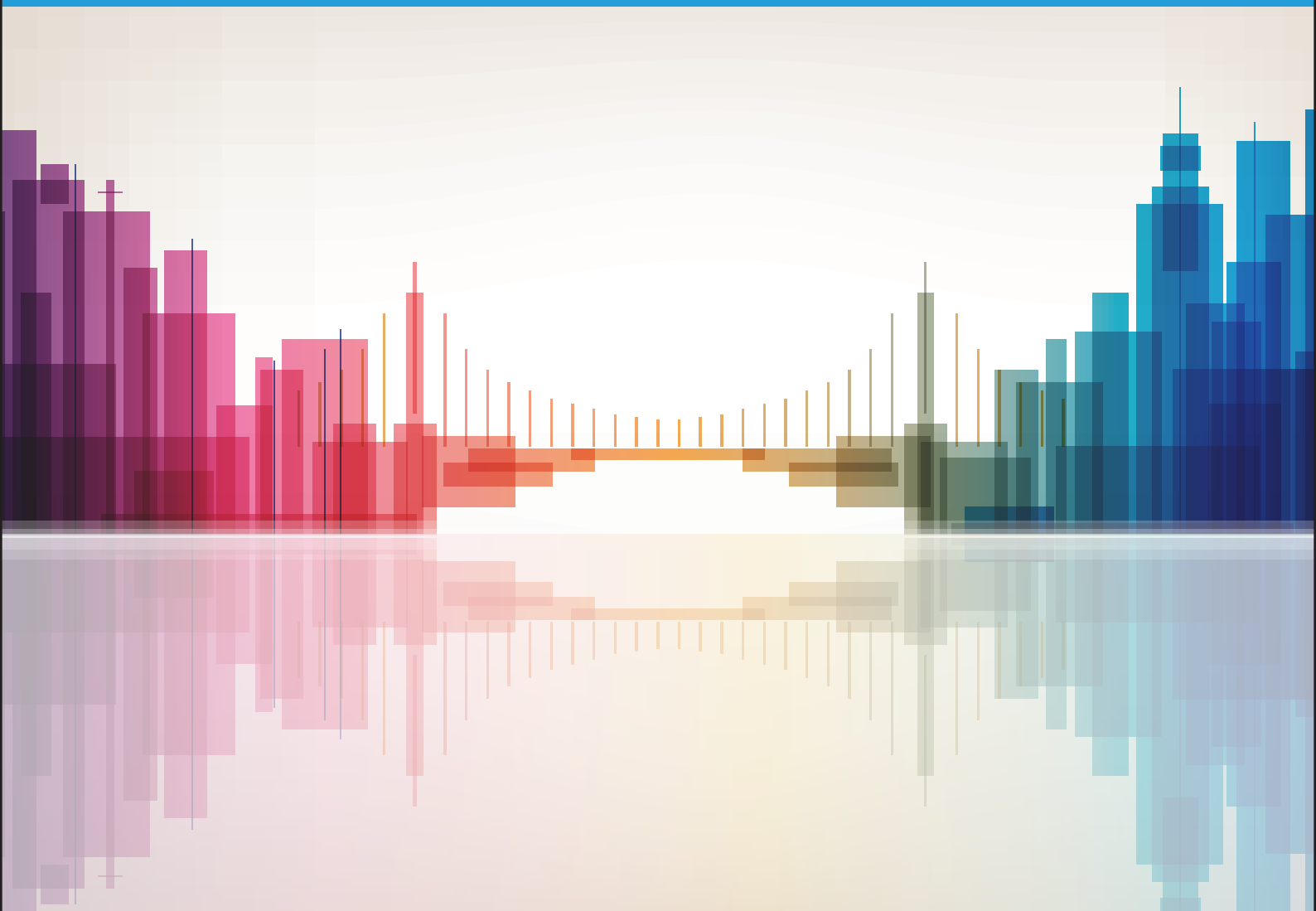


Verification Report **Trondheim, Norway** September 2020



TRONDHEIM KOMMUNE

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Verification Report

Trondheim, Norway

11 SUSTAINABLE CITIES AND COMMUNITIES



Foreword

This publication has been developed by ITU within the framework of the United for Smart Sustainable Cities (U4SSC) initiative. It provides an overview of the reporting and implementation of key performance indicators (KPIs) for smart sustainable cities (SSC) in the City of Trondheim, Norway. This set of KPIs for SSC was developed to establish the criteria to evaluate ICTs' contributions in making cities smarter and more sustainable, and to provide cities with the means for self-assessments.

Disclaimer

This report has been written by John Smiciklas.

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the contributing organizations.

Any references made to specific countries, companies, products, initiatives, policies, framework or guidelines do not in any way imply that they are endorsed or recommended by ITU, the authors, or any other organization that the authors are affiliated with, in preference to others of similar nature that are not mentioned.

This publication is intended for informational purposes only. The results and interim findings presented are a work in progress, as the KPIs (Recommendation ITU-T Y.4903/L.1603) implemented in Trondheim during the first phase of the project are being refined to improve the applicability of these KPIs to all cities. The revision of the KPIs may alter their scope and definition as well as the required data-collection process.

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1. Introduction and Verification Background

This report contains the verification results for the KPI submission by the city of Trondheim to the requirements of the United for Smart Sustainable Cities (U4SSC) Key Performance Indicators (KPIs) as described within the ‘[Collection Methodology for Key Performance Indicators for Smart Sustainable Cities](#)’.

John Smiciklas, who is certified as a U4SSC Key Performance Indicators for Smart Sustainable Cities Verifier, completed the verification in March 2020.

The verification assessment activities included:

- collecting and reviewing KPI data;
- interviewing city stakeholders;
- verifying that the data submitted are in conformance with the requirements of the [Collection Methodology for Key Performance Indicators for Smart Sustainable Cities](#); and
- preparing the Verification Report.

The verification was conducted using the information made available by the city and the information presented during follow-up activities. It was planned and performed in order to obtain limited assurance with respect to the information examined.

There were no limitations that impacted the completion of this verification.

2. KPI Reporting and Verification Summary

	Total	Reported	Verified	% KPIs Verified
Economy				
Core KPIs	23	23	23	100 %
Advanced KPIs	22	20	20	91 %
Environment				
Core KPIs	12	12	12	100 %
Advanced KPIs	5	5	5	100 %
Society & Culture				
Core KPIs	19	19	19	100 %
Advanced KPIs	10	9	9	90 %
Overall				
Core KPIs	54	54	54	100 %
Advanced KPIs	37	34	34	92 %
Total	91	88	88	97 %

3. KPI Data Points Reporting and Verification Summary

Certain KPIs are composed of more than one data point.

Below is a summary of the verification results of those data points.

	Total	Reported	Verified	% Data Points Verified
Economy				
Core Data Points	24	24	24	100 %
Advanced Data Points	31	29	29	94 %
Environment				
Core Data Points	23	23	23	100 %
Advanced Data Points	5	5	5	100 %
Society & Culture				
Core Data Points	19	19	19	100 %
Advanced Data Points	10	9	9	90 %
Overall				
Core Data Points	66	66	66	100 %
Advanced Data Points	46	43	43	93 %
Total	112	109	109	97 %

5. Benchmarks and Scoring Methodology

As part of the U4SSC KPIs project, benchmarks were developed for most KPIs in order to develop a reporting framework with which to demonstrate to cities how their performance could be reported.

The benchmarks were set based on several factors:

- fully meeting the aligned SDG(s);
- performance compared with other international and transnational targets (e.g. OECD, European Commission);
- performance against a UN agency's goals (e.g. International Telecommunication Union);
- evaluation of city performance using UN and other international statistical data; and
- performance measured versus leading city performance globally.

Performance to benchmarks were then scored in four ranges for every KPI and data point reported:

- 0 – 33 % of target – 1 pt;
- 33 – 66 % of target – 2 pts;
- 66 – 95 % of target – 3 pts; and
- 95+ % of target – 4 pts.

The scores for each reported KPI and data point were added to give a percentage score for categories, sub-dimensions and dimensions and were reported based on the above target scores. KPIs or data points that are not reported or have no benchmarks yet defined were excluded.

Example: Education 4 KPIs

- If all 4 are reported and the scores are 1 pt, 3 pts, 4 pts and 1 pt;
Total score 9 pts out of 16 = 56.25 % reported as 33 – 66 % of target.
- If only 3 are reported and the scores are 3 pts, 4 pts and 2 pts;
Total score 9 pts out of 12 = 75 % reported as 66 – 95 % of target.

Targets and scoring are meant to provide additional context to KPI data and should be used in context with city goals and comparisons with other similar cities to determine future actions.

6. Verification Results

This section contains the data and results of the verification for Trondheim's reporting for each of the U4SSC KPIs within the three dimensions:

- Economy
- Environment
- Society and Culture

and the twenty-two categories of the dimensions:

- | | |
|------------------------|---------------------------|
| • ICT Infrastructure | • Air Quality |
| • Water and Sanitation | • Environmental Quality |
| • Drainage | • Public Space and Nature |
| • Electricity Supply | • Energy |
| • Transport | • Education |
| • Public Sector | • Health |
| • Innovation | • Culture |
| • Employment | • Housing |
| • Waste | • Social Inclusion |
| • Buildings | • Safety |
| • Urban Planning | • Food Security |

















Note: The following categories are reported under the Economy and the Environment dimensions.

- Water and Sanitation
- Waste








Note: For the results on following pages.

- **Core KPIs are highlighted in bold.**
- *Advanced KPIs are in italics.*

















Dimension: Economy

CATEGORY	KPI / Data Point	Results	Benchmark
 ICT INFRASTRUCTURE	Household Internet Access	98.00 %	
	Fixed Broadband Subscriptions	80.82 %	
	Wireless Broadband Subscriptions	116 000 / 100 000 inhabitants	
	Wireless Broadband Coverage: 3G	99.80 %	
	Wireless Broadband Coverage: 4G	99.80 %	
	Availability of Wi-Fi in Public Areas	0	N/A
 WATER AND SANITATION	Smart Water Meters	88.92 %	
	Water Supply ICT Monitoring	100.00 %	
	Basic Water Supply	96.95 %	
	Potable Water Supply	100.00 %	
	Water Supply Loss	28.42 %	
	Wastewater Collection	93.70 %	
 DRAINAGE	Household Sanitation	100.00 %	
	Drainage/Storm Water System ICT Monitoring	Not Reported	















Dimension: Economy (continued)

CATEGORY	KPI / Data Point	Results	Benchmark
 ELECTRICITY SUPPLY	Smart Electricity Meters	98.56 %	
	<i>Electricity Supply ICT Monitoring</i>	<i>100.00 %</i>	
	<i>Demand Response Penetration</i>	<i>0.00 %</i>	
	Electricity System Outage Frequency	0.70	
	Electricity System Outage Time	54.71 Minutes	
	Access to Electricity	100.00 %	










Dimension: Economy (continued)

CATEGORY	KPI / Data Point	Results	Benchmark
 <p>TRANSPORT</p>	Dynamic Public Transport Information	100.00 %	
	Traffic Monitoring	10.30 %	
	<i>Intersection Control</i>	<i>25.52 %</i>	
	Public Transport Network	89.80 Km / 100 000 inhabitants	
	<i>Public Transport Network Convenience</i>	<i>80.72 %</i>	
	Bicycle Network	94.64 Km / 100 000 inhabitants	
	<i>Transportation Mode Share: Private Vehicles</i>	<i>50.00 %</i>	
	<i>Transportation Mode Share: Public Transport</i>	<i>12.00 %</i>	
	<i>Transportation Mode Share: Walking</i>	<i>27.00 %</i>	
	<i>Transportation Mode Share: Cycling</i>	<i>10.00 %</i>	
	<i>Transportation Mode Share: Para Transport</i>	<i>Not Reported</i>	
	<i>Travel Time Index</i>	<i>1.55</i>	
	<i>Shared Bicycles</i>	<i>479.27 / 100 000 inhabitants</i>	
	<i>Shared Vehicles</i>	<i>232.07 / 100 000 inhabitants</i>	
	<i>Low-Carbon Emission Passenger Vehicles</i>	<i>17.59 %</i>	















Dimension: Economy (continued)

CATEGORY	KPI / Data Point	Results	Benchmark
 PUBLIC SECTOR	<i>Open Data Sets Published</i>	172	N/A
	<i>Open Data Sets % Availability</i>	100.00 %	
	<i>e-Government</i>	100 Services	N/A
	<i>Public Sector e-Procurement</i>	100.00 %	
 INNOVATION	R&D Expenditure	4.60 % GDP	
	Patents	15.13 / 100 000 inhabitants	
	<i>Small and Medium-Sized Enterprises</i>	99.24 %	
 EMPLOYMENT	Unemployment Rate	1.79 %	
	Youth Unemployment Rate	1.32 %	
	<i>Tourism Sector Employment</i>	6.33 %	
	<i>ICT Sector Employment</i>	4.81 %	
 WASTE	Solid Waste Collection	100.00 %	
 BUILDINGS	<i>Public Building Sustainability</i>	0.33 %	
	<i>Integrated Building Management Systems in Public Buildings</i>	70.00 %	





















Dimension: Economy (continued)

CATEGORY	KPI / Data Point	Results	Benchmark
 URBAN PLANNING	<i>Pedestrian Infrastructure</i>	0.00 %	   
	<i>Urban Development and Spatial Planning: Compact</i>	YES	   
	<i>Urban Development and Spatial Planning: Connected</i>	YES	
	<i>Urban Development and Spatial Planning: Integrated</i>	YES	
	<i>Urban Development and Spatial Planning: Inclusive</i>	YES	
	<i>Urban Development and Spatial Planning: Resilient</i>	YES	


















Dimension: Environment

CATEGORY	KPI / Data Point	Results	Benchmark
 <p>AIR QUALITY</p>	Particulate Matter (PM 2.5)	6.20 $\mu\text{g} / \text{m}^3$	
	Particulate Matter (PM 10)	10.00 $\mu\text{g} / \text{m}^3$	
	Nitrogen Dioxide (NO_2)	18.20 $\mu\text{g} / \text{m}^3$	
	Sulphur Dioxide (SO_2)	0.98 $\mu\text{g} / \text{m}^3$	
	Ozone (O_3)	36.10 $\mu\text{g} / \text{m}^3$	
	GHG Emissions	2.46 tonnes $\text{eCO}_2 / \text{capita}$	
 <p>WATER AND SANITATION</p>	Drinking Water Quality	98.72 %	
	Water Consumption	230.00 $\ell / \text{day} / \text{capita}$	
	Freshwater Consumption	100.00 %	
	Wastewater Treatment: Primary	97.83 %	
	Wastewater Treatment: Secondary	0.00 %	
	Wastewater Treatment: Tertiary	0.00 %	

Dimension: Environment (continued)



















CATEGORY	KPI / Data Point	Results	Benchmark
 <p>WASTE</p>	Solid Waste: Landfill	2.82 %	
	Solid Waste: Burnt	0.00 %	
	Solid Waste: Incinerated	67.87 %	
	Solid Waste: Open Dump	0.00 %	
	Solid Waste: Recycled	29.21 %	
	Solid Waste: Other	0.10 %	
 <p>ENVIRONMENTAL QUALITY</p>	EMF Exposure	100.00 %	
	<i>Noise Exposure</i>	<i>44.90 %</i>	
 <p>PUBLIC SPACE AND NATURE</p>	Green Areas	33 436 ha / 100 000 inhabitants	
	<i>Green Area Accessibility</i>	<i>98.68 %</i>	
	<i>Protected Natural Areas</i>	<i>40.04 %</i>	
	<i>Recreational Facilities</i>	<i>2 425 934 m² / 100 000 inhabitants</i>	
 <p>ENERGY</p>	Renewable Energy Consumption	100.00 %	
	Electricity Consumption	13 424 kWh / yr. / capita	
	Residential Thermal Energy Consumption	12.05 GJ / yr. / capita	
	Public Building Energy Consumption	165.00 kWh / m² / yr.	

Dimension: Society and Culture

CATEGORY	KPI / Data Point	Results	Benchmark
 EDUCATION	Student ICT Access	100.00 %	
	School Enrolment	100.00 %	
	Higher Education Degrees	37 638 / 100 000 inhabitants	
	Adult Literacy	94.00 %	
 HEALTH	Electronic Health Records	99.90 %	
	Life Expectancy	81.65 Years	
	Maternal Mortality Rate	0.00 / 100 000 live births	
	Physicians	87.78 / 100 000 inhabitants	
	In-Patient Hospital Beds	500.46 / 100 000 inhabitants	
	Health insurance / Public Health Coverage	100.00 %	
 CULTURE	Cultural Expenditure ¹	0.05 %	
	Cultural Infrastructure	30.27 / 100 000 inhabitants	N/A
 HOUSING	Informal Settlements	0.07 %	
	Housing Expenditure	16.24 %	

¹ In Norway, cultural expenditure is mainly a function of higher levels of government so that the municipal contribution does not capture the full expenditure.

Dimension: Society and Culture (continued)

CATEGORY	KPI / Data Point	Results	Benchmark
 SOCIAL INCLUSION	Gender Income Equity	0.73 Ratio Female : Male	
	Gini Coefficient	0.25	
	Poverty Rate	5.70 %	
	Voter Participation	65.85 %	
	Childcare Availability	70.06 %	
 SAFETY	Natural Disaster-Related Deaths	0.19 / 100 000 inhabitants	
	Disaster-Related Economic Losses	0.00 % / City GDP	
	Resilience Plans ²	No	
	Population Living in Disaster-Prone Areas	2.70 %	
	Emergency Service Response Time	14.00 Minutes	
	Police Service	90.81 FTE / 100 000 inhabitants	
	Fire Service	72.45 FTE / 100 000 inhabitants	
	Violent Crime Rate	628.09 / 100 000 inhabitants	
	Traffic Fatalities	1.01 / 100 000 inhabitants	
 FOOD SECURITY	Local Food Production	Not Reported	

² Municipalities in Norway will have resilience planning in place; however, they do not yet use the Sendai framework.

7. KPIs Not Reported

KPI Number	Description
EC: ICT: D: 1A	Drainage / Storm Water System ICT Monitoring
EC: I: T: 4A	Partial - Following not reported: Para Transport: Trondheim is able to collect the number of people with access to a para transport card (TT Card). Reported: 2.50 %. The TT Card is usually used for discounted taxi fares as there is no dedicated para transport system. However, access is not the same as usage.
SC: SH: FS: 1A	Local Food Production

8. KPIs Not Verified

All reported KPIs were verified.

9. Next Steps

Trondheim is encouraged to focus on KPIs that have been reported as falling within the benchmarks of 0 – 33 % and 33 – 66 % of targets, determine which of these KPIs indicates critical issues for the city and develop plans for improvement.

Trondheim is encouraged to review the KPIs for which no data were reported, and determine plans for future data collection and reporting.

Trondheim is encouraged to continue ongoing data collection to determine trends in performance against benchmarks over time.

Trondheim is encouraged to stay engaged within the U4SSC process and continue to provide feedback on KPIs and benchmarks.

10. Using KPIs for SSC to Reach the SDGs

The **United for Smart Sustainable Cities (U4SSC)** initiative has developed the Key Performance Indicators (KPIs) for Smart Sustainable Cities (SSC) to support cities worldwide in evaluating the role and contribution of ICTs in smart sustainable cities, and to provide cities with the tools for self-assessments in order to achieve the United Nations Sustainable Development Goals (SDGs).

United for Smart Sustainable Cities (U4SSC)



U4SSC is a UN initiative coordinated by the International Telecommunication Union (ITU), UN-Habitat and UNECE, and supported by 14 other UN Agencies and Programmes, including CBD, ECLAC, FAO, UNESCO, UNDP, UNECA, UN-Women, UNEP, UNEP-FI, UNFCCC, UNIDO, UNU EGOV, UNOP and WMO.

U4SSC is the global platform to advocate for public policies to encourage the use of ICTs to facilitate and ease the transition to smart sustainable cities. [Find out more...](#)

These indicators are developed based on an international standard – Recommendation ITU-T Y.4903/L.1603 ‘Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals’.

These indicators have been developed to provide cities with a consistent and standardized method to collect the necessary data to measure performance and progress with regard to:

- achieving the Sustainable Development Goals (SDGs);
- becoming a smarter city; and
- becoming a more sustainable city.

The U4SSC KPIs consist of 91 indicators. Each indicator forms part of a holistic view of a city's performance in three dimensions: **Economy**, **Environment** and **Society and Culture**. Each of these dimensions provides a separate view of progress, and when reported together they provide a holistic view of a smart sustainable city.

By providing a common set of metrics to benchmark a city's performance, the indicators will also enable cities to compare their performance with those of other cities, allowing for the dissemination of best practices and setting the standards for progression in meeting the Sustainable Development Goals (SDGs) at the city level.

The list of all the U4SSC KPIs for SSC, along with its collection methodology, are contained in:

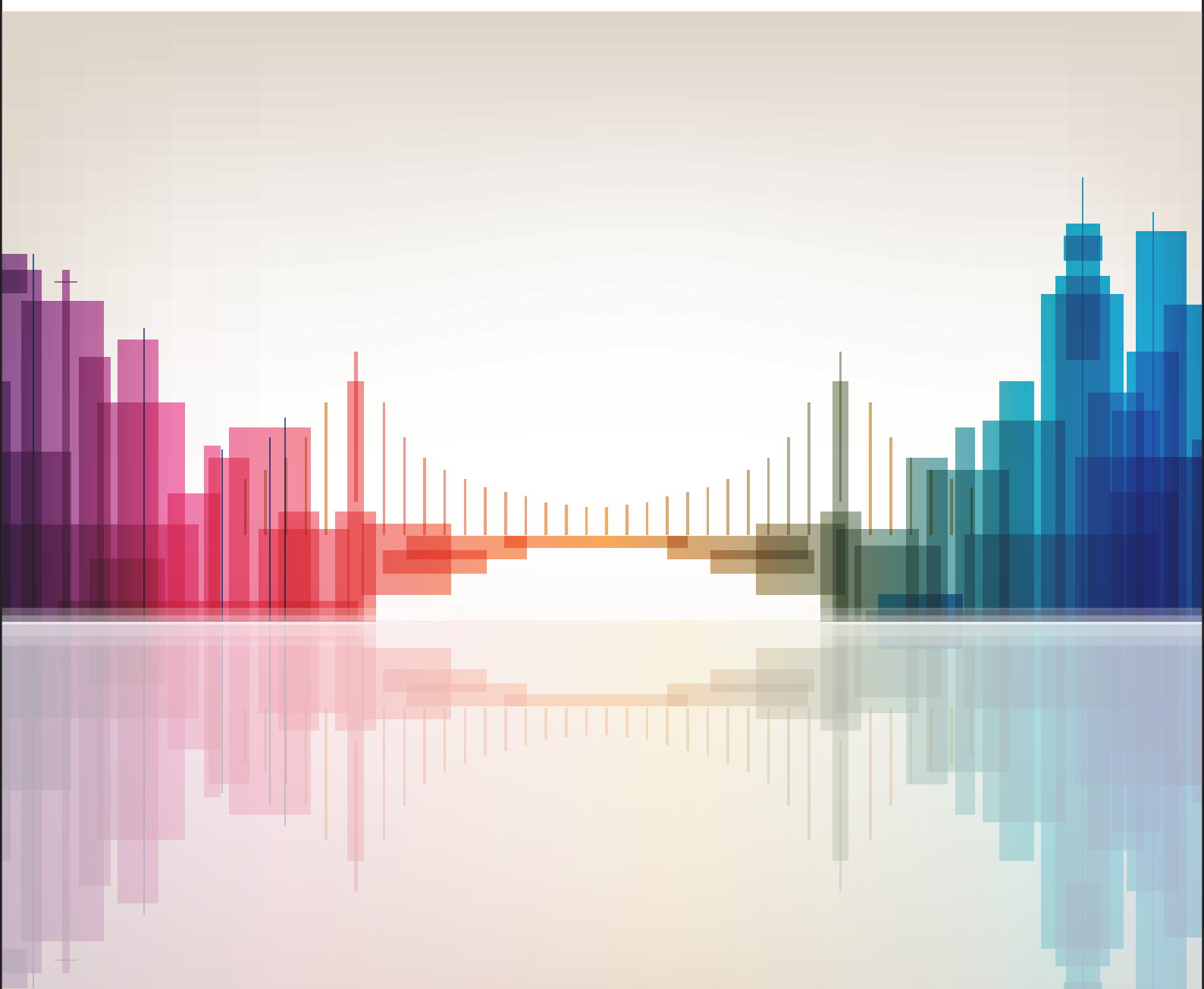
- the Flipbook on the '[Collection Methodology for Key Performance Indicators for Smart Sustainable Cities](#)'.

Over 100 cities worldwide are already implementing these KPIs. All cities are invited to participate in this project and employ these KPIs.

To find out more, contact the U4SSC Secretariat at: u4ssc@itu.int.







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