

## Dissecting Smart City Standards: ISO 37120

The notion of the 'smart city' is frequently offered up these days as one answer to many of the problems of metropolitan living. Underpinning the concept is a multitude of radical, new and exciting ideas around how we can combine previously unused sources of data and information to improve the quality of life in cities, towns and communities worldwide. For some, 'smart cities' means green cities. For others it means better services, more jobs or simply more efficient transportation.

A smart city has also become a buzzword that has been thrown around freely but that is beginning to change with the development of smart city policies and strategies in cities around the globe which are now being scaled up to the national and international level in the likes of the United Nations, the US, Europe, India and China.

UITP recognizes the importance of Smart Cities as a trend that will shape many standards in the information and communication technologies (ICT) sector, and notes a growing interest in this area among a number of standards setting organizations both at the national and international level.

### What is a smart city?

Around 80 definitions have been applied in government policies, but it is generally accepted that a smart sustainable city is one that uses 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, environmental as well as cultural aspects<sup>1</sup>.

At the same time, many cities, transport authorities and operators are grappling with the challenge of understanding how best to connect the rapidly growing volumes of data from their existing service operations, new sensors, social interactions and the like – in order to deliver better outcomes and services for citizens and their local economy.

### Public transport's role in smart cities

In April 2014, UITP's Official Position on Smart Cities made the case that public transport is essential to a smart cities because there is no business case to invest in the future of cities without a strong, connected transport system. At the same time, it also raises significant questions around how the cities of the future will be run, operated and governed. The position highlighted that smart cities initiatives presents strong growth opportunities as well

#### Top three barriers to further implementation

- lack of awareness of benefits and resistance to change amongst users;
- implementation costs (hardware and software);
- inappropriate data and/or restrictions on access.

#### Recommendations to overcome barriers

- better data accessibility coupled with coordination between transport agencies
- awareness raising in relation to best practice
- skills enhancement in relation to business case development and greater benefits realisation.

<sup>1</sup> International Telecommunications (ITU) definition: ITU is the United Nations specialized agency for information and communication technologies – ICTs.

as risks for the sector but also highlighted the importance of standards, particularly around data and indicators, if we are to scale up efforts and deliver replicable solutions.

### Smart city standards

While it may seem strange to develop standards for smart cities given that there are so many different ideas and means to achieving them, there is now a growing consensus amongst governments and standardization bodies both nationally and internationally on the need to develop harmonized definitions, technical specifications and best practices to enable data-sharing between city agencies, including the public transport sector.

International Standardisation Organisation (ISO) is becoming especially active in this areas and are keen to advance efforts on data and indicators as this will allow cities to benchmark their city services against others and allow for the development of solutions and information that will allow for new ways of working and sharing of best practices.

### ISO 37120:2014 Sustainable development of communities – indicators for city services and quality of life

The recently released ISO standard provides city leaders and citizens, for the first time and a standard approach for measuring city services. Though some indicators will be more helpful for cities than others, cities can now consistently apply these indicators should they wish and accurately benchmark their city services and quality of life against other cities.

In general, ISO 37120 defines 100 city performance indicators that could or should be measured, and how. Specifically, ISO 37120 defines 46 core and 54 supporting indicators that cities either “shall” (core) or “should” (supporting) track and report. Note that ISO 37120 conformance will require third party verification of data, and the ISO is in the process of defining an audit process. ISO 37120 also provides for a set of profile indicators, such as population and GDP, to help cities determine which cities are most relevant for comparisons. The World Council on City Data (WCCD) is now piloting ISO 37120 conformance with around 50 cities globally. The table opposite highlights the key themes of ISO 37120. It is clear that public transport authorities and operators will be responsible for providing the data in relation to transport and attached at Annex A provides further information in relation to the core and supporting indicator, the reporting requirements and data sources relevant for the transport sector.

UITP encourages its members at the company level to report on a range of sustainability impacts through its UITP Sustainability Charter and the UITP official position highlighted that getting public transport undertakings to report non-financial information, it can feed into city level reporting frameworks, such as those being set up for smart cities. The table below indicates where public transport organizations can provide sustainability information linked to the UITP Sustainability Charter and how this could contribute to ISO 37120 reporting. The two complementary approaches can support

ISO 37120 Themes
1. Economy
2. Education
3. Energy
4. Environment
5. Finance
6. Fire & Emergency Response
7. Governance
8. Health
9. Recreation
10. Safety
11. Shelter
12. Solid Waste
13. Telecommunications & Innovation
14. Transportation
15. Urban Planning
16. Wastewater
17. Water & Sanitation

sustainability disclosures of public transport providers and highlights the strong role that public transport undertakings could play in reporting their impact on a smart city.

### How can public transport organizations use ISO 37120 to prove performance?

By having comparable data, public transport organizations can make informed decision through better data analysis, benchmark, and target performance, prioritize budgets, improve operations transparency which can support the development of new business models, learning and leverage funding for infrastructure investments.

However, perhaps the biggest opportunity lies in the fact the indicators in ISO 37120 involve geospatial technologies and geo-located sensors collecting real time data, which is the foundation of Smart Cities. The case study below shows how geo-located data can provide better public transport solutions for the benefit of citizens.

Importantly, it also helps to integrate data from other sectors and operators that can help to identify interlinkages between them which can help to drive efficiencies, enhancing integrated decision making, better services and driving down costs in providing better, integrated public transport solutions and city services.

### Conclusions

Governments are moving towards being commissioners of information rather than creating it themselves. Geospatial technologies represent an invaluable tool, due to the ability to integrate, fuse and visualise many different data sources from many location based sources, for enhancing the capacity to benchmark and measure performance of sustainable development at different scales. ISO 37120 offers useful insight in to the types of information that can be sought locally. It

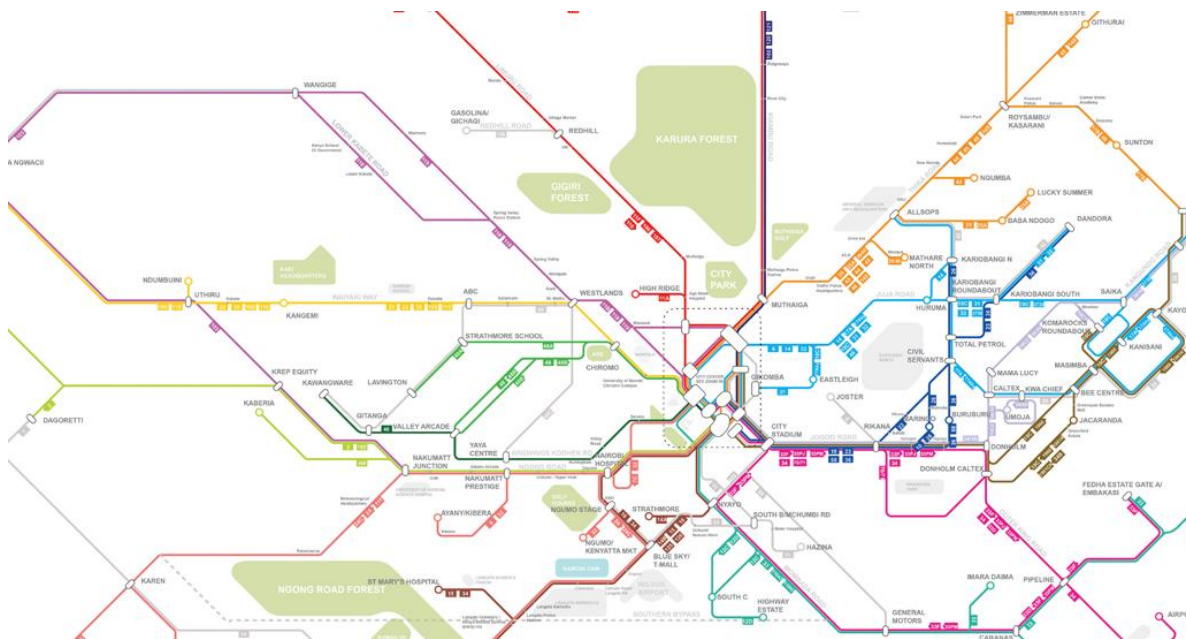
ISO 37120 THEMES	UITP CHARTER ASPECTS
1. Economy	Labour Practices
2. Education	
3. Energy	CO2 & Energy
4. Environment	Air Quality; Noise
5. Finance	Economic Performance
6. Fire & Emergency Response	
7. Governance	Diversity, Human Rights & Anti-Corruption
8. Health	
9. Recreation	
10. Safety	
11. Shelter	
12. Solid Waste	Waste
13. Telecommunications & Innovation	
14. Transport	Market Presence; Health & Safety; Customer Satisfaction
15. Urban Planning	
16. Wastewater	Water
17. Water & Sanitation	Water

also offers useful insight for the public transport sector into the types of city services it interacts with which has the possibility to enhance service delivery and collaboration within and outside the transport sector.

### Case Study<sup>2</sup>: Mapping Matatus: Geolocation Data and Public Transit in Nairobi

**DATA:** Using geolocation technologies in smartphones, researchers mapped networks of informal buses, called matatus, in Nairobi, Kenya


**IMPACT:** Digital Matatus has provided tools to help Nairobi improve matatu routing and reduce traffic congestion



Private buses known as matatus are the primary mode of motorized transport in Nairobi, with about 3.5 million regular riders.<sup>1</sup> In a collaborative effort called Digital Matatus, researchers from Columbia University, the Massachusetts Institute of Technology, and the University of Nairobi used GPS tracking devices and smartphone data to create a digital map of Nairobi's matatu routes, pictured above. University of Nairobi students geolocated stops along routes and recorded important information such as which stops are formally recognized by the city. This map and database is available for riders, government officials, and programmers seeking to create other transit applications, like BRT.<sup>2</sup>

The Digital Matatus project helped passengers discover more efficient routes of commuting. The new dataset will also help regulate bus stop locations; the project found that many buses stop erratically along the road to pick up passengers, with detrimental effects on traffic. The data collected by this project is also the first official record of existing routes. This information facilitates civic engagement and feedback during the transit planning process to incorporate some of the matatu routes into formal bus routes offered by the city.<sup>3</sup>

<sup>2</sup> Source : <http://dataimpacts.org/project/mapping-commuters-streamlines-transit/>



By making the data openly available through Global Transit Feed Specification (GTFS) format, Kenyan tech start-ups have developed useful mobile applications for Nairobi's citizens. Apps that suggest optimal routes, provide warnings about unsafe areas near matatu stops, and allow users to hail matatus by requesting pick-up at a specific location are now available.<sup>4</sup>

The dissemination of these results sparked government planners in Nepal, Nigeria, Ghana, and other countries to approach the research team about adopting similar methods for their own public transport system. The project itself aims to reduce the half a million dollar daily loss in productivity due to traffic jams in the city and highlights the essential role of geo-located data in driving the efficiency of city services.

Source: Digital Matatus project

## Annex A: Transport (clause 18)


<b>CORE INDICATORS</b>		
<b>Requirements / Methodology:</b>	<b>Data Sources and Role of the public transport sector:</b>	<b>UITP Sustainability Charter KPI Links</b>
<b>KPI: Kilometres of high capacity public transport system per 100000 population (core indicator)</b>		
Calculated by adding the kilometres of high capacity public transport systems operating within the city (numerator) divided by one 100 000th of the city's total population (denominator). High capacity public transport may include heavy rail metro, subway systems and commuter rail systems.	Information should be gathered from municipal transport offices and local / regional transit authorities and can also be counted using computerized mapping, aerial photography, or existing paper maps, all of which shall be field-verified. This information may be gathered from transport system plans or other master plans	<ul style="list-style-type: none"> <li>• ECO11 – produced seat km</li> </ul>
<b>KPI: Kilometres of light passenger public transport system per 100000 population</b>		
Calculated by adding the kilometres of light passenger transport systems provided within the city (numerator), divided by one 100 000th of the city's total population (denominator). Light passenger transport may include light rail streetcars and tramways, bus, trolleybus and other light passenger transport services.	Information should be gathered from municipal transport offices and local / regional transit authorities and can also be counted using computerized mapping, aerial photography, or existing paper maps, all of which shall be field-verified. This information may be gathered from transport system plans or other master plans.	<ul style="list-style-type: none"> <li>• ECO11 – produced seat km</li> </ul>
<b>KPI: Annual number of public transport trips per capita</b>		
Calculated as the total annual number of transport trips originating in the city - "ridership of public transport" - (numerator), divided by the total city population (denominator). Transport trips shall include trips via high capacity and light passenger public transport occurring in the city. NOTE: The use of number of transport trips with origins in the city itself will still capture many trips	Data should be gathered from a number of sources, including: official transport surveys, revenue collection systems (e.g. number of fares purchased), and national censuses. NOTE 1 Farebox records (e.g. transport fares paid) are usually the primary source of data for this indicator. Monthly or weekly passes, which do not necessarily allow for	<ul style="list-style-type: none"> <li>• Eco 7 – modal split</li> <li>• Soc 5 – number of trips per mode</li> </ul>

whose destination are outside the city, but will generally capture the impact that the city has on the regional network.	accurate counts of each trip. NOTE 2 Informal trips are not part of the official transport network and shall not be counted.	
<b>KPI: Number of personal automobiles per capita</b>		
Calculated as the total number of registered personal automobiles in a city (numerator) divided by the total city population (denominator).	This shall include automobiles used for personal use by commercial enterprises. This number shall not include automobiles, trucks and vans that are used deliveries. The information should be gathered from municipal transport offices and local / regional transit authorities	<ul style="list-style-type: none"> <li>Eco 7 – modal split</li> <li>Soc 5 – number of trips per mode</li> </ul>

<b>SUPPORTING INDICATORS</b>		
<b>Requirements / Methodology:</b>	<b>Data Sources and Role of the public transport sector:</b>	<b>UITP Sustainability Charter KPI Links</b>
<b>KPI: Percentage of commuters using a travel mode to work other than a personal vehicle</b>		
Calculated as the number of commuters working in the city who use a mode of transportation other than a private Single Occupancy Vehicle (SOV) as their primary way to travel to work (numerator) divided by all trips to work, regardless of mode (denominator). Modes other than non-SOV may include high capacity and light passenger public transport carpools, mini-bus, train, ferry, motorcycle and non-motorized two-wheel vehicles such as bicycles, and walking, and other modes. This indicator uses commuters who work in the subject city, regardless of where they live. For cases where multiple modes are used, the indicator shall	Travel surveys that collect trip frequency, trip duration, and travel mode information from a statistically significant sample of a city's population. Such surveys are frequently performed at irregular intervals (primarily due to the cost and time associated with such an undertaking). One common form of survey is a written travel log. This information is also frequently collected in general population censuses, which occur at regular intervals. This information is typically collected by local / regional transit authorities.	<ul style="list-style-type: none"> <li>Eco 7 – modal split</li> <li>Soc 5 – number of trips per mode</li> </ul>

reflect the primary travel mode, either by length of trip or distance travelled.		
<b>KPI: Number of two-wheel motorized vehicles per capita</b>		
Calculated as the total number of two-wheel motorized vehicles in the city (numerator) divided by the total city population (denominator). Two-wheel motorized vehicles shall include scooters and motorcycles. This shall not include non-motorized vehicles such as bicycles.	The information should be gathered from municipal transport offices and local / regional transit authorities	<ul style="list-style-type: none"> <li>Eco 7 – modal split</li> <li>Soc 5 – number of trips per mode</li> </ul>
<b>KPI: Kilometres of bicycle paths and lanes per 100000 population</b>		
Calculated as the total kilometres of bicycle paths and lanes (numerator) divided by one 100 000th of the city's total population (denominator). Bicycle lanes shall refer to part of a carriageway designated for cycles and distinguished from the rest of the road/carriageway by longitudinal road markings	The information should be gathered from municipal transport offices and local / regional transit authorities.	<ul style="list-style-type: none"> <li>Eco 7 – modal split</li> <li>Soc 5 – number of trips per mode</li> </ul>
<b>KPI: Transportation fatalities per 100 000 population</b>		
Calculated as the number of fatalities related to transportation of any kind within the city borders (numerator), divided by one 100 000th of the city's total population (denominator).	The city shall include deaths due to any transportation-related causes in any mode of travel either any death directly related to an incident within city limits, even if death does not occur at the site of the incident, but is directly attributable to the accident. NOTE Fatalities are used here as a proxy for all transportation injuries. Many minor injuries are never reported—and thus cannot be measured— deaths are almost always reported. Cities and countries may have different definitions of causality, specifically related to the amount of time that can elapse between an incident and a death.	<ul style="list-style-type: none"> <li>Soc 16 – accidents on the network</li> <li>Soc 17 – accidents at work</li> </ul>
<b>KPI: Commercial air connectivity (number of non-stop commercial air destinations)</b>		
Commercial air connectivity shall be expressed as the sum of all non-stop	Commercial air destinations lists should be obtained from airport	<ul style="list-style-type: none"> <li>N/A</li> </ul>





<p>commercial (i.e. scheduled) flights departing from all airports serving the city. Airports serving the city shall include all airports within a two hour travel distance from the subject city. Connecting flights shall be excluded.</p>	<p>operators, passenger airport facility planners, and/or federal aviation agencies. Web resources may also be used. Transport authorities could use this information to provide context for their reporting.</p>	
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