

Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Indicator 11.2.1: Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities

Institutional information

Organization(s):

United Nations Human Settlements Programme (UN-Habitat)

Concepts and definitions

Definition:

This indicator will be monitored by the proportion of the population that has convenient access to public transport. The access to public transport is considered convenient when an officially recognized stop is accessible within a distance of 0.5 km from a reference point such as a home, school, work place, market, etc. Additional criteria for defining public transport that is convenient include:

- a. Public transport accessible to all special-needs customers, including those who are physically, visually, and/or hearing-impaired, as well as those with temporary disabilities, the elderly, children and other people in vulnerable situations.
- b. Public transport with frequent service during peak travel times
- c. Stops present a safe and comfortable station environment

Rationale:

This indicator aims to successfully monitor the use of and access to the public transportation system and the move towards easing the reliance on the private means of transportation, improving the access to areas with a high proportion of transport disadvantaged groups such as elderly citizens, physically challenged individuals, and low income earners or areas with specific dwelling types such as high occupancy buildings or public housing and reducing the need for mobility by decreasing the number of trips and the distances travelled. The accessibility based urban mobility paradigm also critically needs good, high-capacity public transport systems that are well integrated in a multimodal arrangement with public transport access points located within comfortable walking or cycling distances from homes and jobs for all.

The ability of residents including persons with disabilities and businesses to access markets, employment opportunities, and service centers such as schools and hospitals is critical to urban economic development. The transport system provides access to resources and employment opportunity. Moreover, accessibility allows planners to measure the effects of changes in transport and land use systems. The accessibility of jobs, services and markets also allow policymakers, citizens and businesses to discuss the state of the transport system in the comprehensible way. The transportation system is a

critical enabler of economic activities and social inclusion. The access to transport SDG indicator addresses a significant gap that was never addressed by the MDGs, i.e. directly addressing transport as a critical enabler of economic activities and social inclusion. Already, the “externalities” associated with transport in terms of Green House Gas Emissions, traffic congestion and road traffic accidents have been increasing. Emissions from transport are now responsible for 23% of global Green House Gas Emissions and are increasing faster than any other source; outdoor air pollution alone, a major source of which is transport, is responsible for 3.7 million deaths annually, road traffic accidents kill more than 1.2 million people every year and severe traffic congestion is choking cities and impacting on GDPs. Achieving SDG 11 requires a fundamental shift in the thinking on transport- with the focus on the goal of transport rather than on its means. With accessibility to services, goods and opportunities for all as the ultimate goal, priority is given to making cities more compact and walkable through better planning and the integration of land-use planning with transport planning. The means of transport are also important but the SDG’s imperative to make the city more inclusive means that cities will have to move away from car-based travel to public transport and active modes of transport such as walking and cycling with good inter-modal connectivity.

The rising traffic congestion levels and the resulting negative air quality in many metropolitan areas have elevated the need for a successful public transportation system to ease the reliance on the private means of transportation. Cities that choose to invest in effective public transportation options stand out to gain in the long-run. Cities that have convenient access to public transport, including access by persons with disabilities are more preferred as these are more likely to offer lower transportation costs while improving on the environment, congestion and travel times within the city. At the same time, improving the access to areas with a high proportion of transport disadvantaged groups such as elderly citizens, physically challenged individuals, and low income earners or areas with specific dwelling types such as high occupancy buildings or public housing also helps increase the efficiency and the sustainability of the public transport system. Public transport is a very important equalizer of income, consumption and spatial inequalities. This indicator is empirically proven that public transport make cities more inclusive, safe and sustainable. Effective and low-cost transportation is critical for reducing urban poverty and inequalities and enhancing economic development because it provides access to jobs, health care, education services and other public goods.

Clean public transport is a very efficient mean for the reduction of CO₂ emissions and therefore it contributes to climate change and lower levels of energy consumption. Most importantly public transport need to be easily accessible to the elderly and disabled citizens.

Concepts:

This indicator will be monitored by the proportion of the population that has convenient access to public transport. Because most public transport users walk from their trip origins to public transport stops and from public transport stops to their trip destination, local spatial availability and accessibility is sometimes evaluated in terms of pedestrian (walk) access, as opposed to park and ride or transfers.

Hence, the access to public transport is considered convenient when an officially recognized stop is accessible within a distance of 0.5 km from a reference point such as a home, school, work place, market, etc. Additional criteria for defining public transport that is convenient include:

- a. Public transport accessible to all special-needs customers, including those who are physically, visually, and/or hearing-impaired, as well as those with temporary disabilities, the elderly, children and other people in vulnerable situations.
- b. Public transport with frequent service during peak travel times
- c. Stops present a safe and comfortable station environment

Public transport is defined as a shared passenger transport service that is available to the general public. It includes cars, buses, trolleys, trams, trains, subways, and ferries that are shared by strangers without prior arrangement. However, it excludes taxis, car pools, and hired buses, which are not shared by strangers without prior arrangement. It also excludes informal, unregulated modes of transport (para-transit), motorcycle taxis, three-wheelers, etc.

Public transport refers to a public service that is considered as a public good that has well designed 'stops' for passengers to embark and disembark in a safe manner and demarcated 'routes' that are both officially and/or formally recognized.

Additional methodological comments:

The method to estimate the proportion of the population that has convenient access to public transport is based on four steps:

- a) Spatial analysis to delimit the built-up area of the urban agglomeration:

Delimit the built-up area of the urban agglomeration and calculate the total area (square kilometres). Area of delimitation should be aligned with census enumeration areas to match with demographic data.

- b) Inventory of the public transport stops in the city or the service area:

Information can be obtained from city administration or service providers. In some cases where this information is lacking, incomplete or outdated, open sources and community-based maps, which are increasingly recognized as a valid source of information, can be a viable alternative.

When information is available, characteristics of the quality, universal accessibility for people with disabilities, safety, and frequency of the service can be 'assigned' to the public transport stops' inventory for detailed analysis and further disaggregation according to the statistical capacities of countries and cities.

- c) Estimation of urban area with access to public transport:

To calculate the indicator it is necessary to use a map with the inventory of officially-recognized public transport stops and create a buffer area of 500m radius for each stop. Merge and clip with boundary of the boundary built-up area of the urban agglomeration.

- d) Estimation of the proportion of the population with convenient access out of the total population of the city:

Overlay GIS demographic data on the number of dwellings within the area with access to public transport stop. Calculate the population within those dwellings. Estimate the proportion of population out of the total population of the city.

Complementary to the above, other parameters of tracking the transport target include the following:

a) Accessibility related to urban planning: this parameter can be measured using density (people/sq.km) from census surveys, Percentage of street space in cities and Number of Intersections / Sq.Km from analysis of earth observations and/or city maps. Density is an important determinant for the efficiency of public transport systems. The adequacy of streets and crossings determine urban accessibility to a great extent.

b) Accessibility related to transport planning: this parameter can be measured using Percentage of population within 500m of mass transit stop from City maps and sample survey data.

c) Affordability: this can be obtained from Percentage of household income of lowest quintile of population spent on transport from Sample surveys and WTP surveys. Poorest quintile should not spend more than 5% (TBD) on transport.

d) Quality: this parameter can be measured using travel time, universal access, safety, security, comfort and user information from sample surveys.

e) Modal shift to sustainable transport: this is also expressed in Modal share (cars, NMT, PT), Passenger KM travelled on EV as percentage of total passenger KM travelled in urban areas from City mobility surveys. This parameter is also important due to transport's contribution to carbon emissions and air quality issues in cities.

Comments and limitations:

As the Outcome Document 2nd Meeting of the Urban SDGs Campaign in Bangalore (12-14 February 2015) recognizes that no internationally agreed methodology exists for measuring convenience and service quality of public transport. Harmonized global/local data on urban transport systems do not exist, nor are they comparable at the world level.

It is recognized that convenience measured as distance does not categorize the quality of the public transport which will vary from country to country. Nevertheless, the proposed indicator is a comparable and objective measurement that can be assessed in cities across regions.

Other factors of this indicator such as affordability, safety, and universal accessibility may influence the usage of public means of mobility beyond proximity to the transport stop. Yet, the provision of widely accessible public transport is a precondition for its usage.

Finally, high capacity public transport, such as trains allows for a larger capture area, beyond the 0.5km of the proposed indicator.

It is also recognized that there are various forms of public transport in the member countries that are not fully defined or captured in this methodology. In particular, many developing countries have access to

public transport that is available anywhere on the streets and not necessarily at designated public transport stops. The creation of designated stops is a precondition of measurement in these countries.

Methodology

Computation Method:

Method of Computation

This indicator is computed based on the following criteria:

The identification of service areas is typically achieved using the buffering operation (using GIS) by constructing lines of equal proximity around each public transport stop or each public transport route. The buffering operation clearly involves at least two decisions. The first decision is whether routes or stops should be used as the reference of measurement. The two approaches may lead to very different values of spatial availability. But generally, public transport stops offer a more appropriate basis than routes for estimating service area coverage because stops are the actual locations where public transport users access the system. The other decision involved in the buffering operation is the buffer size. A common practice in public transport planning is to assume that people are served by public transport if they are within 0.5km (or 500m) of either a public transport route or stop. Once a distance threshold is defined, buffers are created around the public transport features. Some studies measure the distance based on air, or Euclidean, distance, while others use network distance (that is, the walk distance computed using the street network to reach a public transport feature). Since the network distance between two locations in space is greater than, or equal to, the corresponding air distance, the size of a coverage area defined by the network distance will be smaller than, or equal to, that defined by air distance. Network distance measures are likely to be more realistic because they reflect the configuration of the street network and recognize the presence of any man-made barriers preventing direct access to public transport features. In addition to using the above mentioned distance measures, others have suggested the use of travel time to public transport features as a measure of proximity. Using travel time is preferable to distance as a measure of proximity because travel time measures account for such pedestrian-unfriendly factors such as steep terrains. However, because of the additional data requirements and the amount of processing effort involved, travel time measures are rarely used in practice. For this indicator the public transport stop will be used as the point of service.

The identification of the population served

Once a service buffer is constructed, the next step is to overlay the buffer onto other polygons, such as census tracts, for which socio-demographic data (such as population figures, disabled persons, type of residence area, etc. is available. These polygons are referred to as the analysis zones. Typically, a service buffer (denoted as i) intersects, either fully or partially, with more than one analysis zone j ($j=1, \dots, J$). The population served by the public transport service in buffer i , P_i , is thus equal to the sum of the population in each of the intersecting areas, P_{ij} . Hence

$$P_i = \sum_{j=1}^J P_{ij}$$

Where, P_{ij} is estimated based on the amount of interaction between service buffer i and analysis zone j .

In estimating Pij it is assumed that the population is uniformly distributed within the analysis zones.

Integrating local temporal availability.

The methodology described above covers public transport service solely based on spatial access to stops or routes and does not address the temporal dimension associated with the availability of public transport. We note that temporal aspect of public transport availability is important because a service within walking distance is not necessarily considered as available if waiting times go beyond a certain threshold level that is required. This wait time for public transport is related to the frequency of the service as well as the threshold for tolerable waits for potential public transport users. We will leave out completely the temporal measurement for global comparison, but countries that can additionally capture this component are encouraged to collect and report this information as part of the disaggregation.

Finally, the population with access to public transport out of the entire city population will be computed as;

Percentage with access to Public transport = $100 \times (\text{population with convenient access to Public transport}) / (\text{City Population})$

Disaggregation:

Information can be disaggregated as shown below, including potential disadvantages such as disability, but it requires strong efforts and changes in mainstream mechanisms of data collection:

Disaggregation by location (intra-urban).

Disaggregation by income group.

Disaggregation by sex (female-headed household).

Disaggregation by race (head of household).

Disaggregation by ethnicity (head of household).

Disaggregation by migratory status (head of household).

Disaggregation by age (households inhabitant).

Disaggregation by mode of public transport.

Quantifiable Derivatives:

- Proportion of urban area that has convenient access to public transport.
- Proportion of population/urban area that has convenient access to public transport stop with universal accessibility for people with disabilities.
- Proportion of population/urban area that has frequent access to public transport during peak hours.
- Proportion of population/urban area that has frequent access to public transport during off-peak hours.
- Proportion of urban central/suburban area that has convenient access to public transport.

Treatment of missing values:

- **At country level**

Missing data is anticipated in the first few years of collection of data for this indicator, and this will be largely as a result of the slow adoption of the proposed methodology by the national governments and statistical systems. The spatial nature of the indicator and the variations in the definitions of what is public transport by countries will all affect the availability of data. Hence missing data for selected countries will be scored incrementally based initially on whether an existing public transport system is in place or not.

- **At regional and global levels**

If public transport is in place, then a modelled level of availability will be used to estimate a score instead of reporting zero for missing data. This methodology will be further developed and refined at the first technical working group/EGM for this indicator.

Sources of discrepancies:

For this indicator, national data complemented with internationally available spatial data sources will be used to derive final estimates for reporting at national and global figures. As national agencies are responsible for data collection, no differences between country produced data and international estimated data on the indicator are expected to arise. Where such discrepancies exist, these will be resolved through planned technical meetings and capacity development workshops.

Data Sources

Description:

The actual and recommended data sources for this indicator are the following:

- Data on location of public transport stops in city: city administration or service providers, GIS data
- Dwelling units within 500m of public transport stops: Census, GIS data
- Number of residents per dwellings unit: Census/household survey
- Household surveys that collect information on the proportion of households that declare they have access to public means of transport within 0.5 km. These surveys can also collect information about the quality of the service.

Due to its spatial nature, the use of the urban agglomeration is a precondition for the measurement and comparability of this indicator.

Collection process:

At the Global level, all this data will be assembled and compiled for international consumption and comparison by the UN-Habitat and other partners. UN-Habitat and partners will explore several capacity building options to ensure that uniform standards for generation, reporting and analysing data for this indicator are applied by all countries and regions.

Data Availability

This indicator is categorized under Tier II, meaning the indicator is conceptually clear and an established methodology exists but data is not easily available.

No internationally agreed methodology exists for measuring convenience and service quality of public transport. In addition, global/local on urban transport systems do not exist. Moreover, data is not harmonized and comparable at the global level. Obtaining this data will require collecting it at municipal/city level with serious deficiencies in some areas such as data on mass transit and on transport infrastructure. In addition, an open-source software platform for measuring accessibility, the Open Trip Planner Analyst (OTPA) accessibility tool, will be available to government officials and all urban transport practitioners. This tool was developed by the World Bank in conjunction with Conveyal (<http://conveyal.com>), this tool leverages the power of the OTPA engine and open standardized data to model block-level accessibility. The added value of the tool (free and user friendly) is its ability to easily calculate the accessibility of various opportunities and transportation scenarios. An Expert group meeting is planned later in 2016 that will harmonize the tools and existing data to ensure a more uniform and standard format for reporting on this indicator.

Calendar

Data collection:

The monitoring of the indicator can be repeated at an annual interval, allowing several reporting points until the year 2030. Monitoring at annual intervals will allow to determine whether the proportion of the population with convenient public transport is increasing significantly over time, as well as monitor what is the share of the global urban population living in cities where the convenient access to public transport is below the acceptable minimum. The proposed indicator has the potential to measure improvement within short term intervals. Moreover, the disaggregated monitoring for this indicator will provide increasing attention on the access to transport especially among the vulnerable populations such as women, children, persons with disabilities and older persons.

Data release:

Two year to five year windows will be applied, based on availability of new data.

Data providers

National Focal points as designated by respective Governments underpins the governance framework for monitoring the Transport Target. Such focal points could be the ministries themselves, NSOs, academic or research institutions, Civil Society Organisations, operators or a combination of these working under an agreement facilitated by the National Government. A secretariat or resource centre, comprising UN-Habitat and its partner organizations will work with the National Focal Points, providing capacity building

and quality assurance support. The resource centre will also ensure the exchange of knowledge and experience between participating countries. Specific agreements will be drawn up with respective countries and cities for collaboration in the monitoring. The monitoring framework will be disseminated in UITP and other transport events. A dedicated team combining UN-Habitat and the International Association of Public Transport (UITP) staff will be set up and these will lead the annual monitoring and reporting. Comprehensive reporting will be undertaken on a biennial basis. Reports will be published in the public domain with data available in the UN-Habitat global databases.

Data compilers

UN-Habitat

References

URL:

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References:

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