

Smart Mobility Impact Assessment

Based on the results of MaaSiFiE and SIMPLify projects and HUPMOBILE workshop in Södertälje

Definitions and rationale for each indicator

This material is structured in a following way:

Source

The source of the indicator, if any

Definitions

The definition of the indicator or terms used

Rationale

The rationale for including the indicator in the assessment

Guiding question:

The question in the assessment survey in English

Examples:

Additional examples explain the aim of the question and are also available online for the stakeholder representatives taking part in the assessment.

Individual end user

Stakeholder category 1



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1. Intermodal integration

Source

MaaSiFiE & Luyben, K., (2010), Designing robust road networks OECD, (2010), Improving Reliability On surface Transport Networks, Paris.

Definitions

The number of different intermodal options for the same trip. Increases reliability and possibilities for individual choice.

Rationale

80% of the users surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. It is the same indicator as in the City/Society category.

Guiding question:

Has the solution affected your options for combining transport means that are easy to use and meet your needs?

Examples:

The solution added a new mobility service that you could combine with existing services or made the combination easier than before by increasing information about the possibilities, implementing standard payment options, or perhaps by synchronizing schedules better.

2. Use of private cars

Source

The description and use of the spatial entropy methodology can be found in the following sources: Batty, M. (2010), "Cost, Accessibility, and Weighted Entropy", *Geographical Analysis* vol. 15, issue 3, pages 256–267, 1983; Boussauw, K. (2012), *Aspects of spatial proximity and sustainable travel behaviour in Flanders*, Ghent University, Faculty of Sciences; Brandmüller, T. (2011), "Land cover and land use", *Eurostat regional yearbook 2011*, pages. 166-167, 2011.

Definitions

Functional diversity refers to a mix of spatial functions in an area, creating proximity of mutually interrelated activities.

Rationale

In addition to building new residential areas with good functional diversity, we envision solutions, such as specific policies, that can support the car-reduced living in the area and enhance the accessibility of the essential functions in the area. It is the same indicator only with a different name, "Urban functional diversity" in City/Society category.

Guiding question:

Has the solution affected your need to use a private car in the area where the solution is operational?

Examples:

The solution reduced the need for mobility by sustainably delivering goods to you, improved your accessibility by consolidating essential functions near you - for example, in busy mobility hubs of the area - or reduced the need for a private car in the area by introducing demand-responsive transportation suitable for you.

3. Security

Source

SUMMA and Transport & Mobility Leuven (2004), Operationalising Sustainable Transport and Mobility: The System Diagram and Indicators, p. 23, 136, <http://www.tmleuven.be/project/summa/summa-d3.pdf>

Definitions

“Perceived risk of crime” is your perception of the impact on crime against users, transportation workers, vehicles, or infrastructure.

Rationale

Surprisingly, not a prominent aspect in other sources we have used. However, the sense of security is one aspect of the attractiveness of the work organization and the city. Thus this aspect should be included at the individual level as well. It is the same indicator as in the City/Society and Customer Organization categories.

Guiding question:

Has the solution changed your perceived risk of crime in the area affected by this solution?

Examples:

The solution made you more comfortable using public transportation, walking or riding a bike in the area during nighttime, or improved the area's attractiveness by reducing vandalism.

Source
MaaSiFiE & Civitas ECCENTRIC
Definitions

4. Shared mobility options

The availability and market penetration of shared and combined (e.g., carpooling) travel options. In contrast to Question 1, Question 4 refers to the mobility options for people who want to reduce the need to own the car but need one mobility solution for the whole trip.

Rationale

66% of the users surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. In contrast to other aspects, this describes the mobility options for people wanting to reduce the need to own the car but need one mobility solution for the whole trip. In general terms, over short distances, the use of a shared bicycle (or a car) can be more appreciated than using public transport, as public transport always involves some waiting and walking time, even if the total travel time is similar. A public bike-sharing system can therefore have both a negative and a positive impact on public transport use. It provides a first and last-mile option, but at the same time, it provides an attractive option to be an only mode for short distances. Some research confirms this. For example, Campbell and Breakwood (2017) observed a significant decrease in bus users on routes where cities implemented a bike-sharing system. This decrease is not necessarily a problem, especially on routes where public transport is close to capacity. It is the same indicator as in the Transport Authority category and “Sharing economy” in City/Society category.

Guiding question:

Has the solution affected your use of vehicle or ride-sharing?

Examples:

The solution covers the area of your daily needs so that you do not need to combine a shared mode of mobility with anything other than walking. The solution made it easier for you to access shared mobility options for your different mobility needs.

5. Access to mobility services

Source

MaaSiFiE & Lucas, K., Mattioli, G. Verlinghieri, E. & Guzman, A. 2016. Transport Poverty and Its Adverse Social Consequences. Transport.

Definitions

Compared to Question 1, this refers to a combination of transport affordability, mobility poverty, accessibility poverty, and exposure to transport externalities affecting your perceived access to mobility. Transport affordability refers to the costs of mobility, mobility poverty refers to the lack of mobility services in the area, accessibility poverty refers to your ability to use the mobility solutions in the area, and transport externalities refer to accidents and air and noise pollution from the transportation that affects your ability to use mobility solutions in the area.

Rationale

69% of the users surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. Based on the input from HUPMOBILE cities, this aspect includes all groups also potentially suffering from mobility poverty. It is the same indicator as in the City/Society category and “Customer segments” in the Transport Authority category.

Guiding question:

Has the solution changed your ability to access destinations important to you?

Examples:

The solution improves your ability to use different mobility services by reducing the costs of mobility, increasing service level, or becoming more demand-responsive, removing barriers for personal mobility, reducing the harmful effects of transportation while ensuring your access to mobility options or limiting your ability to use an existing mode of transportation.

6. Visibility

Source

MaaSIFiE & Civitas ECCENTRIC.

Definitions

The number of information sources for the same mobility-related information.

Rationale

69% of the users surveyed in the MaaSIFiE project considered this to be a high relevance factor when introducing MaaS services. Facilitates the use of favourite applications/procedures for daily mobility without the need to use different channels for vital travel-related information. It is the same indicator only with a different name, "Data sharing among partners" in the two organizational categories and "Open data" in City/Society category.

Guiding question:

Has the solution changed the amount of mobility information available for you?

Examples:

You don't have to search for mobility-related information as information about schedules, availability, and costs of a new service are available in the application or web page you use for your mobility needs. In addition to services, there can also be a new technological solution that brings existing information conveniently to one place. Also, if there are, for example, new restrictions in transportation, are these visible in the application you use for your mobility needs, or do you need to search for the information.

7. Digital accessibility

Source

MaaSIFIE & Civitas ECCENTRIC.

Definitions

The ease of use of an integration platform for all mobility-related tasks (information search, planning, booking, payment).

Rationale

64% of the users surveyed in the MaaSIFIE project considered this to be a high relevance factor when introducing MaaS services. Compared to the previous one, this aspect refers to a more centralized approach with a standard (de-facto) and open integration platform to facilitate all the mobility-related tasks. It is the same indicator only with a different name, “Enabling platform” in the Transport Authority category.

Guiding question:

Has the solution changed the need to use different mobility-related applications for your mobility needs?

Examples:

Compared to Question 6, there can be a new technological solution that brings all the mobility-related functions conveniently to one place. However, a new mobility service commonly requires a separate application for booking and payment and is not integrated into the existing platform you use for your mobility. In addition to technological platforms, there can be new technical solutions that automate or ease your mobility-related tasks, such as paying your trip or parking.

8. Affordability

Source

MaaSiFiE & Carruthers, R., M. Dick and A. Saurkar (2005), "Affordability of Public Transport in Developing Countries", Transport Papers, The World Bank Group: Washington.

Definitions

The mobility costs for fulfilling the essential activities of the household.

Rationale

58% of the users surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. Affects social sustainability but does not consider other aspects of sustainability – for example, economic viability and subsidies are covered elsewhere. It is the same indicator as in the Customer Organization category.

Guiding question:

Has the solution changed the costs of mobility for you?

Examples:

The solution replaces more costly mobility solutions while still fulfilling your needs, reduces the need for mobility, or offers reduced mobility costs with combined ticketing during events.

9. Congestion and delays

Source

SIMPlify project

Original Definition

Delays in road traffic and public transport during peak hours compared to free-flow travel.

Rationale

Compared to the affordability of mobility, this aspect refers to the time (cost) used for mobility. Together with other aspects in this category, congestion and delays are one aspect of the area's attractiveness where the customer organization is located. It is the same indicator as in the other categories.

Guiding question:

Has the solution affected congestion and delays in the area where the solution has been implemented?

Examples:

The solution replaced some of the road traffic with more efficient or flexible means of transport, reduced the need for mobility during peak hours, or introduced new technology to make the traffic more fluent.

10. Well-being

Source

WHO, 2019. '10 key facts on physical activity in the WHO European region' (<http://www.euro.who.int/en/health-topics/disease-prevention/physical-activity/data-and-statistics/10-key-facts-on-physical-activity-in-the-who-european-region>)

Definitions

Regardless of the transportation externalities (for example, accidents and air and noise pollution), human-powered mobility is expected to increase the physical and mental well-being of the individual.

Rationale

In addition to the possibilities to maintain one's physical and mental well-being, the opportunity for active mobility is used as a proxy for the quality of the public spaces. Active mobility (walking and cycling) versus non-active mobility (other modes): this is a significant classification from a societal benefits point of view as, according to World Health Organization (WHO), more than half of the people in Europe are not active enough to meet health recommendations. Lack of physical activity is estimated to contribute to 10 % of European deaths, and the trend is towards being even less active. In this context, the health gains of more active modes of transport can be substantial. It is the same indicator with a different name, "Health and well-being" in the Customer organization category and "Human-powered transport" in the City/Society category.

Guiding question:

Has the solution changed your use of human-powered transport modes?

Examples:

The solution increased your possibilities to use human-powered modes of transport, for example, by adding new service, improving the infrastructure and urban space meant for human-powered modes of transportation, or restricting other modes of transportation in the area.

11. Use of travelling time

Source

None

Definitions

Increased ability to utilize travelling time for other tasks compared to the mode of transport you usually use for the trips the solution affects.

Rationale

Increased ability to utilize travelling time – for example, working while traveling or combining other tasks with traveling – may affect the choice of mode of travel. It is the same indicator as in the Customer Organization category.

Guiding question:

Has the solution changed your use of travelling time to other tasks, such as work-related tasks or other errands?

Examples:

The solution freed your hands for working or shopping online while travelling, or for example, the solution is flexible enough for you to combine picking up children from day-care or groceries on your way home.

Customer Organization

Stakeholder category 2



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1. Organizational changes

Source

None

Definitions

Refers to the complexity of the implementation that may reduce the sustainability of the solution.

Rationale

As with the transport organization, if the solution requires new tasks or other organizational changes in the customer organization (such as a significant employer), it increases the complexity of the collaboration and may reduce the sustainability of the solution. It is the same indicator as in the Transport Authority category.

Guiding question:

Has the solution changed the number of mobility-related tasks in your organization to fully utilize the solution for your employees or customers?

Examples:

The full use of the solution requires manual work, such as bills, new applications or application interfaces to get the required information or replaces existing individual routines with a more integrated approach, thus helping your organization with mobility management.

2. Affordability

Source

Carruthers, R., M. Dick and A. Saurkar (2005), "Affordability of Public Transport in Developing Countries," Transport Papers, The World Bank Group: Washington.

Definitions

The average mobility costs for users.

Rationale

Although new sustainable mobility solution potentially affects the affordability of all mobility (and thus the bottom line, for example, of an employer), traveling costs may be in an essential role in the attractiveness of the area where the customer organization is located – together with other aspects in this category. It is the same indicator as in the Individual User category.

Guiding question:

Has the solution changed the costs of mobility in the area affected by the solution?

Examples:

The solution replaced more costly mobility solutions while still fulfilling the needs of employees and customers of your organization, or for instance, offers reduced mobility costs with combined ticketing during events.

3. Use of travelling time

Source

None

Definitions

Increased ability to utilize travelling time for other tasks compared to the mode of transport your employees or customers usually use for the trips to your premises or back from your premises.

Rationale

One aspect in the attractiveness of the area where the customer organization is located – together with other aspects in this category. It is the same indicator as in the Individual User category.

Guiding question:

Has the solution changed your employees' or customers' use of travelling time to other tasks, such as work-related tasks or other errands?

Examples:

The solution freed travelers' hands for working or shopping online while traveling. For example, the solution is flexible enough to combine picking up children from daycare or groceries on their way home.

4. Health and well-being

Source

WHO, 2019. '10 key facts on physical activity in the WHO European region' (<http://www.euro.who.int/en/health-topics/disease-prevention/physical-activity/data-and-statistics/10-key-facts-on-physical-activity-in-the-who-european-region>)

Definitions

The physical and mental well-being of the employee or customer of the organization.

Rationale

In addition to the possibilities to maintain one's physical and mental well-being, the opportunity for active mobility is used as a proxy for the quality of the public spaces. Active mobility (walking and cycling) versus non-active mobility (other modes): this is a significant classification from a societal benefits point of view as, according to World Health Organization (WHO), more than half of the people in Europe are not active enough to meet health recommendations. Lack of physical activity is estimated to contribute to 10 % of European deaths, and the trend is towards being even less active. In this context, the health gains of more active modes of transport can be substantial. It is the same indicator with a different name, "Well-being" in the Individual User category and "Human-powered transport" in the City/Society category.

Guiding question:

Has the solution changed the use of human-powered transport modes for people trying to reach your premises or events?

Examples:

The solution increased your possibilities to use human-powered modes of transport, for example, by adding new service, improving the infrastructure and urban space meant for human-powered modes of transportation, or restricting other modes of transportation in the area.

5. Air polluting emissions

Source

None

Definitions

Air polluting emissions of all passenger and freight city transport modes.

Rationale

Air polluting emissions may be in a more and more critical role in the attractiveness of the area – together with other aspects in this category. Exposure to air pollution leads to cardiovascular and respiratory diseases (including lung cancer), high healthcare costs and lost working days. In the European Quality of Life Survey (EQLS), people were asked whether they experienced four neighbourhood problems, including heavy traffic, litter, noise and air pollution (Eurofound, 2017). Since the topic has been in the survey (2011), a quarter of the EU population reported some or significant problems with air pollution in their neighbourhood. The recently published handbook on the external costs of transport (DG MOVE, 2019) indicates the relative importance of the various external costs of transport. The total external costs of transport (excluding the active modes, aviation and maritime transport) in the EU-28 amount to EUR 841 billion, of which the costs of greenhouse gas emissions and air pollution contribute to 19 %. It is the same indicator as in the City/Society category.

Guiding question:

Has the air polluting emissions of transport changed by this solution in the area where your main office is located?

Examples:

The solution replaced more polluting mobility solutions in the area where your organization's main office is located, restricted the most polluting vehicles entering the area, or increased vehicle occupancy in the existing mobility solutions.

6. Number of parking spaces

Source

None

Definitions

The number of parking spaces that the customer organization needs to have for their employees or customers.

Rationale

Economic rationale. It is the same indicator only with a different name, "Parking policy" in City/Society category.

Guiding question:

Has the solution changed the need for parking spaces on your organization's premises or in the events you organize?

Examples:

The solution increased the use of shared vehicles, replaced car parking spaces with a more efficient bike parking facility, gave employees or customers incentives to use public transport or increased vehicle occupancy in the existing mobility solutions.

7. Security

Source

SUMMA and Transport & Mobility Leuven (2004), Operationalising Sustainable Transport and Mobility: The System Diagram and Indicators, p. 23, 136, <http://www.tmleuven.be/project/summa/summa-d3.pdf>

Definitions

“Perceived risk of crime” is the educated opinion on how your employees and customers perceive the impact of the solution on crime against users, transportation workers, vehicles, or infrastructure. One of the aspects of the attractiveness of the area where the customer organization is located.

Rationale

Together with other aspects in this category, the sense of security is one aspect of the area’s attractiveness where the customer organization is located. It is the same indicator as in the City/Society and Individual User categories.

Guiding question:

Has the solution affected the perceived risk of crime for people trying to reach your premises or events?

Examples:

The solution made your employees and customers more comfortable using public transportation, walking or riding a bike in the area during the late evening, or improved the area’s attractiveness by reducing vandalism.

8. Access to mobility services

Source

Lucas, K., Mattioli, G. Verlinghieri, E. & Guzman, A. 2016. Transport Poverty and Its Adverse Social Consequences. Transport.

Definitions

The educated opinion about the perceived access of our employees and customers. Perceived access consists of transport affordability, mobility poverty, accessibility poverty, and exposure to transport externalities. Transport affordability refers to the costs of mobility, mobility poverty refers to the lack of mobility services in the area, accessibility poverty refers to the ability to use the mobility solutions in the area, and transport externalities refer to accidents and air and noise pollution from the transportation that affects the ability to use mobility solutions in the area.

Rationale

Together with other aspects in this category, access to mobility services is one aspect of the area's attractiveness where the customer organization is located. It is the same indicator as in the Individual User and City/Society categories and "Customer segments" in the Transport Authority category.

Guiding question:

Has the solution changed the accessibility of the premises of your organization or events that you organize?

Examples:

The solution improves the ability to use different mobility options by reducing the costs of mobility, increasing the service level or becoming more demand-responsive, removing barriers for personal mobility, or reducing the harmful effects of transportation while ensuring the access of your employees and customers to mobility options.

9. Congestion and delays

Source

SIMPlify project

Original Definition

Delays in road traffic and public transport during peak hours compared to free-flow travel.

Rationale

Compared to the affordability of mobility, this aspect refers to the time (cost) used for mobility. Together with other aspects in this category, congestion and delays are one aspect of the area's attractiveness where the customer organization is located. It is the same indicator as in the Transport Authority and City/Society categories.

Guiding question:

Has the solution affected congestion and delays in the area where the solution has been implemented?

Examples:

The solution replaced some of the road traffic with more efficient or flexible means of transport, reduced the need for mobility during peak hours, or introduced new technology to make the traffic more fluent.

10. Data sharing among partners

Source

Civitas ECCENTRIC

Definitions

The availability of (open) mobility data for different actors in the area.

Rationale

Facilitates the sharing of mobility-related information through different channels and creates value-adding services for the employees and customers of the organization based on shared information. It is the same indicator as in the Transport Authority category, "Visibility" in the Individual User category and "Open data" in City/Society category.

Guiding question:

Has the solution changed the amount of information available to your organization and your ability to create new services for your employees or customers based on this information?

Examples:

The solution is integrated into existing information channels or brings existing information conveniently to one place for the user. As an organizational customer, you get helpful information conveniently about the effects of the solution on your employees' mobility or the information is shared as open data to all. If you are partnering with the solution provider, you get information about the use of the solution in a helpful format.

Transport Authority

Stakeholder category 3



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1. Support from the transport authority

Source

MaaSiFiE & Civitas ECCENTRIC

Definitions

The strategic focus of the transport authority is in enabling different business models/collaboration and opportunities for transport organizations to solve mobility needs.

Rationale

78% of the transport operators surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. When the local authority is involved in measures/incentives to support the development of sustainable mobility solutions with the service providers, it creates an opportunity for efficient collaboration between actors and different business models. The same indicator is only with a different name, "Economic opportunity," in the City/Society category.

Guiding question:

Has the implementation of the mobility solution changed the acceptance of the solution among the transport authority prominent in the area?

Examples:

The local authority is involved in measures/incentives to support the development of these mobility solutions together with the solution provider. Some of the risks related to implementing the solution are shared, transport authority enables solution-providers to use the information needed for the full implementation of the solution, or transport authority is committed to testing sustainable mobility solutions by organizing innovation competitions or similar pre-procurement processes.

2. Enabling platform

Source

MaaSiFiE & Civitas ECCENTRIC

Definitions

The completeness of a de-facto integration platform creates a strong value proposition for transportation users.

Rationale

69% of the transport operators surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. This aspect refers to a presence of a standard (de-facto) and open integration platform (where a new solution can be integrated and have a strong value proposition) to facilitate all the mobility-related tasks. It is the same indicator only with a different name, "Digital accessibility," in the Individual User category.

Guiding question:

Has the solution changed the number of mobility-related applications travelers have to use for their mobility needs in the area?

Examples:

The solution does not use a dedicated application. However, it is integrated into a standard (de-facto) and open platform existing in the area, or the solution creates such an integration platform and effectively reduces the number of mobility-related applications people have to use for their mobility needs.

3. Economic viability

Source

MaaSiFiE & Civitas ECCENTRIC

Definitions

The need for long-term subsidies in transportation in the area.

Rationale

65% of the transport operators surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. To some degree, counterbalancing the “Affordability” aspect (the use of subsidies should be carefully considered long-term decision) and affecting the economic viability of (new) market-based mobility solutions.

Guiding question:

Has the solution changed the cost of organizing the transport services of the area?

Examples:

The solution sustainably increased the demand-responsiveness of transportation, operates entirely on a commercial basis without increasing public transportation costs, or decreases the need for other mobility services covered by the public sector.

4. Data sharing among partners

Source

MaaSIFiE & Civitas ECCENTRIC

Definitions

The availability of (open) data for different actors in the area.

Rationale

65% of the transport operators surveyed in the MaaSIFiE project considered this to be a high relevance factor when introducing MaaS services. Facilitates the sharing of vital transport-related information through different channels and the creation of value-adding services based on shared information. It is the same indicator as in the Customer organization category, "Visibility" in the Individual User category, and "Open data" in City/Society category.

Guiding question:

Has the solution increased the amount of information available to different actors and facilitated the creation of new value-adding services using the same information?

Examples:

The solution is integrated into existing information channels or brings existing information conveniently to one place for the user. As a transport authority, you get information about the use/effects of the solution in a format that is useful to you or information about the efficiency of the transport system in the area affected by this solution.

5. Need for investments

Source

MaaSiFiE

Definitions

The need for new investments (technology, infrastructure, vehicles) for the transport operator in the area.

Rationale

60% of the transport operators surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. This question relates to the need of the transport authority or the city to make unique investments when there is no possibility to use existing infrastructure or those investments are not covered, for example, by the local transport authority.

Guiding question:

Has the solution changed the need for transport-related investments in the area?

Examples:

It is the first time such a solution has been implemented in the area. The transport operator takes the risk of investing in localized infrastructure to enter the market. The transport operator or authority has to make extensive modifications for their application interfaces. A new policy/service in the area requires considerable supporting investments from the public sector.

Source

MaaSiFiE & Civitas ECCENTRIC

Definitions

The availability and market penetration of shared and combined (e.g., carpooling) travel options.

Rationale

56% of the transport operators surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. In contrast to other aspects, this describes the mobility options for people wanting to reduce the need to own the car but need one mobility solution for the whole trip. In general terms, over short distances, the use of a shared bicycle (or a car) can be more appreciated than using public transport, as public transport always involves some waiting and walking time, even if the total travel time is similar. A public bike-sharing system can therefore have both a negative and a positive impact on public transport use. It provides a first and last-mile option, but at the same time, it provides an attractive option to be an only mode for short distances. Some research confirms this. For example, Campbell and Breakwood (2017) observed a significant decrease in bus users on routes where cities implemented a bike-sharing system. This is not necessarily a problem, especially on routes where public transport is close to capacity. It is the same indicator as in the Individual User category and "Sharing economy" in City/Society category.

Guiding question:

Has the solution changed vehicle or ride-sharing in the area?

Examples:

The area covered by the solution is significant enough for the daily needs of users. Users do not need to combine other transport modes other than walking to access the shared mobility option, or the solution made it easier for them to access shared mobility options for different mobility needs, station-based shared mobility options are placed to significant mobility hubs in the area, or there is a clear indication that vehicle or ride-sharing in the area has increased in an economically viable way.

6. Shared mobility options

7. Customer segments

Source

MaaSIFIE & Lucas, K., Mattioli, G. Verlinghieri, E. & Guzman, A. 2016. Transport Poverty and Its Adverse Social Consequences. Transport.

Definitions

The number of new customer segments able to use sustainable mobility service (compared to a private car).

Rationale

45% of the transport operators surveyed in the MaaSIFIE project considered this to be a high relevance factor when introducing MaaS services. When thinking Transport Poverty broadly (as HUPMOBILE cities suggested), the ability of the transport operator to mitigate actual or perceived obstacles in using sustainable mobility solutions also means reaching new customer segments for their service. In the context of mobility options, this imposes requirements on the quality, comfort, and accessibility (physical accessibility to 'traditional' mobility services and digital accessibility to 'new' mobility services supported on electronic platforms) of the services they offer. It is the same indicator only with a different name, "Access to mobility services," in all the other categories.

Guiding question:

Has the solution changed the customer segments able and willing to use sustainable mobility?

Examples:

The solution uses identification and payment schemes used in public transportation, sustainable mobility service is bundled with other services (such as event tickets), or the use of less sustainable modes is restricted in the area.

8. Organizational changes

Source

MaaSiFiE.

Definitions

The complexity of the implementation.

Rationale

53% of the transport operators surveyed in the MaaSiFiE project considered this to be a high relevance factor when introducing MaaS services. The need for localization, building new interfaces, and new tasks or other organizational changes increases the complexity of the implementation and may reduce the sustainability of the solution. It is the same indicator as in the Customer Organization category.

Guiding question:

Has the implementation of the solution changed the need for unique or highly localized routines in participating organizations?

Examples:

A new application or application interface is required to get information about the use of the solution, transport operator has to build highly localized interfaces to operate in the area, a new policy increases the workload in your organization with new tasks, or the solution replaces existing individual routines with a more integrated approach, thus helping your organization in daily tasks.

9. Role of public transport

Source

MaaSiFiE & Civitas ECCENTRIC

Definitions

The number of new combined mobility offerings from the public transport authority.

Rationale

49% of the transport operators surveyed in the MaaSiFiE project considered “Channels to reach new customers” to be a high relevance factor when introducing MaaS services. Since visibility of information is covered elsewhere, this aspect takes the viewpoint of communicating the value proposition of the transport organization through partners. It is the same indicator as in the City/Society category.

Guiding question:

Has the solution changed the number of mobility options connected to the public transport offering in the area?

Examples:

The solution integrates to the public transport offering in the area or bundles existing mobility solutions to public transport offering seamlessly, or there is a clear indication of the increased popularity of public transport in the area affected by this solution.

10. Congestion and delays

Source

SIMPlify project

Original Definition

Delays refer to increased waiting times in road traffic and public transport during peak hours compared to free-flow travel.

Rationale

Compared to the economic viability of mobility, this aspect refers to the time (cost) used for mobility. In addition to economic viability, delays may be the most publicly visible criteria for the success of the transport authority in organizing public transportation in the area. It is the same indicator as in the Customer Organization and City/Society categories.

Guiding question:

Has the solution affected congestion and delays in the transport system of the area of interest?

Examples:

The solution replaced some of the road traffic with more efficient or flexible means of transport, reduced the need for mobility during peak hours, or introduced new technology to make the traffic more fluent.

City / Society

Stakeholder category 4



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1. Access to mobility services

Source

Lucas, K., Mattioli, G. Verlinghieri, E. & Guzman, A. 2016. Transport Poverty and Its Adverse Social Consequences. Transport.

Definitions

The combination of transport affordability, mobility poverty, accessibility poverty, and exposure to transport externalities affecting the perceived access to mobility.

Rationale

Together with other aspects in this category, access to mobility services is one aspect of the area's attractiveness. Based on the input from HUPMOBILE cities, this aspect includes all groups also potentially suffering from mobility poverty. Using the population aged 65 years and over as an example, as their share is increasing in every EU Member State, for different mobility options, this imposes requirements on the quality, comfort and accessibility (physical accessibility to 'traditional' mobility services and digital accessibility to 'new' mobility services that are supported on electronic platforms) on the services that they offer. It is the same indicator as in the Individual User, Customer Organization, and "Customer segments" in the Transport Authority category.

Guiding question:

Has the solution affected the perceived access to mobility in the area?

Examples:

The solution improves the ability to use different mobility options by reducing mobility costs, increasing service level, or becoming more demand-responsive, removing barriers for personal mobility, or reducing the harmful effects of transportation while ensuring access to mobility options. Also, the use of less sustainable modes may be restricted in the area.

2. Intermodal integration

Source

Luyben, K., (2010), Designing robust road networks OECD, (2010), Improving Reliability On surface Transport Networks, Paris.

Definitions

The availability of intermodal connections and the quality of the interchange facilities. The strategic focus of the transport authority is in enabling different business models/collaboration and opportunities for transport organizations to solve mobility needs.

Rationale

Increases the reliability of the transport system. It is the same indicator as in the Individual User category.

Guiding question:

Has the solution changed the number of easy-to-use combinations of transport means for the users in the area?

Examples:

The solution added a new mobility service that the users could combine with existing services or made the combination easier than before by increasing information about the possibilities, implementing standard payment options, or perhaps by synchronizing schedules better.

3. Human-powered transport

Source

WHO, 2019. '10 key facts on physical activity in the WHO European region' (<http://www.euro.who.int/en/health-topics/disease-prevention/physical-activity/data-and-statistics/10-key-facts-on-physical-activity-in-the-who-european-region>)

Definitions

Options and infrastructure for active mobility refer to the use of human-powered modes, namely walking and cycling.

Rationale

In addition to the possibilities to maintain one's physical and mental well-being, the opportunity for active mobility is used as a proxy for the quality of the public spaces, which is one of the aspects in the attractiveness of the area for existing and future residents and companies operating in the area. Active mobility (walking and cycling) versus non-active mobility (other modes): this is a significant classification from a societal benefits point of view, as more than half of the population in the World Health Organization (WHO) European region is not active enough to meet health recommendations. Lack of physical activity is estimated to contribute to 10 % of European deaths. In this context, the health gains of more active modes of transport can be substantial. It is the same indicator only with a different name, "Health and well-being" in the Customer Organization category and "Well-being" in the Individual User category.

Guiding question:

Has the solution affected the use of human-powered transport in the area?

Examples:

The solution increased the possibilities to use human-powered modes of transport by adding new service, improving the infrastructure and urban space meant for human-powered modes of transportation, or restricting other modes of transportation in the area.

4. Air polluting emissions

Source

None

Definitions

Air polluting emissions of all passenger and freight transport modes.

Rationale

Air polluting emissions may be in a more and more critical role in the attractiveness of the area – together with other aspects in this category. Exposure to air pollution leads to cardiovascular and respiratory diseases (including lung cancer), substantial healthcare costs and lost working days. In the European Quality of Life Survey (EQLS), people were asked whether they experienced four neighborhood problems: heavy traffic, litter, noise, and air pollution (Eurofound, 2017). Since the topic has been in the survey (2011), a quarter of the EU population reported some or significant problems with air pollution in their neighbourhood. Thus, one of the aspects of the area's attractiveness for existing and future residents and companies operating in the area. The recently published handbook on the external costs of transport (DG MOVE, 2019) indicates the relative importance of the various external costs of transport. The total external costs of transport (excluding the active modes, aviation and maritime transport) in the EU-28 amount to EUR 841 billion, of which the costs of greenhouse gas emissions and air pollution contribute to 19 %. It is the same indicator as in the Customer Organization category.

Guiding question:

Has the solution affected the air polluting emissions of transport in the area?

Examples:

The solution replaced more polluting mobility solutions in the area, restricted the most polluting vehicles entering the area, or increased the vehicle occupancy in the existing mobility solutions.

5. Noise pollution

Source

EU Noise directive during the period 2005-2010. Source: H.M.E. Miedema, and H. Vos, (1998), "Exposure-response relationships for transportation noise," J. Acoust. Soc. Am. 104(6), 3432-3445. Noise pollution, or exposure to ambient sound levels beyond the usual comfort levels, can affect the quality of life and lead to cognitive impairment in children, high stress levels, sleep disturbance and adverse health impacts, such as problems with the cardiovascular and metabolic systems. The recently published handbook on the external costs of transport (DG MOVE, 2019) indicates the relative importance of the various external costs of transport. The total external costs of transport (excluding the active modes, aviation and maritime transport) in the EU-28 amount to EUR 841 billion, of which the costs of noise contribute to 8 %. For further relevance, see S. McGuire, P. Davies (2008), an overview of methods to quantify annoyance due to noise with application to tire-road noise.

Definitions

Hindrance of the population by noise generated through transport.

Rationale

From source.

Guiding question:

Has the solution affected noise pollution of transport in the area?

Examples:

The service solution prefers electric or human-powered vehicles, the technical solution mitigates noise pollution of the existing transport modes, or the areawide policy restricts noise-generating traffic, for example, nighttime.

6. Accidents & fatalities

Source

Global Cities Institute (2013), Global City Indicators, "Profile Indicators,"

p.2 <http://www.cityindicators.org/Default.aspx>

Definitions

Your expert opinion on the solution's impact on the number of accidents and fatalities in the area. Accidents and fatalities are defined here as a normal indicator - for example, Global Cities Institute (2013), Global City Indicators, "Profile Indicators."

Rationale

The recently published handbook on the external costs of transport (DG MOVE, 2019) indicates the relative importance of the various external costs of transport. The total external costs of transport (excluding the active modes, aviation and maritime transport) in the EU-28 amount to EUR 841 billion, of which the most important cost category is accident costs, which equate to 34 % of the total costs.

Guiding question:

Has the solution affected transport accidents and fatalities in the area?

Examples:

The service solution uses professional drivers and replaces private car use, a technological solution informs travellers of potential hazards or improves operating conditions, an area-wide policy improves the safety of specific mode of transfer by dedicating space for that mode, or there is a clear indication that accidents and fatalities in the area affected by this solution have been changed since the implementation of the solution.

7. Security

Source

SUMMA and Transport & Mobility Leuven (2004), Operationalising Sustainable Transport and Mobility: The System Diagram and Indicators, p. 23, 136, <http://www.tmleuven.be/project/summa/summa-d3.pdf>

Definitions

“Perceived risk of crime” is your educated opinion on how the residents in the area affected by this solution perceive the impact of the solution on crime against users, transportation workers, vehicles, or infrastructure.

Rationale

One of the aspects of the area’s attractiveness for existing and future residents and the companies operating in the area. It is the same indicator as in the Customer Organization and Individual User categories.

Guiding question:

Has the solution affected the perceived risk of crime in the transport of the area?

Examples:

The solution made the residents more comfortable using public transportation, moving in the area during the late evening with a bike or walking, or improving the area's attractiveness by reducing vandalism.

8. Urban functional diversity

Source

The description and use of the spatial entropy methodology can be found in the following sources: Batty, M. (2010), "Cost, Accessibility, and Weighted Entropy," *Geographical Analysis* vol. 15, issue 3, pages 256–267, 1983; Boussauw, K. (2012), *Aspects of spatial proximity and sustainable travel behavior in Flanders*, Ghent University, Faculty of Sciences; Brandmüller, T. (2011), "Land cover and land use," *Eurostat regional yearbook 2011*, pages. 166-167, 2011.

Definitions

Urban functional diversity refers to a mix of spatial functions in the area, creating proximity of mutually interrelated activities. Regions can achieve the same functionality in peri-urban areas by good (and sustainable) accessibility of the residents' essential activities. One of the aspects in the attractiveness of the area for existing and future residents of the area.

Rationale

In addition to building new residential areas with good functional diversity, we envision solutions, such as specific policies, that can support the car-reduced living in the area and enhance the accessibility of the essential functions in the area. The same indicator is only with a different name, "Use of private cars" in the Individual User category.

Guiding question:

Has the solution affected the accessibility of the essential functions for residents of the area?

Examples:

The solution reduced the need for mobility by sustainably delivering goods, improved accessibility by consolidating essential functions to busy mobility hubs of the area or reduced the need for private cars by introducing demand-responsive transportation suitable for several user groups.

9. Congestion and delays

Source

SIMPLify project

Definitions

Delays refer to increased waiting times in road traffic and public transport during peak hours compared to free-flow travel.

Rationale

Compared to the affordability of mobility, this aspect refers to the time (cost) used for mobility. The recently published handbook on the external costs of transport (DG MOVE, 2019) indicates the relative importance of the various external costs of transport. The total external costs of transport (excluding the active modes, aviation and maritime transport) in the EU-28 amount to EUR 841 billion, of which the congestion costs are 32 %. Together with other aspects in this category, congestion and delays are one aspect of the area's attractiveness. It is the same indicator as in the Customer Organization and Transport Authority categories.

Guiding question:

Has the solution affected congestion and delays in the transport system of the area of interest?

Examples:

The solution replaced some of the road traffic with more efficient or flexible means of transport, reduced the need for mobility during peak hours, or introduced new technology to make the traffic more fluent.

10. Energy efficiency

Source

International standard values from United Nations (2007), Indicators of Sustainable Development: Guidelines and Methodologies

Definitions

Total energy consumed for transport in the area.

Rationale

Compared to the air polluting emissions, this aspect refers to all means of increasing sustainability by being energy efficient.

Guiding question:

Has the solution affected the energy efficiency of transport in the area?

Examples:

The solution replaced some road traffic with more energy-efficient or environmentally sustainable means of transport, reduced the need for mobility especially during peak hours, increased the popularity of efficient trunk lines, or influenced people's mobility behaviour by describing their energy consumption in traffic.

11. Parking policy

Source

None

Definitions

The number of parking spaces that the city is allocating for private cars in the area affected by the solution.

Rationale

The strategic aim of using parking policies and standards for residential areas to support sustainable mobility could reduce the need for curbside parking spaces and private parking areas. Since for most of the day private cars are parked, much land is used for parking, some of which could alternatively be converted to infrastructure for non-motorized mobility (and F/L/O mile options) or to other uses that make living surroundings more sustainable and attractive (green spaces, playgrounds for children, etc.). It is the same indicator only with a different name, "Number of parking spaces" in the Customer Organization category.

Guiding question:

Has the solution changed the need for parking spaces in the area?

Examples:

The popularity of shared economy enables the conversion of private car parking spaces to bike racks or parking spaces dedicated to shared cars, a new parking policy reduces the number of parking spaces reserved for residents if accompanied with other mobility options, there is a new car-free zone in the area, or there has already been a reduction in parking spaces since the implementation of other solutions.

Source

MaaSIFIE & Civitas ECCENTRIC

Definitions

The availability and market penetration of shared and combined (e.g., carpooling) travel options.

Rationale

Describes the mobility options offered for people wanting to reduce the need to own the car but need one mobility solution. In contrast to other aspects, this describes the mobility options for people wanting to reduce the need to own the car but need one mobility solution for the whole trip. In general terms, over short distances, the use of a shared bicycle (or a car) can be more appreciated than using public transport, as public transport always involves some waiting and walking time, even if the total travel time is similar. A public bike-sharing system can therefore have both a negative and a positive impact on public transport use. It provides a first and last-mile option, but at the same time, it provides an attractive option to be an only mode for short distances. Some research confirms this. For example, Campbell and Breakwood (2017) observed a significant decrease in bus users on routes where cities implemented a bike-sharing system. This is not necessarily a problem, especially on routes where public transport is close to capacity. It is the same indicator only with a different name "Shared mobility options" in Individual and Transport Authority categories.

Guiding question:

Has the solution affected vehicle or ride-sharing in the area?

Examples:

The area covered by the solution is significant enough for the daily needs of users. Users do not need to combine other transport modes other than walking to access the shared mobility option, or the solution made it easier for them to access shared mobility options for different mobility needs, station-based shared mobility options are placed to significant mobility hubs in the area, or there is a clear indication that vehicle or ride-sharing in the area has increased in an economically viable way.

12. Sharing economy

13. Role of public transport

Source

MaaSIFIE & Civitas ECCENTRIC

Definitions

The number of new combined mobility offerings from the public transport authority.

Rationale

Refers to “channels to reach new customers.” Since visibility of information is covered elsewhere, this aspect takes the viewpoint of communicating the value proposition of public transport through partners. It is the same indicator as in the Transport Authority category.

Guiding question:

Has the solution changed the number of mobility options connected to the public transport offering in the area?

Examples:

The solution integrates to the public transport offering in the area or bundles existing mobility solutions to public transport offering seamlessly, or there is a clear indication of the increased popularity of public transport in the area affected by this solution.

14. Economic opportunity

Source

MaaSIFiE & Civitas ECCENTRIC

Definitions

The strategic focus of the policymakers is in enabling different business models/collaboration and opportunities for transport organizations to solve mobility needs.

Rationale

55% of the transport operators surveyed in the MaaSIFiE project considered “Laws and regulation context” to be a high relevance factor when introducing MaaS services. When policymakers are involved in measures/incentives to support the development of sustainable mobility solutions by making enabling laws, it increases economic opportunities and prosperity. It is the same indicator only with a different name, “Support from the transport authority” in the Transport Authority category.

Guiding question:

Has the implementation of the mobility solution changed the acceptance of the solution among the policymakers of the area?

Examples:

The policymakers are supporting the transport authority prominent in the area to develop the solution themselves or together with the solution-providers, there is a political decision that some of the risks related to implementing the solution are subsidized, and the added value of the solution is deemed bigger than the costs, the transport authority is required to provide solution-providers with the information needed for the full implementation of the solution, or there is long term support for the policies aimed at increasing the sustainability of transportation.

15. Public investments

Source

MaaSiFiE

Definitions: The need for new local investments (technology, infrastructure, vehicles) in the area. This question relates to the situation when there is no possibility to use existing infrastructure or those investments are not covered, for example, by the government or co-funded by the EU for the benefit of all the operators/solutions.

Rationale

48% of the policymakers surveyed in the MaaSiFiE project considered this aspect a high relevance factor when introducing MaaS services.

Guiding question:

Has the solution changed the need for new or improved public infrastructure in the area to be successful?

Examples:

It is the first time such a solution has been implemented in the area, and the public sector needs to invest in infrastructure or data interfaces for an operator to enter the market, a new policy in the area requires considerable supporting investments or the city authorities uses new procurement methods such as pre-commercial procurement to acquire technology suitable for their sustainability targets.

16. Open data

Source

Civitas ECCENTRIC

Definitions

The availability of open mobility data for different actors in the area.

Rationale

Facilitates sharing mobility-related information through different channels and creates value-adding services for users based on shared information. Closely related to “Economic opportunity” as there usually are policies involved, but the focus is on collecting and sharing data/information. It is the same indicator as “Data sharing among partners” in the Customer Organization and Transport Authority categories and “Visibility” in the Individual User category.

Guiding question:

Has the solution changed the amount of information available to different actors and facilitated the creation of new value-adding services using the same information?

Examples:

The solution is integrated into existing information channels or brings existing information conveniently to one place for the user. As a city or traffic planner, you get information about the use/effects of the solution in a format that is useful to you or information about the efficiency of the transport system in the area affected by this solution.