Muntstroom PCP, Brussels Capital Region

Pre-Commercial Procurement (PCP) regarding
R&D of end-to-end solutions for
monitoring multi-faceted people flow

Market consultation document

Annex 2: Use cases

Content

1 Introduction

1.1 Place of use cases in the PCP

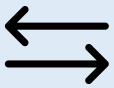
During PCP-phase 3 (the Living Lab-phase) the functioning of the developed prototypes from PCP-phase 2 will be tested by means of use cases. The foreseen location of the Living Lab is on, under and around the Brussels Place de la Monnaie / Muntplein. See Annex 1 of this Market consultation document.

1.2 Desired analytics

The following figure was used to define the desired analytics for the analytics use cases.

Figure 1: How big data is analysed (source: Agoria white paper Data, 2018)

1.3 Overview use cases

		Use case	Subject
Analytics		**1.** Pedestrians analytics	Understanding “the” pedestrian.
		2. Analysis on reasons of movements	Understand why pedestrians move around.
		**3.** Event analytics	Understanding the behaviour of pedestrians that visit events (specific zones and specific time horizon).
		**4.** Crowd analytics: security	Understand and react to security issues.
		**5.** Crowd analytics: COVID	Understand and react to social distancing issues.
		6. Mobility hub analytics: usage of specific public transport lines	Quantify the alighting, onboardings, people onboard and interchanges.
		7. Mobility hub analytics: transfers	Understand how travellers transfer between public transport lines.
		8. Asset management	Understand how pedestrians / travellers make use of assets.
		9. Commercial analytics: shopping policy and research	Understand the vitality of a street, its commercial attractiveness and the commercial potential of a specific location.
		**10.** Commercial analytics: individual shop	Understand the relation between the people flow and individual marketing strategies.
		**11.** Traffic light analytics	Understand the impact of traffic lights on people flow and indicators like safety.
Routing		**12.** PMR routing: wheelchair	Defining and testing step-free routes.
		13. PMR routing: partially sighted person	Defining and testing the routing of a partially sighted person.
		14. Indoor routing: subsurface	Defining and testing routing within underground corridors.
		15. Indoor routing: building	Defining and testing routing within a building.
Access		**16.** Smart access	Testing the technologies to support different business models.

2 The use cases

2.1 Pedestrian analytics

Topic	Description
	Understanding “the” pedestrian.
Explanation	The Public Life Data Protocol (2017), see the Annex, describes different features of pedestrians. Capturing and analysing those would be very valuable for e.g. policies on pedestrians and persons with reduced mobility (PRM).
Analytics	Descriptive analytics
Expected difficulty	High
Sort	Mandatory
Basic requirements	• Elaborate the subcategory “Staying”[1] • Elaborate the subcategory “Walking” • Elaborate the subcategory “Running”
Bonus	• Elaborate the subcategory “Supported” • Elaborate the subcategory “Carried” • Elaborate the subcategory “Rolling” • Identify the (percentage of) PRM • Identify vehicles (bikes and scooters) • Visualise the number and nature of conflicts
Typical objects / input	• See Annex: Public Life Data Protocol (2017) • Definition of “conflicts” • Definition of “person with reduced mobility” • Definition of “vehicles”

[1] Not mentioned in the Public Life Data Protocol!

2.2 Analysis on reasons of movements

Topic	Description
	Understand why pedestrians move around.
Explanation	Better understanding why people move helps to improve their trips. Can we deduce the reasons why people move around from sensor data? Thus without adding external data or performing physical surveys.
Analytics	Diagnostic analytics
Expected difficulty	High
Sort	Mandatory
Basic requirements	1. Define the classic people flow scenario's with the most common movements on and around the square. For instance the chance that pedestrians will use the (pré)metro after entering the gallery. 2. Define different types of pedestrians.[2] 3. Combine 1+2: Define a classic people flow scenario per type of pedestrians
Bonus	4. Identifying an attractor: an individual that other crowd members tend to follow. 5. Putting the movements on the Muntplein in a bigger picture of a displacement.[3]
Typical objects / input	Not applicable

[2] For instance workers (travel in rush hours), schools classes (travel in big groups), shoppers (with shopping bags), passers-by, local inhabitant, cyclists (with bikes), tourist (with backpacks or rolling cases).
[3] For instance by making a link to the metro transfers that people make. Or the origin and destination of classic people flow scenario's

2.3 Event analytics

Topic	Description
	Understanding the behaviour of pedestrians that visit events (specific zones and specific time horizon).
Explanation	There is an event on the square or there are public works going on. Some new objects will be placed and/or existing objects will be removed. This will influence people flow.
Analytics	• Diagnostic analytics • Predictive analytics • Prescription analytics
Expected difficulty	Average
Sort	Mandatory

Basic requirements	• Allow the removal and introduction of new objects on the maps, including information about them (name, sort, opening time, entrances, ...)
	• Visualise the impact of the new structures
	  ○ On the normal usage of the square
	  ○ On the shopping people flow
	• Visualise the impact of the events on the residence time[4]
	• Being able to add and remove sensors

Bonus	• Evaluation of the changes in the people flow (what is (un)desirable?)
	• Suggestion of scenarios to:
	  ○ Frame what will happen if objects are added or removed (predictive analytics)
	  ○ Influence how changes will happen (prescription analytics)
	• Suggestion for a standard reporting within the framework of activity transport plans for activities involving more than 1 000 persons[5]

Typical objects / input	• New structures • Known obstacles on the square
Possible routes	• The Place the la Monnaie

[4] How much time a person spends in the area?
[5] Ordonnantie houdende het Brussels Wetboek van Lucht, Klimaat en Energiebeheersing

2.4 Crowd analytics: security

Topic	Description
	Understand and react to security issues
Explanation	Public spaces are designed for a certain objective and/or a certain amount of people. When areas are used for another objective or when there are too few of too many people using it, this could cause unwanted conflicts and measures could be thought of to resolve these conflicts.
Analytics	• Descriptive analytics • Diagnostic analytics • Predictive analytics • Prescription analytics
Expected difficulty	High
Sort	Mandatory

Basic requirements	Descriptive analytics:
	• Define the O-situation (trends in historic data)
	• Visualise in (near) Real-time how pedestrians are dispersing
	• Detect and visualise changes of people flow
	  ○ RT combined with historic data
	  ○ Visualise similar events during the year
	• Send out alert[6] (RT response times)

Bonus	• General analysis of why changes are happening (diagnostic analytics)
	  ○ Relate with expected disturbances[7]
	  ○ Related with unexpected disturbances elsewhere[8]
	  ○ Relate with weather
	  ○ Valuation of the changes in the people flow: what is (un)desirable?
	• Predict new unexpected disturbances and their impact on the people flow (predictive analytics)
	  ○ Relate with the modal split[9]
	  ○ Relate with expected weather
	  ○ Relate with expected disturbances (announced works, events)
	• Suggestion of scenarios to restore the people flow (prescriptive analytics)
	  ○ Relate the predicted changes in people flow with possible measures

Typical objects / input	• For inside: scan via Urbis Indoor • Definition of zones • Definition of (combination of) the research parameters of “weather”

[6] Inclusive business logic.
[7] E.g. closing of the opera or events
[8] E.g. a sudden breakdown of the metro of demonstrations on the North-South axis
[9] For instance via the impact on the vending machines of STIB-MIVB or the validation of PT-tickets

2.5 Crowd analytics: COVID

Topic	Description
	Understand and react to social distancing issues
Explanation	Since the outbreak of COVID the respecting of social distancing is a primary condition for e.g. the retail and the public transport. Too many people on the square or in the corridors could create serious health challenges.
Analytics	• Descriptive analytics • Predictive analytics • Prescription analytics
Expected difficulty	Middle
Sort	Nice-to-have
Basic requirements	• Integration of the maximum capacity per zone with the zones on the map • (near) Real-time reporting on the occupancy of the zones / crowd density

Bonus	• Send out alerts[10] (for instance, to activate specific digital street signs)
	• Suggestion of scenarios to
	  ○ Use barriers for crowd control
	  ○ Frame what will happen if alerts are being send out (predictive analytics)
	  ○ Influence how changes will happen (prescription analytics)

Typical objects / input	• Scan via Urbis Indoor • Definition of zones + maximal amount of people allowed in a zone

Figure 2: Example of Corona use case at STIB-MIVB. (Source: stib-mivb.be)

[10] Inclusive business logic.

2.6 Mobility hub analytics: usage of specific public transport lines

Topic	Description
	Quantify the alighting, onboardings, people onboard and interchanges
Description	A mobility hub is a complex system of platforms and corridors at many different levels. Knowing how travellers transfer[11] and move within a mobility hub helps improving the customer experience and their security.
Analytics	Descriptive analytics
Expected difficulty	High
Sort	Mandatory

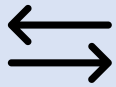
Basic requirements	• Alighting, onboardings and people onboard
	  ○ how many people are in the T4 toward P Stalle when it enters De Brouckère?
	  ○ How many of them alight in de Brouckère?
	  ○ How many people board in De Brouckère?
	  ○ How many people are on board when the T4 leaves the station?
	• Interchanges
	  ○ How many people make a transfer between M1 coming from Gare de l'Ouest and T4 towards P Stalle?

Bonus	• Alighting, onboardings and people onboard
	  ○ how many people are in the T4 toward P Stalle when it enters De Brouckère?
	  ○ How many people are on board when the T4 leaves the station
	• Mapping the occupancy of the (pré)metro vehicles
	  ○ In which compartments contain most and least amount of people

Typical objects / input	• Definition of different zones (waiting zones, platforms, shopping zones, corridors) • Definition of vehicles • Scan via Urbis Indoor
Possible routes	In mobility hub

[11] Incl. onboarding, alightings and number of people onboard

2.7 Mobility hub analytics: transfers via gates, platforms and corridors

Topic	Description
	Understanding how travellers transfer between public transport lines
Description	A mobility hub is a complex system of platforms and corridors at many different levels. Knowing how travellers transfer[12] and move within a mobility hub helps improving the customer experience and their security.
Analytics	Descriptive analytics, Diagnostic analytics & Prescriptive analytics
Difficulty	High
Sort	Mandatory

Basic requirements	• Count the travellers
	  ○ Passing the gates
	  ○ Passing in the corridors (different zones)
	  ○ Waiting on the platforms (different zones)
	• Visualise in (near) RT how travellers are dispersing inside the mobility hub
	  ○ Gates: visualise in (near) Real-time how travellers are passing
	  ○ Platforms: define the waiting zones and times
	  ○ Interchanges: how many people make a transfer between each pair of platforms, and between each pair of platform and gates? Which corridor do they use?
	  ○ Visualise the number and nature of conflicts between pedestrians

Bonus	• Levels
	  ○ Make a 2D-visualisation per level + people flow
	  ○ Make a 3D-visualisation of the Mobility Hub + people flow
	• Temporary measures:
	  ○ visualise the impact of temporary measures[13]
	  ○ analyse this people flow (Diagnostic analytics)
	  ○ recommendations (Prescriptive analytics)
	• Mapping of the occupancy of the mobility hub
	• output to inform a potential traveller about
	  ○ the current crowding level (platforms, stops, vehicule[14])
	  ○ if it's going to be more or less crowded later on?

Map data	• Definition of different zones (shopping & waiting zones, platforms, corridors) • Definition of "vehicles" and "conflicts" • Barriers/services (like gates, information signs, etc.) • Scan via Urbis Indoor
Possible routes	In mobility hub

[12] Incl. onboardings, alighting and number of people onboard
[13] Like the closing of parts of the platform, corridors or gates.
[14] See the other use case Mobility Hub use case.

2.8 Asset management

Topic	Description
	Understand how pedestrians / travellers make use of asset
Explanation	A mobility hub / shopping center is a complex system of platforms and corridors at many different levels. Knowing how travellers use the assets helps improving the customer experience and the security of the travellers. Similar questions may arise from managers of assets in the public space.
Focus test	• Descriptive analytics • Diagnostic analytics • Prescriptive analytics
Expected difficulty	High
Sort	Mandatory

Basic requirements	• visualise the people flow around:
	  ○ vending machines
	  ○ validation devices
	  ○ waste bins
	  ○ information boards
	  ○ information signage
	• analyse this people flow (Diagnostic analytics)
	• recommendations (Prescriptive analytics)

Bonus	• analytics of the use of people conveyors (escalator, elevator)
Map data	• Definition of different zones (waiting zones, platforms, shopping zones, corridors) • Definition of vehicles • Services/assets • Scan via Urbis Indoor

2.9 Commercial analytics: shopping policy and research

Topic	Description
	Understand the vitality of a street, its commercial attractiveness and the commercial potential of a specific location.
Explanation	Policy makers and researchers can use the people flow-data to improve the general attractiveness of a shopping zone. Which is also of interest for both for shop owners as for shoppers.
Focus test	• Descriptive analytics • Diagnostic analytics
Expected difficulty	Average
Sort	Mandatory

Basic requirements	• Dashboard with
	  ○ The number and % of total people flow that passes shops
	  ○ The time that pedestrians spend on this shopping route
	  ○ Different speeds (walking, strolling/shopping, sitting down)
	• Define KPIs for the general attractiveness of a shopping area.
	  ○ Popular places
	  ○ Attractiveness of a shop
	  ○ Relation with the (urban) planning zones
	• Define the popular places and classic shopping routes / rounds.
	• Removal of doubles (when people e.g. enter and leave a shop)

Bonus	• Relation with the origin of pedestrians (visitors or passers-by), the weather and particular events in the area
	• Diagnostic analytics
	  ○ Identify shopper-profiles based on the behaviour of pedestrians
	  ○ Identify which shopping windows are popular and which not
	• When do people slow down before a shop window? Can you influence this?
	• Make a link between the people flow and the complementarity of the shops: the quantity of the offer and variety of the shops (the quality).

Typical input	• Map-data
	  ○ For inside: scan via Urbis Indoor
	  ○ Definition of zones in a shopping route
	  ○ Definition of shops
	  ○ POI-data per shop (name, sort, opening time, ...)
	Definition of (combination of) the parameters of “weather”

Possible routes	• Kleerkopersstraat, via the Place de la Monnaie, to the Nieuwstraat. • Inside shopping De Mint • Inside mobility hub / around Metrostores

2.10 Commercial analytics: individual shop

Topic	Description
	Understand the relation between the people flow and individual marketing strategies
Explanation	Owners of buildings and hiring businesses can use the People Flow-data to improve their rental conditions and marketing strategies to maximise exposure to passing pedestrian traffic and attract potential customers.
Focus test	• Descriptive analytics • Diagnostic analytics
Expected difficulty	Average
Sort	Nice-to-have
Basic requirements	• Dashboard as in use case 9, but specific for the environment of a shop. • The percentage of the pedestrians that actually enter shops[15] • Internal heatmap

Bonus	• Relation between people flow and
	  ○ changes in a shop window (to slow down /attract people)
	  ○ the turnover

Typical input	• Map-data
	  ○ For inside: scan via Urbis Indoor
	  ○ Definition of zones in a shopping route

Possible routes	Shop should be part of a shopping route from Use case 9

[15] Only in this use case. NOT in use case 9.

2.11 Traffic lights analytics

Topic	Description
	Understand the impact of traffic lights on people flow and indicators like safety.
Explanation	Map pedestrian flow at the traffic lights that are placed on either side of the square where the Kleerkopersstraat and Nieuwstraat are located. This helps to understand the safety of the pedestrians and their "walking experience".
Focus test	Descriptive analytics & Diagnostics analytics
Expected difficulty	High
Sort	Mandatory

Basic requirements	• General
	  ○ % of the pedestrians that waits for the green light / jaywalks
	  ○ Visualise the number and nature of conflicts between pedestrians
	• Conclusion: are these traffic lights bottlenecks?

Bonus	• General
	  ○ % of vehicles + cyclists that waits for the green light / "jaywalks"?
	  ○ Visualise the number and nature of conflicts with pedestrians and other modes.
	• Analyse why jaywalks are happening (diagnostic analytics)
	  ○ Relation with the weather
	  ○ Recommendations
	• Scenarios
	  ○ Impact of actions (changes)
	  ○ The evolution during a particular event

Typical input	• Location traffic light • Definition of "waiting zones" and "zebra crossing" • Definition of (combination of) the parameters of "weather" • Location of barriers in the area (like poles) • Definition of "conflicts" • Definition of "walking experience" indicators for pedestrians
Possible routes	• Traffic light @ Kleerkopersstraat • Traffic light @ Nieuwsstraat

2.12 Routing PMR: wheelchair

Topic	Description
	Defining and testing step-free routes[16]
Description	Route an opera lover in a wheelchair towards the opera, and back
Focus test	Indoor and outdoor routing
Expected difficulty	High
Sort	Mandatory

Basic requirements	• The maps show the facilities for PRM.
	• Route them via the smoothest route to the opera
	  ○ with a minimum of barriers
	  ○ in a way that avoids crowds (link with historical + RT-data)
	  ○ via the PRM facilities like a wheelchair accessible entrance
	• Conclusions
	  ○ Regarding the beacon plan
	  ○ Regarding routes for persons in a wheelchair
	• Test what information, of which level of detail, is interesting to share with the end-users of the solution? (strength of signals, place of beacons, …)

Bonus	• Route them back • Output (via Smart access) for users that facilitate indoor routing
Map data	• Scan via Urbis Indoor • Wheelchair accessible entrance/exits • Step-free access • Elevators • Public toilets for PRM • Resting places
Possible routes	• Underground carparking of De Brouckère to the opera (and back) • prémetro (tram) stop of De Brouckère to the opera (and back)

[16] Step-free access means lifts, ramps and level surfaces so PRM don't have to use stairs or escalators, and can avoid the step and gap onto e.g. Public Transport.

2.13 Routing PMR: partially sighted

Topic	Description
	Defining and testing the routing of a partially sighted person
Description	Route a partially sighted opera lover (maybe with dog) towards the opera, and back
Focus test	Indoor and outdoor routing
Expected difficulty	High
Sort	Nice-to-have

Basic requirements	• The maps show the facilities for PRM.
	• Route her via the smoothest route to the opera
	  ○ with a minimum of barriers
	  ○ in a way that avoids crowds (link with historical + RT-data)
	  ○ via the PRM facilities for partially sighted persons
	• Conclusions
	  ○ Regarding the beacon plan
	  ○ Regarding routes for partially sighted persons
	• Test what information, of which level of detail, is interesting to share with the end-users of the solution? (strength of signals, place of beacons, …)

Bonus	• Route her back • Output (via Smart access) for users that facilitate indoor routing
Map data	• Scan via Urbis Indoor • Step-free access • Elevators • Public toilets for PRM • Resting places
Possible routes	• Underground carparking of De Brouckère to the opera (and back) • prémetro (tram) stop of De Brouckère to the opera (and back)

2.14 Indoor routing: subsurface

Topic	Description
	Defining and testing routing within underground corridors
Explanation	The place de la Monnaie also houses working spaces and in the Mobility hub there is also a big underground bicycle parking. To stimulate employees to come by bike, employees need to know the route from the public (underground) bicycle parking to their work.
Focus test	Indoor routing
Objective	Testing a long indoor route
Expected difficulty	Average
Sort	Mandatory

Basic requirements	• Routing via a coffee shop
	• Conclusions
	  ○ Regarding indoor beacon plan
	  ○ Regarding creating indoor maps
	• What information, of which level of detail, is interesting to share with the end-users of the solution? (strength of signals, place of beacons, …)

Bonus	• Output (via Smart access) for users that facilitate indoor routing
Maps data	• The location of on and off-road bicycle parking places • Scan via Urbis Indoor • POI-info of some coffee shops.
Possible routes	• Indoor routing from the secure De Brouckère bicycle parking, through the underground corridors until the Place de la Monnaie

2.15 Indoor routing: building

Topic	Description
	Defining and testing routing within underground corridors
Focus test	Indoor routing
Objective	Get an overview of challenges when using the Muntstroom solution for indoor routing in a private building
Expected difficulty	Low
Sort	Nice-to-have

Basic requirements	• Routing of a person
	• Allow the introduction of new objects on the maps
	• Conclusions
	  ○ Regarding indoor beacon plan
	  ○ Regarding creating indoor maps
	  ○ What information, of which level of detail, is interesting to share with the end-users of the solution? (strength of signals, place of beacon, …)

Bonus	• Output (via Smart access) for users that facilitate indoor routing
Typical objects	• Scan via Urbis Indoor • Internal POI
Possible routes	• Route a person in a wheelchair via the locker room of the opera to her reserved seat for PRM (Indoor) • Route a student from the entrance of Muntpunt to her reserved study space (Indoor) • Route a visitor of the Dominican, via the receipt of the meeting, towards the event space in the Dominican hotel (Indoor)

2.16 Smart access

Topic	Description
	Testing the technologies for supporting different business models.
Explanation	Because of several reasons (e.g. Open Data regulation, valorisation public data, business case of the Muntstroom solution) having a Smart Access to Closed, Shared and Open Data, see the figure below, is essential for the desired solution.
Objective	• Show a combination of different levels of access per sort output • Elaborate possible privacy issues
Expected difficulty	High
Sort	Mandatory

Basic requirements	• Closed data: access of a "full" user
	  ○ Access to its own raw sensor data
	  ○ Access to the, less detailed, aggregated sensor data
	  ○ Access to the maps and graphics
	• Shared data: access for a 3 different sort of users
	• Open Data: access of a standard user
	• Access for a user that facilitates indoor routing

Bonus	• Closed data:
	  ○ access for a public organisation that has a critical security role
	  ○ access for an owner of a chain of stores (combination of data from at least two stores, at different places)
	• Shared data: access for 5 different sort of users
	• Elaborate governance issues for the solution + recommendations

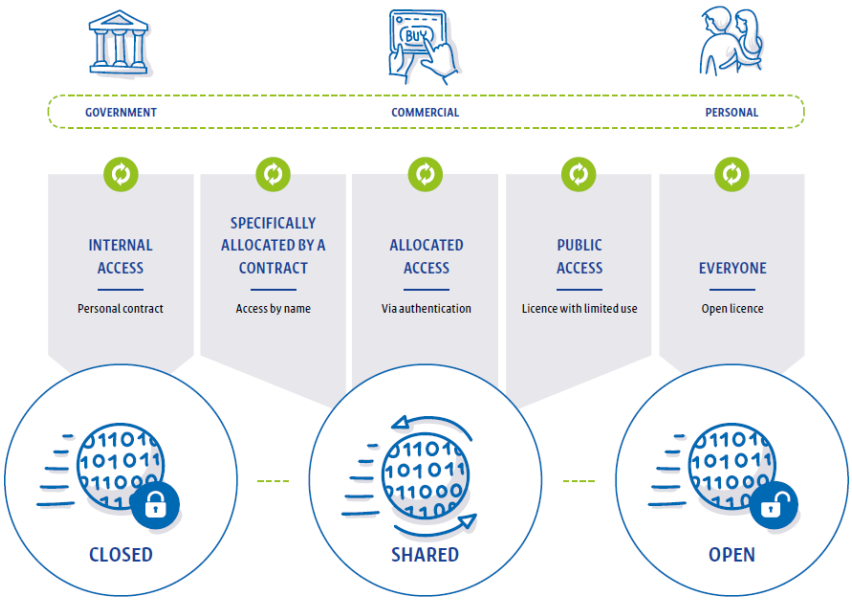


Figure 3: Different business models for data (Source: Agoria white paper Data (2018)

Annex: Public Life Data Protocol

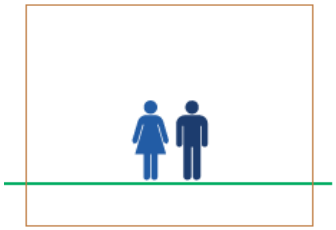
To support policy development on pedestrians and PRM and taking effective measures, the Public Buyers would like the collected data to be structured in accordance with the Public Life Data Protocol (2017)[17] of the Gehl Institute.

The Public Life Data Protocol describes a set of metrics that are important to the understanding of public life—people moving and staying in public space—and aims to establish a common format for the collection and storage of such data. See e.g. the figure and table below.

[17] https://gehlpeople.com/tools/public-life-data-protocol-beta/

GENDER

Applies to people staying and moving



Example Questions:

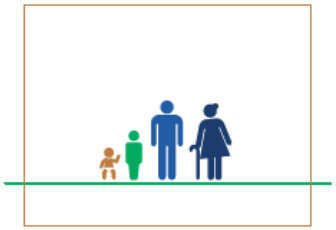
Do all genders feel equally invited?

Are the planned activities in accordance with the users of the place?

Do gender minorities choose to walk in public at night?

AGE

Applies to people staying and moving



Example Questions:

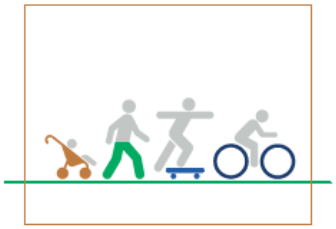
How many children visit this place?

Do the people on the street match the census data for the area?

Do the elderly have adequate facilities to spend time outside?

MODE

Applies to people moving



Example Questions:

What is the detailed mode-split across a street section?

Is the street of the right width and surface type for the users?

How many people move through the space at night?

GROUPS

Applies to people staying and moving

Example Questions:

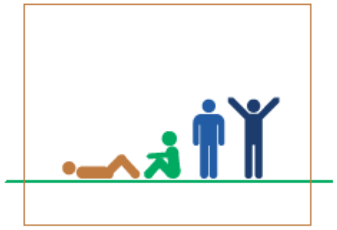
How sociable are the people staying within this place?

Does the urban furniture provide opportunities for groups to meet?

Do people need space to walk in pairs?

POSTURE

Applies to people staying



Example Questions:

Do people feel comfortable lying down and sitting within the space?

Are there invitations for people to rest?

How do people use the urban furniture and other elements within the space?

ACTIVITIES

Applies to people staying and moving

Example Questions:

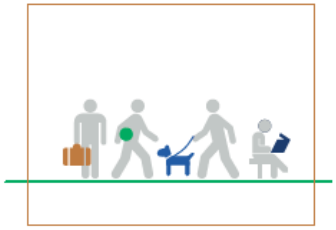
Are people engaged in a single activity or multiple activities?

Are the activities that people spend time doing optional or necessary?

What is the diversity of activities?

OBJECTS

Applies to people staying and moving



Example Questions:

How many of the pedestrians are also walking a dog?

Do people carry their own chairs or blankets into the space?

Are bicyclists wearing helmets?

GEOTAG

Applies to people staying

Example Questions:

Which corners of the space are more popular for people to spend time in?

Are some kinds of urban furniture more popular than others?

What is the impact of shade and sun?

Figure 4 : Public Life survey components
Source : Public Life Data Protocol (Gehl Institute, 2017)

Category	Sub-category	Advanced	Content	Description
Pedestrian	Walking		Strolling	Pedestrian walking leisurely with intermittent stops.
			Average pace	Pedestrian walking at an average human walking pace.
			Brisk	Pedestrian walking briskly and determined without looking anywhere but ahead.
			Other	Any other type of walking that does not fall in any other category.
	Running		Jogging	Pedestrian running at an average or leisurely pace.
			Sprinting	Pedestrian running determined and at a pace that is too fast to notice the surroundings.
			Skipping	Pedestrian running with a skipping step.
			Other	Any other type of running that does not fall in any other category
	Supported	Lightly	Rollator, Walking cane, Guide cane, Long cane, Cart, Crutches, Guide dog, Other	Pedestrian walking with light support, typically from an object or an animal, to overcome any type of perceived mobility impairment or disability.
		Heavily	Wheelchair: manual, electric, pushed or other	Pedestrian moving with heavy support, typically from a wheelchair, to overcome any type of perceived mobility impairment or disability.
	Carried	Wheels	Stroller, Pram, Cart, Other	Pedestrian being moved by other people in objects on wheels who is not perceived to be subject to any mobility impairments or disability. Typically children in strollers or prams.
		Body	Arms, Sling, Carrier, Back, Other	Pedestrian being carried on the body of another person who is not perceived to be subject to any mobility impairment or disability. Typically children being held by their parents.
	Rolling	Manual	Scooter, Skateboard, Rollerblades, Heelies, Longboard	Pedestrian moving by an optional, light, manual vehicle with wheels.
		Powered	Moped, Skateboard, Uniwheel, Segway	Pedestrian moving by an optional, light, powered vehicle with wheels.

Table 1: Categories and subcategories for the mode pedestrians
Source : Public Life Data Protocol (Gehl Institute, 2017)