AMIGOS

Active Mobility Innovations for Green and safe city sOlutionS

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D1.1 – Updated Fotefar Mobile Application

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Nature of the deliverable		
R	Document, report (excluding the periodic and final reports)	X
DEM	Demonstrator, pilot, prototype, plan designs	
DEC	Websites, patents filing, press & media actions, videos, etc.	
DATA	Data sets, microdata, etc.	
DMP	Data management plan	
ETHICS	Deliverables related to ethics issues	
SECURITY	Deliverables related to security issues	
OTHER	Software, technical diagram, algorithms, models, etc.	

Dissemination level		
PU	Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page)	X
SEN	Sensitive, limited under the conditions of the Grant Agreement	
CI	Classified, EU RESTRICTED, CONFIDENTIAL or SECRET under the Commission Decision No2015/444	

Quality Procedure

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Project Abstract

To reach carbon neutrality, cities must adopt new, more adapted energy models for urban mobility, relying on zero-emission and active mobility modes. The uptake of sustainable mobility solutions relies on their inclusivity, affordability, and safety, as well as their consistency with users' needs. Through co-creation activities and innovative digital tools, the AMIGOS project will identify present and future mobility challenges for 5 cities (living labs) and 10 urban areas (safety improvement areas).

The digital tools include a Mobility Observation Box (MOB) and an application for the collection of new mobility data, which will feed a big data platform for their analysis and digital twins to visualize mobility scenarios. They will allow urban stakeholders to identify mobility challenges and will serve as a basis for the co-development of adapted mobility solutions: towards reducing traffic, increasing public and active mobility modes, improving safety and co-habitation between different mobilities for the 5 cities, and increasing safety for the 10 urban areas.

Therefore, key stakeholders such as public authorities and vulnerable users will be included in the definition of technological and policy solutions and mobility solutions that will be implemented in the cities. Their environmental, safety, economic, and social impacts will be assessed, in addition to their medium- and long-term impact and their replicability, given their implementation in 5 twin cities.

Executive Summary

The AMIGOS investigation includes data collection from fifteen (15) case studies. As part of WP1 activities, this document describes the successful process of coordinated steps designed to integrate data from Epigram's Fotefar travel behavior tracking application and a specifically designed survey. This integration is not a simple feature within the application but a comprehensive enhancement to the overall data collection method. This data collection approach will result in a richer, more detailed set of data that combines the survey responses with the behavioral data captured by Fotefar, offering deeper insights into travel patterns and preferences, which can inform decisions to improve sustainable mobility solutions.

In addition to respondents' socio-demographic info, their travel patterns/habits, attitudes towards travel, travel preferences, and the characteristics of their most frequent trips (e.g., travel mode, departure time, travel time), a Stated Preference (SP) section is included. SP is a research method that presents hypothetical scenarios to users describing different travel conditions and options and asks about their travel preferences. Based on the September 2023 preliminary Case Studies Survey, the SP section was customized to address specific interventions and measures.

The survey data, along with Epigram's Fotefar travel behavior tracking application data, will help analyze the reasons behind citizens and stakeholders transitioning to or adopting more sustainable and active travel options within the case studies. The evaluation will mainly focus on understanding how incentives contribute to these changes in travel behavior.

The updated app integrated with the WP1 Survey is expected to be ready by M9 (February 2024) for use in Subtask 1.3.2, which involves collecting mobility behavior data (led by TØI) starting in M10 (March 2024).

Abbreviations and Terminology

Table 1: List of abbreviations

Abbreviation	Definition
API	Application Programming Interface
App	Application
DMP	Data Management Plan
DT	Digital Twin
EU	European Union
GBFS	General Bikeshare Feed Specification
GDPR	General Data Protection Regulation
GTFS	General Transit Feed Specification
ID	IDentification
LL	Living Lab
MOB	Mobility Observation Box
QR Code	Quick Response Code
RP	Revealed Preferences
SIA	Safety Improvement Area
SIRI	Service Interface for Real-time Information
SP	Stated Preferences
SUMP	Sustainable Urban Mobility Plan
TC	Travel Cost
TT	Travel Time
WP	Work Package

Table 2: Terminology

Term	Definition
App / Application	A digital application downloaded to a mobile smartphone by a user
Case Study	AMIGOS 15 cities including 5 living labs (LL) and 10 safety improvement area (SIA)
User	An individual who installs and uses an app on their smartphone
Partner	AMIGOS research partners and beneficiaries
Respondent	An individual who agreed to participate in a research study and respond to a survey

1. Introduction

Document "D1.1 - Updated Fotefar Mobile Application" presents the work done in Subtask 1.3.1 titled "Travel behavior and stated preference survey design and application integration" (led by TECHNION) within Task 1.1 "Context and stakeholder analysis" within Work Package 1 (WP1) led by TOI.

The purpose of this document is to describe the mixed approach and journey mapping used to seamlessly integrate data-gathering processes under WP1. The integration of WP1 Survey data with Fotefar travel tracking data aims to collect comprehensive data to enhance data analysis and ensure a holistic understanding of travel patterns.

WP1 Survey data includes respondents' socio-demographic information, travel behaviors, attitudes towards travel, preferences, and specifics of their most frequent trips, such as mode of transport, departure times, and trip duration. Additionally, it incorporates a Stated Preference (SP) section. SP is a validated tool for understanding the preferences and motivations related to urban mobility solutions.

Considering the results of a preliminary Case Studies Survey conducted in the AMIGOS 15 location case studies during September 2023, the SP section was developed considering the local challenges and the description of the pre-defined urban mobility solutions cities are interested in implementing.

The goal is to use the information gathered from data to create effective strategies and policies that promote sustainable transportation in the AMIGOS case studies. To achieve this, we aim to integrate data from the WP1 Surevy SP section with the Fotefar travel behavior tracking app data. This innovative method will help us analyze the impact of incentives that encourage changes in travel behavior and understand better the reasons behind the adoption of sustainable and active travel alternatives in urban areas.

2. The Living Labs and Safety Improvement Areas: Case Studies

Simons (2014) describes a case study as an in-depth examination from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program, or system. Therefore, it is critical to view a case study as a framework, rather than a method all on its own, having the capability of incorporating several methodologies. It has been shown that case studies are widely used and that they are even a thriving method for collecting data. The case study approach can be classified as pure theoretically variable-driven research. This means that rather than examining a small number of variables in many cases, a significant number of variables is studied in a small number of cases (Thomas, 2011).

AMIGOS data collection will be conducted in 15 location case studies starting in M10 (March 2024). Data on user needs will be collected from **5 living lab (LL) case studies**, as well as **10 additional safety improvement area (SIA) cases** that will investigate how the project's solutions have been introduced in European cities or regions. A short description of each case study is presented in Table 3.

Table 3: AMIGOS Living Labs & Safety Improvement Areas

Roles	***City***	***Population***	***Area of focus***
LL #1	Istanbul (TR)	15.46 M inhab.	Whole city
LL #2	Hamburg (DE)	1.9 M inhab.	
LL #3	Las Rozas (ES)	95,550 inhab.	
LL #4	Lappeenranta (FI)	72,288 inhab.	
LL #5	Gabrovo (BG)	59,663 inhab.	
SIA #1	Istanbul (TR)	15.46 M inhab.	Pedestrianized zone in city center
SIA #2	Ankara (TR)	5,663 M inhab.	Junction point
SIA #3	Hamburg (DE)	1.9 M inhab.	District of Eimsbuttel
SIA #4	Bologna (IT)	1,019,539 inhab	New routes to “Piccola Cassia”
SIA #5	City of Reykjavik (IS)	137,809 inhab.	City centre, redesign of major mobility hub
SIA #6	Las Rozas (ES)	95,550 inhab.	Routes from commuter stations to universities and business hubs
SIA #7	Nazareth (IL)	77,445 inhab.	Traffic intersection near city hall
SIA #8	Lappeenranta (FI)	72,288 inhab.	Public school in the city center
SIA #9	Gabrovo (BG)	59,663 inhab.	Public school in the city center
SIA #10	Jurmala (LV)	57,813 inhab.	Public school in the city center

2.1. Capacity Building Workshop

Considering the wide range of potential mobility solutions (e.g., new sidewalks, parking restrictions, new bicycle routes) as well as incentives travelers can receive (e.g., reduced travel costs, coffee coupons), partners sought to gather information about the needs and interests of the partnering cities. In response to a discussion that took place during the online WP1 Capacity Building Workshop with the case studies representatives on August 29, 2023, a preliminary online survey was designed to identify the interests and needs of the case studies.

Survey details and results are detailed in section 6.1.

3. Fotefar Application

The Fotefar mobile phone application seeks to provide a reliable and user-centric travel tracking and recording tool that operates seamlessly on mobile devices. The application is designed to be as unobtrusive as possible, working in the background to minimize disruptions to the user. It allows for easy internationalization configuration and prioritizes compatibility across different mobile device makes and operating systems, ensuring inclusivity and a broad reach.

It is aimed at serving as an automatic travel diary collector, to eliminate the need for users to audit or manually intervene in data collection. Positioned as a research tool to enhance travel behavior understanding, Fotefar generates a detailed location-based travel diary for each user. This includes information on travel modes, travel purposes, travel routes, and intermediate stops.

Per GDPR, the IP Addresses are not saved and the user location is stored on personal devices, for geofencing. On the server, location is precise to ~100m radius, or to the closest non-personalizing local statistical unit, dependent on surveyor requirements.

3.1. Travel Tracking Mobile Apps Overview

Response rates for self-reported Travel Diary studies have continued to decline over the years (McCool et al., 2021). While mobile and location technology has made tracking a person's location accurate, smartphone applications have become increasingly popular for self-monitoring and performance tracking (Sunio and Schmöcker, 2017). In travel behavior research, the collection of travel behavior data via mobile phone tracking applications replaces traditional self-reporting methods i.e., paper trip diaries (Gillis et al., 2023).

Tracking behaviors and performance through self-monitoring apps use a variety of measures including calories burned, travel time, travel cost, distance traveled by mode, carbon emissions, etc., that can be compiled on a daily, weekly, monthly, and yearly basis. The use of smartphone applications can also be used as a means of intervention. Embedded persuasive technology holds significant potential in promoting sustainable travel behavior change (Sunio and Schmöcker, 2017).

3.2. Functionality

As an example of how the application works, below you will find a few examples of what its functionality and user interface look like.

3.2.1. Installation

This application is simple to install using the provided QR codes for installation (Figure 1), along with automating the separation of Android and iOS users after the installation is complete.

Individualized QR codes for app installation are automatically generated based on associated groups.

Figure 1: Invite website (Currently only localized in Norwegian)

3.2.2. Login

App landing pages contain a code login that can be used to map users back to surveys and to group them into user groups with varying sets of features. Per GDPR, users are then prompted to allow permissions (as listed below) and consent to enable data collection (Figure 2).

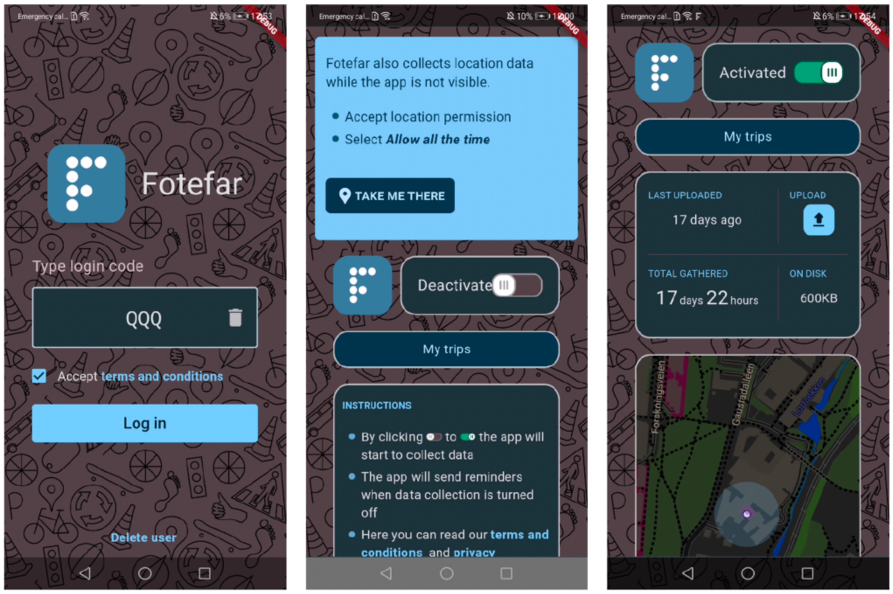

Figure 2: Login - allow permissions – activate and enable the application

List of permissions for data collection:

- Location - for route choice and context clues.
- Activity - for context clues.
- Low-level sensors (on some mobile phone operating systems) as gyroscopes, accelerometers, etc. – which are used solely to induce a mode of travel.
- Background processing (on some mobile phone operating systems) - to be able to run while not in the foreground.
- Notification (on some mobile phone operating systems) - to be able to notify a user of their activity, etc.

3.2.3. Travel Diary

Figure 3 depicts the travel diary capabilities of the app. Users can see at a glance all the trips they have recorded in a listed summary. The summary of each trip offers key details such as the date, duration, and primary mode of travel.

Users can explore single trips in detail to gain a deeper understanding of the characteristics of a selected trip. This feature allows for:

- The tracking of a trip on an interactive map by using the visual representation of the route.
- Travel mode breakdown provides insight into the pattern of travel used during the trip.
- Adding context to the travel narrative as the purpose of the trip and intermediate stops were made.
- Analysis based on detailed time stamps allows users to view their total usage of modes and their typical travel times between points of interest, including origin-destination, average speed, and trip duration.

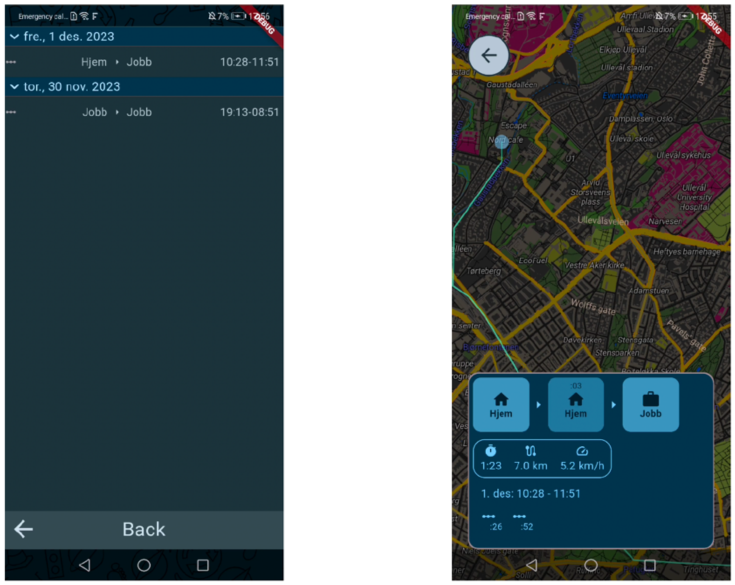

Figure 3: User Travel Diary

3.2.4. Points of Interest (POI)

Whenever a user spends extended periods inside a bounded area, points of interest (sometimes called anchors) are generated for them (see Figure 4). These anchors get an initial prediction of purpose (e.g., shopping places, workplace) mainly based on time of day and length of stay. App users can update and change these.

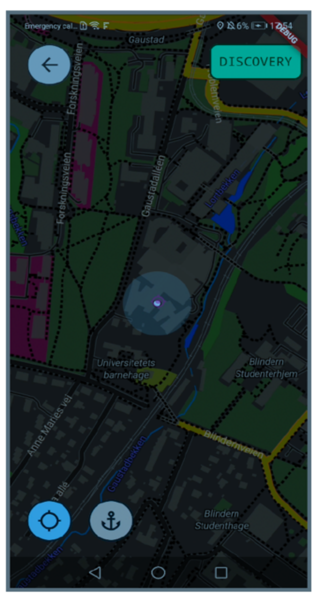

Figure 4: User's Points of Interest / Anchors

3.3. System Considerations

Following are some ways that Fotefar effectively addresses challenges associated with implementing its application to ensure maximum data quality and minimize the inconvenience to the user.

Operating system

The application is designed for implementation on both iOS- and Android-powered phones.

Battery usage

Fotefar implements a custom battery-saving algorithm that dynamically controls sensor usage rates. By employing dynamic geo-temporal areas, events occurring within these designated regions and timeframes can be selectively disregarded or sampled less frequently, all while maintaining data quality.

Given the importance of battery usage, Fotefar prioritizes user engagement with the app by incorporating dynamic battery optimization. This means that the app adjusts its power usage in real time to ensure efficient battery utilization, enhancing the user experience while maintaining the functionality and performance of the application. The application optimizes sensors to minimize battery consumption and enhance data precision.

To get a rough estimate, a tracking app running in the background with default settings on a modern smartphone might use around 5-10% more battery per day. However, if an app is set to high-accuracy mode and is frequently reporting location data, it could use significantly more. Fotefar, however, in ideal conditions utilizes very little device battery, with an average consumption of only 2% per trip-hour during a normal trip.

Network usage

Considering battery usage, the application restricts network uploads to Wi-Fi, ensuring low battery consumption and an efficient experience. Uploading on Cellular can be enabled by the app user but can be expensive due to significant volumes of data.

Device manufacturers

It is important to note, however, that some Android device manufacturers have modified the core Android operating system or added unique features, which can alter or restrict standard functionalities such as processing schedules, application lifespan, and sensor event timing. Thus, some individuals may not be able to participate due to technical limitations.

3.4. Localization and Local Adaptations

The Fotefar application is localization-ready, for both left-to-right (LTR) languages e.g., English, and right-to-left (RTL) languages e.g., Arabic.

Currently, complete localization is only available in two languages, Norwegian and English. Yet it is possible to add localizations, by updating a tabular file of the translations.

Open transport standards such as General Transit Feed Specification (GTFS), General Bikeshare Feed Specification (GBFS), and the service interface for real-time information (SIRI) are implemented in many countries and published for free. Fotefar can, with some local specialization, integrate these data sources to enhance its data. It was noted that the app can be integrated with local public transport data for trips where a clear mode of travel cannot be determined with a high degree of certainty, context clues from timetables, routes, and stops of public transport are used to improve the prediction. The choice of integration of these sources into Fotefar is discretionary, it could improve data quality and context, but is not necessary to the success of Fotefar.

3.5. Customization

To enhance the app user experience and provide specialized features, Gated Features are implemented, with some features being enabled/disabled depending on the criteria for app customization. This enables us to cater to the needs of different app user target groups and offer them unique functionalities. The app developers are working closely with AMIGOS partners to customize the app according to the various project case studies' needs.

A few examples of gated features are as follows:

- Linking survey responses with app data
  With the updated app, a sophisticated gated feature enables to link app users to groups and allows personalization per that group's characteristics. Such a gated feature could allow linking app users, per their location for example, to a group and displaying group-specific information on their main app screen.

- Notification reminders

  With the updated app, notifications to finish/continue the survey are examined. Following the selected participant journey, notifications could be implemented given the chosen survey platform provider offers an API for querying the respondent's survey progress.

- Places app users visit regularly.
  The app allows its users to pinpoint places they regularly visit, providing insights into their trips and points of interest within ~100m proximity per GDPR privacy requirements.

3.6. Fotefar Data

The trip-tracking app outputs travel information including travel modes, travel purposes, travel routes, and intermediate stops. The app outputs can be provided in a wide range of data formats and levels of detail, providing the flexibility to tailor the data for various analyses and the unique goals and requirements of the project, as detailed below.

Data collection

As per the Grant Agreement (GA), 750 participants per city case studies (listed in Table 3) are expected to install the updated application integrated with the WP1 Survey.

The application has been designed to track the app users' travel patterns while discreetly gathering data on travel behavior.

Raw data

Raw data includes all geospatial and temporal data, including unprocessed location data and unrefined anchor locations. The ML algorithms were designed to automatically clean, validate, and pre-process raw data before analyzing it.

Data format

While the underlying Database structure is complex, the application provides data in a variety of formats, allowing researchers to choose the format that best suits their needs. Specifically, the application offers three distinct formats for data presentation, each of which is tailored to meet specific case studies.

Researchers can easily access and select the format that aligns with their requirements, ensuring that the data is presented clearly and concisely. The three data formats supported are:

- Interactive web interface
- Geospatial dataset, shapefile or geojson. (Compatible with e.g., qgis)
- Tabular data with geospatial information. (Compatible with e.g., pandas)

Time series data

The purpose of geospatial time series is to track trips, their parts, and travel modes. This results in a heavily processed dataset.

- Based on machine learning (ML) predictions, travel modes are assigned to the data. The quality of predictions varies depending on several factors, most of which are hidden variables such as variables specific to the location, variables specific to the app user, and variables specific to the device.
- The location data is map-matched as a best fit to the networks of traversable areas given an identified travel mode.
- The data is presented as a set of trips:
    - TripChain, is a trip from one anchor to another, with a purpose (see Figure 5).
    - Trips between two locations.
    - Consisting of trip legs, divided by a point where mode change occurred.

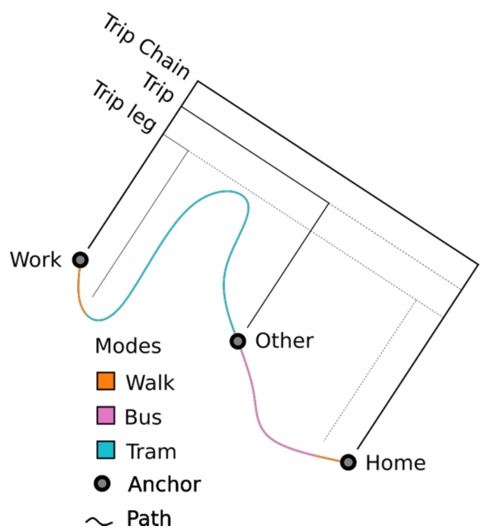

Figure 5: Trip Chain

Metadata

There are various sources of metadata that can be used for the validation of predictions. These sources include external data such as relevant geospatial context, as well as lower-level prediction metadata. Device metadata and app metadata can also be incorporated for this purpose, as well as open standard transport datasets (e.g., General Transit Feed Specification aka GTFS, General Bikeshare Feed Specification aka GBFS, and the service interface for real-time information aka SIRI).

3.7. App User Ingres

As described in the section about app functionality, app users are initially funneled to a landing page, then to the app setup screen, where they are uniquely identified using a login code, which allows them to participate in the AMIGOS research.

To determine some background parameters, potential app users are asked to complete the WP1 Survey before being directed to the app. To ensure efficient tracking of survey responses and their association with specific app users, the updated app is designed to use an API to generate respondent IDs on the fly, or a list of pre-activated respondent IDs that would be used for linking the survey respondent with the app user IDs.

The following features were identified and addressed in the updated application:

- An identifying ID for each app user to link use location data to their survey response.
- App user assignment to a group of specific Living Lab (LL) or Safety Improvement Areas (SIA) cases studied, to provide them with the correct specialized app features and the specific WP1 Survey tailored to their location, based on the project objectives for each case study.
- Maximize the completeness of the aggregated data.

4. Surveying

This section provides an overview of the surveying methodology used in this project to collect survey data from the case studies' partners and individuals in the AMIGOS LLs and SIAs.

For the WP1 Survey, four main objectives have been outlined:

1. Identify the main factors that have the potential to contribute to behavioral change among personal mode users towards sustainable and active modes.
2. Identify the main factors that have the potential to contribute to behavioral change among public transport users towards active modes.
3. Identify incentives that will effectively increase users' willingness to use both sustainable and active modes. Moreover, identify which travelers (in terms of socio-demographic characteristics) are more prone to which incentives.
4. Understand the role of urban design and policy in promoting the safety and security of sustainable and active mode users.

Given the wide range of potential mobility solutions (e.g., new sidewalks, parking restrictions, new bike routes) and incentives to travelers (e.g., decreased travel cost, coffee coupons), partners first sought to determine which solutions and incentives to focus on. To better understand the interests and needs of the case studies involved in the project, partners held in-depth discussions with case study representatives during the World Café session at the AMIGOS kick-off project meeting in June 2023, as well as at the WP1 Capacity Building Workshop on August 29th, 2023. This was followed by a Case Studies Survey conducted in September 2023 to determine which mobility solutions and incentives to prioritize in the WP1 survey.

4.1. Case Studies Survey

To narrow down the potential mobility solutions and incentives based on the feedback received from the case studies' representatives, a preliminary Case Studies Survey was conducted in September 2023 to identify the most relevant interventions and measures for customization of the SP section of the WP1 Survey (section 4.2). The survey lasted for 10 minutes and was designed to gather insight into the local challenges facing cities and the pre-defined urban mobility solutions they are considering implementing under the AMIGOS project. Its main objective was to identify specific mobility solutions and incentives that can be offered to travelers in the WP1 Survey.

4.1.1. Survey Methodology

The Case Studies Survey addressed two main questions:

1. Which urban mobility solutions is the city interested in examining travelers' responses to in the survey?
2. Which incentives is the city interested in examining travelers' response to and is willing to implement?

The survey included a list of possible solutions and a list of potential incentives. Case studies were asked to indicate the level of interest they have in each solution/incentive on a 1-5 Likert scale for each. Case studies were also allowed and encouraged to suggest additional solutions and incentives and were given appropriate space to do so. See Annex 1 for the complete survey instructions and questions.

4.1.2. Findings and Insights

All 10 partnering cities completed the survey (see Annex 1) in the time frame allotted. As a first step, case studies reviewed the responses to ensure they were valid, non-extreme, and coherent. For each solution/incentive, case studies calculated descriptive statistics (mean, standard deviation, minimum, and maximum). Table 4 presents the overall statistics of case studies' ratings, including the mean rating for each solution/incentive, the standard deviation (SD), the minimum rating, and the maximum rating.

Table 4: Case studies survey results: Mobility solutions (panel A), and traveler incentives (panel B) statistics

A. Mobility solutions statistics:

	New sidewalks	Sidewalk width	Separating sidewalks	Pedestrian zone	New bike routes	Separating bike routes	Lights and signs for bikes	Parking restrictions	Parking fees	Carbon-neutral hubs	Car parking center	Redesign intersection	Digital safety solutions	Planting trees	Streetlights	Security cameras
Mean	3	2.8	3	3.4	3.7	3.2	2.9	2.3	2	2.9	2.1	2.7	3.7	3.2	3.7	3
SD	1.25	0.92	1.33	1.71	1.34	1.32	0.99	1.34	1.05	1.60	1.45	1.49	1.16	1.48	1.34	1.76
Min	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Max	5	4	5	5	5	5	4	4	4	5	4	5	5	5	5	5

B. Traveler incentive statistics, divided into incentives targeting public transport use, use of active modes, and general incentives:

	Public Transport (PT)						Active modes			General incentives	
	Decreased travel cost	Free ride	Free PT	Free ride for a friend	Coupon for coffee	Info on carbon footprint	Decreased fee for shared bike	Info on health benefits	Info on carbon footprint	Free docking	Combined fee for PT & shared
Mean	2.8	1.8	1.8	1.8	1.9	3	2.6	3.6	3.5	2.9	2.5
SD	1.23	0.79	1.03	0.79	1.10	0.94	1.17	0.97	1.18	1.37	1.35
Min	1	1	1	1	1	1	1	2	1	1	1
Max	5	3	4	3	4	4	4	5	5	5	5

The descriptive tables and core results were presented and discussed in several AMIGOS meetings, aimed at shortlisting the identified solutions/incentives and selecting those to be integrated into the survey. In what follows, case studies present the core findings and insights from this survey.

For the mobility solutions, the case studies seem very interested in examining travelers' expected response to new bike routes, bike routes' separation from car traffic, and a pedestrian zone. Therefore, these three solutions were incorporated into one variable, named **designated infrastructure**, which is included in the WP1 Survey as a "separated bike lane" for the bike mode, and as a "pedestrian zone" for the walk mode. Further, based on the survey results, it was decided to include **streetlights** as one of the factors in the survey as some measure of security.

For the potential incentives, the case studies seemed to be most interested in examining participants' responses to **information on carbon footprint** and **information on health benefits**. Thus, these factors have been included in the WP1 Survey. However, because it was decided not to limit the survey to information-based incentives, case studies decided to also include monetary incentives of a free ride and a reduced cost as additional levels for the travel cost variable.

4.1.3. Influencing Factors

The Case Studies Survey has revealed the six most influencing factors. After careful consideration and discussions with the AMIGOS research team, these factors were recognized as the independent variables to be used in the SP section of the WP1 Survey. Following an efficient design was used to select the attribute levels for the scenario/respondent. See Table 5 for the list of factors.

Table 5: List of influencing factors chosen to be tested in the SP section.

Independent variable	# Levels	Levels
Travel time (TT)	3	• TT reported for current trip • TT+20%TT • TT-20%TT
Travel cost (TC)	4	• TC reported for current trip • €0 (free ride) • €X (reduced cost) • €Y (higher cost)
Designated infrastructure	2	• No • Yes: ○ For bike - separated bike lane ○ For walk - pedestrian zone
Lighting conditions	2	• Poor lighting in public spaces • Improved lighting in public spaces
Environmental information (CO_2 emissions)	2	• None • Information on CO_2 emitted
Health benefits information (Calories burned)	2	• None • Information on calories burned

4.2. Stated Preference (SP)

Travel demand research is often based on survey data collected from travelers. One common survey type is the Stated Preference (SP) survey, which evaluates potential participant choices for hypothetical scenarios (Gkartzonikas and Gkritza, 2019). SP surveys constitute an effective tool for assessing participant estimation of multi-attributed choices, thereby enabling the evaluation of complex choice decisions (Cantelmo et al., 2022; Monteiro et al., 2023; Yang et al., 2009). Furthermore, SP surveys allow researchers to investigate the effects of various variables (e.g., travel cost, presence of bike lanes), with different levels (due to their hypothetical nature), and possibly levels beyond the current range.

SP surveys provide systematic and efficient use of the data collected for modeling purposes. The SP data collected in AMIGOS will ultimately be used to estimate a discrete choice model (e.g., mixed logit model), commonly used to predict traveler behavior and quantify the effects of different influential factors (Ben Akiva and Lerman, 1985).

As aforementioned, the AMIGOS WP1 Survey aims to identify the main factors that could contribute to behavioral change among personal mode users to either public transport or active modes, and public transport users to active modes. Following the GA, the survey's target population is 750 per city including personal mode users, public transport users, but also active mode users (walking, biking), given that understanding these users' motivation and preferences (in terms of urban design and policies, for example) is also a focal point of this project.

4.3. WP1 Survey

4.3.1. Structure and Procedure

Using either panel data or local recruitment (see Participant Recruitment), respondents will be able to complete the online survey via the Internet, along with downloading the mobile application.

WP1 survey is programmed via the Qualtrics survey platform on a user-friendly interface. The expected survey completion time is 12-15 min. Before data collection begins, the survey will be tested in one of the case studies to confirm the survey's technical functionality (particularly, the SP section and question selection), as well as confirm respondents' comprehension of the questions and their tasks in the SP section. Based on insights gained in this pilot testing, the WP1 Survey will be refined and finalized for data collection.

The WP1 survey structure is as follows:

1. **Socio-demographic information**
2. **Travel attitudes and preferences**, including:
    - Statements on personal norms for private car usage (following Zhang et al., 2020)
    - Different travel mode perceptions in terms of security level, safety, and various other measures
    - Expected response to sustainability enhancing measures (partly case study tailored)
3. **Travel patterns and most frequent trips**, including:
    - Most frequent trip attributes: Purpose, departure time, travel mode
    - Estimated travel time for most frequent trips in different travel modes
    - Parking expenses
4. **SP section**
    - 6 scenarios per respondent

See Annex 2 for the complete AMIGOS WP1 Survey.

4.3.2. SP Section

The SP section was developed based on inputs from the case studies during the initial SP section design phase.

Dependent measure: Mode choice

The SP section of the survey includes 6 hypothetical scenarios that will be presented to each respondent. Each respondent will be randomly presented with a different set of scenarios. In each scenario, the respondent is asked to choose between three alternative travel modes based on various attributes (e.g., travel time, travel cost, designated infrastructure). Thus, mode choice serves as the dependent measure. The alternative modes presented to respondents are:

- Private car
- Public transport
- Active modes: a) bike, b) walk

Thus, in each scenario, the respondent will be presented with three alternatives, in some of these the active mode category will appear as 'bike' while in others it will appear as 'walk'.

To enhance scenario realism, respondents will be presented only with modes that are actually available to them (thus, a respondent who reported not being able to ride a bike, for example, will not be presented with a bike alternative).

SP scenario example

Figure 6 illustrates an SP scenario example, including three mode alternatives with corresponding attribute information (i.e., influencing factors; first column).

In the following table, you will find information on three travel alternatives:

	Private car	**Public transport**	**Bike**
Total travel time (walking and waiting included)	20 min	22 min	25 min
Travel cost	€8	€3	€0
Designated infrastructure	Separated bike lane		
Lighting conditions	Improved lighting in public places		
CO_2 emitted	5.2 kg	0.7 kg	0 kg
Calories burned	0 kcal	36 kcal	127 kcal

Given this information, which alternative would you choose for your trip to work?

Figure 6: SP section question example portraying one choice scenario

4.3.3. WP1 Survey Localization

Initially composed in English (Annex 2), the WP1 Survey will be translated into 10 local languages by partners. By providing translations that cater to the unique linguistic needs of each case study, partners will aim to make the survey locally accessible. The objective is to ensure that the survey is accessible and understandable to a broad audience, promoting effective and efficient communication within the target audience involved in the project.

4.3.4. GDPR and Ethical Considerations

The General Data Protection Regulation, or GDPR, is a key component of EU privacy law and human rights law, particularly Article 8(1) of the Charter of Fundamental Rights. The GDPR aims to enhance individuals' control and rights over their personal information. Furthermore, the regulations govern data transfers outside the EU.

Surveying data will be collected via the Qualtrics survey platform and stored on Qualtrics' GDPR-compliant data center servers in Germany.

Furthermore, as necessary, approvals will be sought from local case study's Ethical Committees (e.g., for Israel's LL and SIA, the Technion ethical committee will be approached for approval).

For additional information on this please refer to "D7.2 - DMP - Data Management Plan."

5. Survey & App Integrated Data Collection

Different methodological strategies were assessed by the collaborative task partners for integrating the data collection efforts from the application and the survey. It's important to note that this integration is procedural and serves to enhance the analysis capabilities by incorporating the survey and the app's travel behavior data. This integration is not a simple feature within the application but a comprehensive enhancement to the overall data collection method.

It is planned to execute a pilot program in early March 2024 to enhance outcomes. A mixed approach was recommended for optimizing response rates, as detailed in the participant journey.

5.1. AMIGOS Participant's Journey

The sub-sections below detail the Fotefar application and survey integration participant journey in a graphical format. The participant journey includes multiple elements, from the recruitment of participants to considerations related to GDPR and consent to participate, during, as well as after, the survey is completed.

5.1.1. Participants Recruitment

According to the GA, in terms of recruitment, the goal is to recruit 750 participants per case study. Due to the estimated complexity of the recruitment, including varying sizes of participating cities, and the requirement of app users in addition to the survey process, it was decided to use a mixed approach. There will be a combination of recruitment from a panel company (e.g., WALR) as well as local recruitment by the local project partners from the case studies, see Figure 7 for details. The Panel company and local case study partners will be responsible for motivating participants to finish the survey, potentially through a reward mechanism. A concept that was proposed includes organizing a prize lottery in each city as a form of incentive.

Prospective participants shall be reached through engagement with a panel company. Following the completion of the AMIGOS WP1 Survey (Annex B), including socio-demographic information, general travel patterns, attitudes, preferences, perceptions, and SP scenarios, participants will receive an invitation to install the application.

Coordination of local recruitments by case study partners is under consideration.

Panel data

- Performed by survey panel company – central procurement
- 100-500 participants per city
- Offering Fotefar app to respondents
- Link to survey (one per case study)

Local recruitment & local panels

- Various sources (SoMe, field, stakeholders, etc)
- 250-650 participants per city
- Possibliy separate Fotefar recruitment (i.e. not survey), in addition
- Link to survey (one per case study)

Figure 7: Participant Recruitment

5.1.2. GDPR and Consent

Figure 8 below illustrates the participants' journey regarding GDPR and their consent to participate (for details refer to Annex D in D7.2) in the survey and use the app for this study.

To protect personal data, GPS location, and IP addresses are not recorded as security measures, as well as explicit consent for data collection and processing is put into place. Additionally, anonymization and encryption techniques will be employed.

Step I: First page

- Short info about GDPR, related to the survey
- Roll-down menu with full text
  - Including withdraw and opt out info
- Consent yes/no
- Continue to survey

Step II: After all questions

- Short explanation about the app
- Roll-down menu with GDPR text concerning GDPR
- Want to try the app? Yes/no

Step III: In the app

- Full GDPR text
- Who to contact if you have question or wish to opt out

Figure 8: GDPR and participation consent

5.1.3. Survey Structure followed by App Recruitment

Figure 9 illustrates the survey structure, followed by the app recruitment process.

Socio-demographics
- Age
- Gender
- Employment
- Education level
- Number of household members
- Income level

Travel attitudes and preferences
- Attitutes towards car use
- Perception of different modes in terms of security, safety and more
- Expected response to various mobility measures

Travel patterns
- Most frequent trip attributes, including purpose, departure time, travel mode
- Estimated travel time for most frequent trip in different travel modes
- Parking expenses

SP section
- Stated preference survey section: 6 hypothetical scenarios per participant

App recruitment
- App intoduction
- Consent to try
- Record email /phone number
- Exit from survey:
  - Yes: to Fotefar login page
  - No: “thanks”
- App login+QR code sent to SMS/email
  - Code assigned to user after consent (hidden)

Figure 9: Survey Structure followed by App Recruitment

5.1.4. Application Setup

Upon completion of the survey, respondents will be invited to install the Fotefar app and participate in the project's travel behavior investigation. See the detailed participant journey in Figure 10.

Fotefar login page
- Unique login code follows respondent
  - Either from survey or with email
- Triggers a unique QR code
- User reads QR code with phone camera
- Redirects to AppStore (IOS) or PlayStore (Android)
  - Based on phone type

AppStore/PlayStore
- Normal user journey
- IOS avilable via the ios beta platform "testflight" - Dec 23
  - Full AppStore support is in the works and due February 24.

In the app
- User code automatically entered
- User needs to set permissions
  - Location
  - Battery saving
- Needs to activate app
- Needs to have WIFI on
- Data is uploaded automatically via WIFI

Figure 10: Participants’ journey upon survey completion

6. Conclusion

This deliverable provides an overview of our ongoing work of surveying design and development, emphasizing our commitment to privacy, ethics, and continuous improvement of the study of travel behavior. It summarizes the successful process of coordinated steps designed to integrate data from the specifically designed WP1 Survey and Epigram's Fotefar travel behavior tracking application.

The Fotefar tracking app and WP1 survey are to be utilized in an integrated data collection approach, aiming to comprehensively understand travel behavior, and explore preferences and influencing factors. The app, designed for iOS and Android, prioritizes efficient battery usage and robust data security.

Pilot testing guides methodology refinement, and both quantitative and qualitative analyses, employing descriptive statistics and modeling tools, will be conducted. The updated Fotefar app, integrated with the WP1 Survey, enables participant-linked data for statistical analysis and modeling.

Furthermore, tracking and Mobility Observation Box (MOB) observatory data collected in cities' Living Labs (LLs) and Safety Improvement Areas (SIAs) could contribute to advanced analyses and inform digital twins (DT) and sustainable urban mobility plans (SUMP) via the AMIGOS big data platform.

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Annex 1: Case Study Survey

Start of Block: Default Question Block

Q1
Dear AMIGOS partner,

We are reaching out to you regarding the stated preference (SP) survey planned for WP1.

Following the WP1 Capacity Building workshop, we wish to collect your input for the survey. The survey will be distributed to thousands of users across the living labs (LLs) and safety improvement areas (SIAs) identified in the proposal, including your city/area. In this survey, we aim to collect your city/area's interest and suggestions regarding the survey data collection from users. Please allocate 5-10 minutes to complete this survey by Monday, Sep 18.

We thank you for your contribution.

Best regards,
Technion and TOI teams

Page Break

Q2 Your name:

____

Q3 Position:

____

Q4 City/area:

____

Q5 Country:

____

Page Break

Q6

In the upcoming SP survey, we will ask users to choose between three travel modes: personal modes, public transport, and active modes. These choices will be evaluated across various hypothetical scenarios in which we will explore the influence of **potential urban mobility solutions** (among other factors). We kindly request you to share your city/area's level of interest in investigating users' responses to the following solutions within the survey.

For each of the following solutions, position the slider between 1 and 5, to indicate the level of interest your city/area has in examining users' response to this solution. Higher scores indicate that your city/area is more favorable towards including the specific solution in the survey. Note that for your response to be recorded, you need to click on the slider even if you do not wish to move it.

Important: Although it would be interesting to investigate users' responses to many of these solutions, SP surveys are inherently limited in the number of solutions that can be examined in one survey (no more than 2-3). Thus, we would appreciate your effort in differentiating between important and non-important solutions to your city/area.

Q7

	Not interesting				Highly interesting
	1	2	3	4	5
Adding new sidewalks ()					
Increasing sidewalk width ()					
Physically separating sidewalks from vehicle lanes ()					
Creating a pedestrian designated zone ()					

Q8

	Not interesting 1	2	3	4	Highly interesting 5
Adding new bike/scooter routes ()					
Physically separating bike/scooter routes from vehicle lanes ()					
Incorporating traffic lights and road signs for bikes/scooters ()					

Q9

	Not interesting 1	2	3	4	Highly interesting 5
Parking restrictions for cars ()					
Parking fees for cars ()					
Creating carbon-neutral hubs ()					
Adding a large private car parking center ()					

Q10

	Not interesting				Highly interesting
	1	2	3	4	5
Redesign of a central intersection ()					
Incorporating digital solutions to increase safety ()					
Planting trees (for example, for shade) ()					
Installing streetlights for security and safety ()					
Installing security cameras ()					

Q11 If there are additional mobility solutions your city/area is considering (solutions which you would estimate as "5 - highly interesting"), please indicate them here:

____

____

____

____

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Page Break

Q12 The SP survey will also examine **the effectiveness of different incentives in creating a behavioral change among users towards sustainable and active modes**. Here, we ask that you reflect the interest, as well as the ability, of your city/area to offer the following incentives to users. Some of the incentives refer to public transport and some to active modes.

For each of the following incentives, position the slider between 1 and 5. Higher scores indicate that your city/area is interested in examining users' responses to the specific incentive <u>and</u> can implement it.

Q13 **Incentives to promote public transport usage**

	Not interested or not feasible				Highly interested and feasible
	1	2	3	4	5
Decreased travel cost ()					
Free ride for every X paid rides ()					
Fully free public transport ()					
1+1 invite a friend to ride for free ()					
Coupon for coffee ()					
Information about carbon footprint ()					

Q14 **Incentives to promote active modes usage**

	Not interested or not feasible				Highly interested and feasible
	1	2	3	4	5
Decreased fee for shared bike/scooter services ()					
Information about health benefits ()					
Information about carbon footprint ()					

Q15 **General incentives**

	Not interested or not feasible				Highly interested and feasible
	1	2	3	4	5
Free docking/charging for bike/scooter at public transport station ()					
Combined fee for public transport and shared services ()					

Q16 If you have additional incentive ideas your city/area is willing to offer users, please indicate them here:

____

____

____

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Page Break

Q17 If you wish to raise anything else we should consider in the SP survey design, please do so here:

____

____

____

____

____

Page Break

Q18 Thank you for your contribution!

If you have questions or wish to comment on the contents of this survey, please contact us at:
Yoram Shiftan - shiftan@technion.ac.il
Einat Tenenboim - einatrei@technion.ac.il
Aslak Fyhri - aslak.fyhri@toi.no

End of Block: Default Question Block

Annex 2: WP1 Survey

AMIGOS WP1 Survey

Thank you for agreeing to participate in this travel study funded by the European Commission and led by Prof. Yoram Shiftan and Prof. Aslak Fyhri. This research is aimed at understanding the factors related to people's travel mode choices with the purpose of improving transportation services.

Please complete the following survey. Survey completion time is approximately 12 mins.

[CONSERT FORM DOCUMENT]

In case you have questions or comments, please reach out to us at:

Prof. Yoram Shiftan: shiftan@technion.ac.il

Prof. Aslak Fyhri: aslak.fyhri@toi.no

Thank you for your cooperation,

The research team

Qualtrics programming note:

Red font: Response directs to end of survey

Blue font: Conditional presentation (the question/alternative response will not appear to all)

Green font: Piped text (text taken from the respondent's own response to a previous question)

Block 1: Socio-demographics

1. What is your gender?
    - Female
    - Male
    - Other gender identities (may specify)
    - Prefer not to say

2. What is your age?
   (drop-down menu; less than 18, 18-99, prefer not to say)

3. What is your current employment status?
    - Employed full-time
    - Employed part-time
    - Self-employed
    - Unemployed
    - Student
    - Retired
    - Other (please specify)

4. How many days do you commute to work in a typical week?
    - 5+ days a week
    - 4 days a week
    - 3 days a week
    - 2 days a week
    - 1 day a week
    - Not every week
    - Rarely
    - Never

5. What is the highest degree or level of school you have completed?
    - Less than a high school diploma
    - High school diploma or equivalent
    - Bachelor's degree
    - Master’s degree
    - Doctorate (PhD, EdD, MD, etc.)
    - Other (please specify)
    - Prefer not to say

6. Enter the number of your household member(s) in each age range, including yourself:

5 or younger	0
6 to 15	0
16 to 25	0
26 to 45	0
46 to 64	0
65 or older	0
Total	(will be calculated automatically)

7. To obtain a representative sample, we require an estimate of your household's gross annual income from all sources. The average gross household income in [insert country name] is [insert yearly amount] yearly, or [insert monthly amount] monthly. Please select the option that best fits your household's income:
    - Much lower than average
    - Slightly lower than average
    - Average
    - Slightly higher than average
    - Much higher than average
    - Prefer not to say

8. Do you have a valid driver's license to drive a car or a motorcycle/scooter/moped?
    - Yes, car and motorcycle/scooter/moped
    - Yes, car only
    - Yes, motorcycle/scooter/moped only
    - No

9. Including yourself, how many individuals in your household have a valid driver's license?
    - 1
    - 2
    - 3
    - 4
    - 5
    - 6+

10. Please indicate the number of transport resources that are currently available to you and the members of your household:

	Number available
Fuel or hybrid engine vehicle	
Electric vehicle	
Pedal bicycle	
Electric bicycle	
Moped/Motorcycle	
E-scooter	

11. If has at least one Fuel or hybrid engine vehicle (Q10 – previous question)

The vehicle you typically use:

- Is self-owned (by me or someone else in my household), and I pay its expenses
- Is self-owned, yet its expenses are paid fully/partially by the company I work for
- Is owned/leased by the company I work for
- Is leased
- Other (please specify)

12. Do you have any physical/cognitive/mental health condition(s) or other long-standing illnesses that makes it difficult for you to do any of the following activities?
    - Ride a pedal bicycle? (yes/no)
    - Use local buses? (yes/no)
    - Get in or out of a car? (yes/no)
    - Walk for 300m? (yes/no)

Block 2: Travel patterns and daily commute

13. Thinking back of the past month, how often have you used the following travel modes?
    If the specific mode is not available in your residence/work area, or is not available only to you, select "not available/applicable".

	1 Never	**2** Rarely	**3** Not every week	**4** Once a week	**5** 2-4 times a week	**6** Daily or almost daily	Not available /applicable
Walking (as a means of transport)							
Bike							
Private car							
Public transport							
Other (please specify)							

14. If answered Q3 with 'retired'/'unemployed' or answered Q4 with 'not every week'/'rarely'/'never'
    There are some questions in this survey that refer to commute trips. If you do not typically commute, please refer to your <u>most frequent trip</u> when asked about your commute trip. If you do not have a specific trip frequently performed, refer to your most recent trip.

    What is the purpose of the most frequent/recent trip that you perform?
    - Grocery store

- Shopping/errands
- Medical services
- Social/recreational
- Meals
- Exercise/fitness
- Other (please specify)

15. Please use the following map to indicate where your home is located.
    (Include map; after data collection, local partners will divide the respective city areas according to a classification scheme based on e.g., density level)

16. Please use the following map to indicate where your workplace is located.
    If you do not commute, indicate where your most frequent trip destination is located.
    (Include map; after data collection, local partners will divide the respective city areas according to a classification scheme based on e.g., density level)

17. What travel mode do you typically use for your daily commute?
    If you use more than one mode on a single commute (for example, walking and then taking a bus), select only the main mode.
    - Walking
    - Bike
    - Scooter
    - Private car; as driver
    - Private car; as passenger
    - Bus
    - Tram/BRT/train
    - Uber/Lyft
    - Taxi
    - Other (piped text from Q13-other)

18. How much time (in minutes) does/would it take you to complete your commute trip using the following modes (one-way)?
    If you do not know the travel time in one or more of these modes, give your best estimate. If you have absolutely no idea, check the 'I don't know' box.
    If making the trip using one of these modes is not feasible (for example, due to a large distance), check the 'not feasible' box.

	Private car	**Public transport**	**Bike**	**Walking**
Time (in min)				
I don't know				
Not feasible				

19. If answered Q17 with 'private car; as driver'
    How much do you typically pay for parking at/near your workplace? Round up to the nearest [insert local currency name].
    (Cost provided by typing digits + I do not pay for parking)

20. If answered Q17 with 'private car as driver'
    Are you reimbursed/compensated by your employer for these parking costs?
    - Yes
    - No
    - Partly
    - I am not sure

21. During the winter months, how often do you commute to/from work at dawn/dusk/dark?
    - Every day or almost every day
    - 3-4 days a week
    - 1-2 days a week
    - Not every week
    - Rarely
    - Never

Block 3: Travel preferences

22. For the following statements, please indicate your level of agreement on a 1-5 scale, where 1 reflects 'strongly disagree', and 5 reflects 'strongly agree'.

	1 Strongly disagree	**2**	**3**	**4**	**5** Strongly agree
I feel morally obliged to use sustainable transport instead of a car					
If I would buy a new car, I would feel morally obliged to buy an energy-saving one					
People like me should do everything they can to reduce car use					
I feel obliged to bear the environment and nature in mind in my daily behavior					
I would be a better person if I protected our environment					

23. Overall, how satisfied/dissatisfied are you with the cycling infrastructure in your city?
    (1-5 scale; Very dissatisfied – Very satisfied)

24. Overall, how satisfied/dissatisfied are you with the walking infrastructure in your city?
    (1-5 scale; Very dissatisfied – Very satisfied)

25. Overall, how satisfied/dissatisfied are you with the public transport services in your city?
    (1-5 scale; Very dissatisfied – Very satisfied)

The following are all 1 'strongly disagree' to 5 'strongly agree'

26. For me, to cycle on my everyday travel would be:
    a) Fast
    b) Safe
    c) Flexible
    d) Pleasurable
    e) In line with my identity

27. For me, to walk all the way on my everyday travel would be:
    a) Fast
    b) Safe
    c) Flexible
    d) Pleasurable
    e) In line with my identity

28. For me, to use public transport on my everyday travel would be:
    a) Fast
    b) Safe
    c) Flexible
    d) Pleasurable
    e) In line with my identity

29. For me, to drive on my everyday travel would be:
    a) Fast
    b) Safe
    c) Flexible
    d) Pleasurable
    e) In line with my identity

30. In [insert city name] most car drivers are considerate towards cyclists and pedestrians.
(1-5 scale; Strongly disagree – Strongly agree)

31. Measure 1 (increase cycling)

Imagine that the city government in [insert city name] were to create a complete network of separated bicycle roads in the city. Indicate your level of agreement with the following statements.

(1-5 scale; Strongly disagree – Strongly agree)

- The city should prioritize this solution
- This solution would make it more likely for me to use a bike for my everyday commute
- This solution would make it safer for me to use a bike in that area

32. Measure 2 (increase walking)

Imagine that the city government in [insert city name] were to build sidewalks on all streets of the urban area. Indicate your level of agreement with the following statements.

(1-5 scale; Strongly disagree – Strongly agree)

- The city should prioritize this solution
- This solution would make it more likely for me to use walk for my everyday commute
- This solution would make it safer for me to walk in that area

33. Measure 3 – increase public transport use

Imagine that the city government in [insert city name] were to make public transport free. Indicate your level of agreement with the following statements.

(1-5 scale; Strongly disagree – Strongly agree)

- The city should prioritize this solution
- This solution would make it more likely for me to use public transport for my everyday commute
- This solution would make it safer for me to use public transport in that area

34. Measure 4 – reduce private car use

Imagine that the city government in [insert city name] were to reduce the number of parking spots for private cars in the city centre to half of the existing amount. Indicate your level of agreement with the following statements.

(1-5 scale; Strongly disagree – Strongly agree)

- The city should prioritize this solution
- This solution would make it less likely for me to use private car for my everyday commute
- This solution would make it safer for me to walk in that area

Block 4: SP scenarios

In each of the following 6 hypothetical scenarios, you are asked to choose between 3 different travel alternatives to perform your commute. If you do not regularly commute, refer to your most frequent trip (or, if you do not have one, your most recent trip). For each alternative, we will present some attributes (travel time, cost, streetlighting condition, etc.). We will also present to you information about the environmental impact of your travel and information about health benefits.

In each scenario, **imagine that the 3 alternatives are your only options for traveling to your actual workplace/frequent trip destination**. Carefully read the attribute information given and choose your preferred alternative. Keep in mind the characteristics of your actual commute trip.

Please note:

1. For a car alternative, **travel cost** presents fuel and other per-kilometer costs (assuming you already own a car). For a bike alternative, the cost includes a rental fee (if a bike is not available to you).
2. The environmental information includes the **amount of CO_2 emitted** with each alternative mode (in kg).
3. Health benefits information is presented in terms of **calories to be burnt** with each alternative mode (in kcal).

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Thank you for completing this survey!

Your response has been recorded.