Support study on data collection and analysis of active modes use and infrastructure in Europe

Final Report

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ABSTRACT

The study addresses the lack of comparable statistics concerning walking and cycling in the EU. Travel surveys are the main source of statistics on average daily walking and cycling distance and number of trips per person. Countries were divided in seven groups according to the data collection and reporting methods used.

The most recent and representative statistics were used to produce a first comparative overview on walking and cycling use based on these non-harmonised statistics. The European median daily walking and cycling distances and number of trips were estimated. The results were compared with statistics derived from EU surveys.

The potential of using crowdsourcing for data collection of infrastructure was examined and results were promising for collecting cycling infrastructure statistics. This would require standard definitions and guidelines for the data collection.

The potential of big data was analysed through the case studies of 'Google Better Cities' and 'COWI City Sense'. Although promising for the future, neither of these could provide active modes statistics.

Recommendations to further improve information and statistics on active modes include: common definitions, new indicators concerning walking friendliness of urban environments, alignment of data collection efforts with ongoing and future initiatives and post-processing methods to improve comparability.

L'étude concerne le manque d'informations et de statistiques piétonniers et cyclables en Europe. Les enquêtes de déplacements fournissent les statistiques sur la distance moyenne par jour et le nombre de ces modes de déplacement par personne. Sept groupes de pays sont identifiés en fonction des méthodes de collecte de ces données.

Les statistiques les plus récentes et les plus représentatives ont permis d'avoir un premier aperçu comparant marche et vélo. Les médianes européennes des distances parcourues par jour et des déplacements pédestres et cyclistes sont estimées à partir de ces statistiques non harmonisées. Les résultats sont comparés aux statistiques issues d'enquêtes Européennes.

Une production participative de données concernant les infrastructures cyclables est possible, mais cela demande des définitions et des directives standardisées pour la collecte de ces données.

Le potentiel offert par le 'big data' est prometteur, mais cela ne permet pas encore de produire des statistiques pour piétons et cyclistes.

Les recommandations pour améliorer information et statistiques sur la mobilité active, incluent des définitions communes, des nouveaux indicateurs concernant la convivialité d'environnements urbains pédestres, l'alignement des efforts de collecte de données avec d'autres initiatives en cours et à venir, et des méthodes de traitement afin d'améliorer la comparabilité des statistiques.

CONTENT

APPENDICES

LIST OF ACRONYMS

AT	Austria
BE	Belgium
BG	Bulgaria
CAPI	Computer Assisted Paper Interview
CASI	Computer Assisted Self Interviewing
CATI	Computer Assisted Telephone Interviewing
CAWI	Computer Assisted Web Interview
CH	Switzerland
COST-PQN	Pedestrian Quality Needs project. www.walkeurope.org
CR	Country Researchers
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
E.V.	Electric Vehicle
EC	European Commission
ECF	European Cyclists' Federation
EE	Estonia
EHIS	European Health Interview Survey
EL	Greece
ES	Spain
EU	European Union
F2F	Face to face interviews
FI	Finland
FR	France
GPS	Global Positioning System
HR	Croatia
HU	Hungary
ICTCT	International Co-operation on Theories and Concepts in Traffic Safety
IE	Ireland
IT	Italy
LAU	Local Administrative Unit
LT	Lithuania
LU	Luxembourg
LV	Latvia
MiD	Mobilität in Deutschland
Mobile	the part of the surveyed population that makes at least a trip on population the surveyed days

MT	Malta
NL	The Netherlands
NP	National Contact Points
NO	Norway
NTS	National Travel Survey
NUTS	Nomenclature of Territorial Units for Statistics
O/D	Origin/Destination
OECD	The Organisation for Economic Co-operation and Development
OSM	OpenStreetMap
PAPI	Paper and Pencil Interviewing
pkm	Person-km
PL	Poland
PMP	Project Management Plan
PT	Portugal
RO	Romania
SASI	Smartphone Assisted Personal Interview
SE	Sweden
SHANTI	COST Action TU0804
	Survey Harmonisation with New Technologies Improvement
SI	Slovenia
SK	Slovakia
TE	Thematic Experts
TOR	Terms of Reference
UK	United Kingdom
WAPI	Web Assisted Personal Interview
WBCSD	World Business Council for Sustainable Development

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

OVERVIEW OF THE STUDY

This study aims at addressing the lack of comparable information and statistics on walking and cycling use and related infrastructure. Its main objectives are to provide comparable information and statistics on these active modes at urban and national level, and to suggest ways forward to further improve this information.

This final report covers all study tasks:

- Task 1 consisted of the mapping of data sources, providing an overview on walking and cycling use and infrastructure at urban, regional and national level.
- Task 2 describes the active modes data collection in the EU28, Switzerland and Norway, and their capitals. For each country, a country report presents the available statistics in a summary table, and the response to the questionnaire, along with background information to help interpret these data. These country reports are published as Appendix C in this final report. The information was obtained through countries consultation by mapping the data sources on walking and cycling use and infrastructure.
- Task 3 presents the identified strengths and weaknesses of different data collection methods for providing comparable information on walking and cycling use. Data collection methods from the country reports include travel surveys, national census, and traffic counts. In addition, other European active modes statistics are examined; i.e. Eurobarometers and the European Health Interview Survey (EHIS). New data collection methods are introduced: the potential of big data and of crowdsourcing.
- Task 4 is a comparative overview showing how much is feasible in terms of EU wide statistics on walking and cycling use and related infrastructure.
- Task 5 presents the difficulties encountered when developing the comparative overview and compares the active modes statistics produced based on the countries consultation, with those from Eurobarometers and the European Health Interview Survey.
- The recommendations are presented in Task 6.

DATA MAPPING AND COUNTRIES CONSULTATION

The study started with an overview of data sources, based on a literature review and semi-structured expert interviews. This provided key issues to address in the consultation of active modes data providers in 30 countries and their capitals. The first part of the consultation addressed the available data collection methods, focusing on the methods leading to the indicators 'average daily distance travelled per person' and 'average number of trips per day', for both walking and cycling. The study also addressed the issues related to the comparability of the statistics: the target population, how trips are recorded, and factors affecting distance. Questions were also asked about other potential sources of active modes data, such as big data, traffic counts and national census. Finally, the study covered walking and cycling infrastructure data. Aside from the countries consultation, two case studies (Google Better Cities and COWI City Sense - Signal Re-identification) were selected to assess the potential of big data for providing walking and cycling statistics.

The consultation covered different types of organisations and institutions. The majority of the respondents were either from City Authorities (27%), Ministries or related agencies (38%). More than half of the countries (18 out of 30) mentioned difficulties when collecting active modes data. In countries with a systematic data collection structure, difficulties due to under reporting and bias or partial data were mentioned. In seven countries the lack of systematic and consistent data collection is mentioned, whilst three countries mention a complete lack of data.

DATA COLLECTION METHODS IN COUNTRIES AND CAPITALS ACROSS EUROPE

The countries could be divided in seven groups according to the data collection method and reporting used concerning walking and cycling: Group 1 - National surveys are carried out regularly and the data collected and reported include all key indicators, Group 2 - National surveys are carried out regularly and the data collected and reported include SOME of the key indicators, Group 3 - National surveys are carried out regularly but the data collected and the ensuing reports do NOT include key indicators, Group 4 - Ad-hoc surveys are carried out at national level only, Group 5 - Surveys are conducted regularly only at capital level, Group 6 - Ad-hoc surveys are carried out at capital level, Group 7 - No surveys including active modes. Geographically, the groups divide Europe in two parts: Western and Scandinavian countries are mostly in Groups 1, 2 and 3, whilst Eastern and South-eastern countries feature more in Groups 4-7.

All countries producing statistics on average daily walking distance per person and on average daily number of walking trips at country and capital level obtain these figures from travel surveys. In countries where walking and cycling data are collected as part of the National Census, mobility data refers to commuting trips and mostly about the main mode; therefore these are not sufficient to produce comparable data for a comprehensive overview. Traffic counts are currently not an option to produce comparable data on pedestrians, although good practice examples of automated counts were identified in Oslo and Zürich. For cycling, dedicated cycling apps allow comparisons between cities, but further research is needed to find out more about the bias in such statistics.

The most recent and representative statistics referred to the mobile population (the part of the surveyed population that makes any trip on the surveyed days). The 'average daily distance travelled per person' and 'average number of trips per day' per country/capital, for both walking and cycling, are presented in the country report summary tables (Appendix C). These data were introduced in a geodatabase to produce a first comparative overview on walking and cycling in 30 European countries and their capitals.

COMPARISON OF THE AVERAGE DAILY DISTANCE WALKED AND NUMBER OF WALKING TRIPS PER PERSON

The average daily distance walked per person could be produced for 17 countries, in most cases for both the country and its capital but in some cases only for one of the two. When data for the capital was not available, data from another city in the same country was used instead. General impressions based on these non-harmonised data collected are that: 1) The numbers are quite similar throughout Europe; 2) Averages for the mobile population are higher than for the total population; 3) People tend to walk more (in terms of pkm/day) in cities. The average number of walking trips per day could be produced for 15 countries, but in nine cases data are available only at country or capital level, making it harder to make comparisons across Europe.

COMPARISON OF THE AVERAGE DAILY DISTANCE CYCLED AND NUMBER OF CYCLING TRIPS PER PERSON

The average daily distance cycled per person could be produced for 18 countries. Unfortunately, there are statistics which are not in line with expected values and are harder to interpret. For example, the Netherlands is considered as the number one cycling country in Europe according to the Special Eurobarometer 406 "Attitudes of Europeans towards urban mobility", but reports an average of 2.55 pkm/day; while countries such as Poland or Norway report values almost twice as high. At urban level, this could be linked to the fact that some cities measure the kilometres cycled and trips of the urban population (sometimes limited to the urban perimeter) whilst others have statistics of the numbers of kilometres cycled per day in the city. There are also different methods for calculating the average distance per person: on the basis of the total population, mobile population or just the cycling population. The estimated percentage of the population cycling regularly was compared with the cycling statistics of the Special Eurobarometer 406. The main differences are due to unclear definitions of what is considered 'regularly' (i.e. in some cases this means once a week, in others once a month, and in most cases it is not clearly defined at all).

TOTAL DISTANCE WALKED AND CYCLED PER YEAR IN THE EU

Based on the non-harmonised statistics of the country reports, the calculated medians for the whole EU are summarized as follows: the daily walking distance is around 1.06 pkm/day; while the daily cycling distance is 0.80 pkm/day; as regards to the number of trips, the median values are 0.66 walking trips/day and 0.22 cycling trips/day in Europe, while the share of the population cycling is estimated to be around 26%. When generalising these numbers on a yearly base for the EU28, this amounts to 193 billion walked person-kilometres per year, and 146 billion cycled person-kilometres which corresponds respectively to 2.78% and 2.11% of the total annual passenger-km in Europe, although these figures should be treated as rough estimates.

POTENTIAL OF CROWDSOURCING FOR COLLECTING CYCLING INFRASTRUCTURE DATA

No overview at European level could be produced on cycling infrastructure based on the information gathered during the consultation but the potential of crowdsourcing infrastructure data collection was tested. In Amsterdam, the cycling infrastructure statistics from three sources were compared: the city database, the Fietsersbond (Dutch cycling federation) and the cycling infrastructure data from the OpenCycleMap. Fietsersbond data are collected by volunteers according to clear standards based on the European Cycling Lexicon. The difference with the length of cycling infrastructure in the city database is less than 7% and is most likely due to a different way of treating one-way cycling paths. The statistics derived from the OpenCycleMap are very similar to those derived from the Fietsersbond database (less than 1% difference). A visual screening performed of the OpenCycleMap in 20 cities providing cycling infrastructure statistics in the consultation revealed an overall consistent image regarding the overall length of cycling infrastructure, but differences in quality e.g. concentration of infrastructure in specific neighbourhoods and parks. When cycling infrastructure statistics for Berlin, Brussels, Prague, Sofia and Vienna, were derived in a similar way as for Amsterdam, the difference with the reported data in the consultation was more than 50% in each city. The main reason is a systematic problem in the recording of one-way and two-way cycle tracks and lanes. This leads to the conclusion that there is potential for using crowdsourcing cycling infrastructure data to produce cycling infrastructure statistics, but that this requires standard definitions and guidelines for the contributors, for example like those provided by the European Cycling Lexicon.

POTENTIAL OF BIG DATA FOR COLLECTING WALKING AND CYCLING DATA

Both 'Google Better Cities' and 'COWI City Sense - Signal Re-identification' appear to be promising for data collection of active modes use in the future. In their current stage of development, neither big data collection methods could provide active modes statistics for Europe. For cycling, Google Better Cities speed data for cyclists was found to be sufficiently accurate on heavily travelled links in Copenhagen. No study of pedestrian speeds has been publicly released yet. COWI has undertaken projects on pedestrians over the past two years, based on increasingly accurate GPS based systems. These systems are used to analyse human mobility around sporting events or community gatherings. However, this application has only been applied in Denmark so far.

NEED FOR COMMON DEFINITIONS

Our recommendations emphasize the need for common definitions, starting with basic questions such as "what is cycling?" and "what is walking?". Some specific recommendations concern the European Cycling Lexicon,

and the extension of cycling infrastructure definitions, with zones with speed limits for all modes. On the same lines, a harmonized definition for cities and urban areas should be used when preparing walking and cycling statistics, such as the OECD-EC definition (Dijkstra et. Al., 2012).

DEVELOPMENT OF POST-PROCESSING METHODS

Rather than harmonizing data collections on active modes used in all the European countries and cities, the development of post-processing methods is likely to improve comparability and to harmonize statistics from different national data collections. For walking infrastructure, indicators of the pedestrian-friendliness of urban environments could be explored as an alternative to obtaining statistics on the existing infrastructure.

DEFINE KEY PERFORMANCE INDICATORS FOR WALKING AND CYCLING

New initiatives, such as the pan-European master plan for the promotion of cycling, are a good opportunity to define key performance indicators for walking and cycling. The study shows that existing indicators such as the walking and cycling frequency from the Eurobarometer and the walking and cycling times from EHIS, could be complemented by national statistics on active modes such as average distance and number of trips per day, after they are made comparable through post-processing. Other existing initiatives such as the “Quality of Life in cities” survey, undertaken by DG REGIO could be used to collect data on active modes in cities.

1 INTRODUCTION

This study aims at addressing the lack of comparable information and statistics on walking and cycling use at urban and national level. As stated in the Terms of Reference "Without this information, it is impossible to identify and compare performance at the EU level, which severely hampers identifying and transferring best-practice examples and developing a well-informed European strategy. The main aims of the study are to provide comparable information and statistics on walking and cycling use at urban and national level, and suggest ways forward to further improve this information."

This final report covers all study tasks and takes into account the comments made in the Inception and Interim reports.

TASK 1 illustrates the data sources providing an overview of walking and cycling use and infrastructure at urban, regional and national level. This consisted of a literature review and semi-structured expert interviews, the identification of stakeholders in the 30 countries (EU28, Switzerland and Norway) and a desk research on open access data and on the potential of using big data. The main walking and cycling data collection and harmonisation methods are presented in Appendix A. This report presents how these were used to develop a questionnaire for the country consultation, to identify stakeholders, and to propose an analysis of the potential of Big Data for active modes data collection through case studies.

TASK 2 describes the mapping of data sources on walking and cycling use and infrastructure in the EU28, Switzerland and Norway, and their capitals. The first part presents the development of the questionnaire and guidelines and the launch of the country consultation. This consultation consisted of discussions with national contacts (i.e. data providers/ generators) done by researchers having the necessary language skills and country knowledge, in order to gather the information needed for completing the questionnaire and describing the current data collection methods in the countries and their capitals. The second part presents the response from the national contact points and a summary of the key findings per country.

TASK 3 presents the identified strengths and weaknesses of different data collection methods (i.e. travel surveys, census, traffic counts) in terms of providing comparable information on walking and cycling use. Two case studies assessed the potential of Big Data for active modes data collection: Google Better Cities and COWI City Sense and Signal Re-identification. For walking and cycling infrastructure the answers to the consultation are inconclusive. The consultation provided a good practice example of cycling infrastructure data collection through crowd sourcing in the Netherlands, which was selected for further analysis.

TASK 4 is a comparative overview showing walking and cycling use and related infrastructure in Europe. This was done in a geodatabase, developed by compiling tables of the key statistics found during the countries consultation. Walking and cycling overview tables and maps (in pkm and trips) were compiled based on the non-harmonised statistics gathered during the consultation. Indications on the average walking and cycling distances and trips per day in European countries and capitals were also calculated. Maps with the overview of other active modes indicators were produced based on the Eurobarometers 406 (Attitudes of Europeans towards urban mobility, 2013) and 419 (Quality of Life in Cities Survey, 2015), and the European Health Interview Survey (2014). These were used to interpret outlier values from the countries consultation and to search for methodological reasons for incomparable statistics in the national data collection and processing.

TASK 5 presents the difficulties encountered when developing the comparative overview. The difficulties are discussed separately for walking and cycling use and related infrastructure.

The recommendations presented in Task 6 were produced on the basis of the main findings of the data collection exercise, discussions with key experts from DG REGIO and ECF, and review of the new urban mobility indicators tool developed by the World Business Council for Sustainable Development (WBCSD). The recommendations are organised in two parts: recommendations on possible data collection strategies and recommendations on data management and analysis.


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CYKLER
Foto

2 TASK 1. OVERVIEW OF DATA SOURCES

The purpose of this task consisted of mapping data sources providing an overview on walking and cycling use and infrastructure at urban, regional and national level. This was conducted by means of a literature review and semi-structured interviews with thematic experts, the identification of stakeholders in the 30 countries (EU28, Switzerland and Norway) and a desk research on open access data and on the potential of using big data.

2.1 LITERATURE REVIEW AND SEMI-STRUCTURED EXPERT INTERVIEWS

The main data collection and harmonisation methods identified in the literature review are presented in Appendix A. This section presents a summary of key findings. Semi-structured interviews were conducted with thematic experts prior to the launch of the questionnaires to provide background information on issues to be addressed.

COST-SHANTI AND COST PQN

The harmonisation issues identified in the COST-Shanti project (concerning National Travel Surveys (NTS) in 16 countries) and those identified in the COST PQN - Pedestrian's Quality Needs were used in the formulation of the some sections of questionnaire, more specifically: 'Target population', 'How trips are recorded' and 'Factors that affect distance'.

EUROSTAT URBAN AUDIT AND EUROBAROMETERS

Eurostat urban audit statistics were used as inspiration for the cartographic visualisation of the results in GIS. The statistics on walking and cycling frequency calculated based on the Eurobarometers 406 and 419 are added to the geodatabase as reference for the comparative overview (Task 4), and for the analysis of data sources and collection methodologies (Task 3).

In the future, the implementation of new Eurostat guidelines on passenger mobility statistics will improve active modes data collection, processing and reporting.

THE EUROPEAN CYCLING LEXICON 2016

The European Cycling Lexicon 2016 includes a three page section on cycling infrastructure, with 14 pictures of infrastructure types and the corresponding words used in the 24 official languages of the EU. This was used in the questionnaires to identify sources of cycling infrastructure data and to collect statistics on the cycling infrastructure types.

2.2 IDENTIFICATION OF STAKEHOLDERS IN THE 30 COUNTRIES

A first list of national and/or urban contacts (NP) was set up based on desk research, semi-structured interviews with thematic experts, and contacts provided by DG MOVE, Unit A.3. The country researchers contacted these stakeholders and asked in the initial contact mail (templates used are presented as Appendix D) to confirm their interest in participating in the study or to indicate a potential colleague that could support the consultation. The contacts obtained through this sampling approach were permanently updated. The resulting national contacts are presented as Appendix B[1]. An overview of the consultation process is provided in Figure 1.

2.3 DESK RESEARCH ON THE POTENTIAL OF USING BIG DATA

Data on cycling and walking are collected for transport planning and operations. There is now the possibility to collect data on walking and cycling from Big Data sources that may significantly reduce costs and increase the spatial and temporal coverage. These sources also offer new possibilities for analysis. However, there are a number of technical challenges and other considerations in working with Big Data sources. This section presents an overview of some recent literature on Big Data and data collection for cycling and walking.

2.3.1 DEFINING BIG DATA

The most generally accepted definition of "Big Data" refers to the "three V's". The three V's are defined as:

VOLUME

Here the physical amount of data are considered, often on the scale of gigabytes (GB), terabytes (TB), petabytes (PB), zettabytes (ZB) or even yottabytes (YB). The volume of data presents a technical challenge for users by requiring adequate computing infrastructure and skill competencies.

VELOCITY

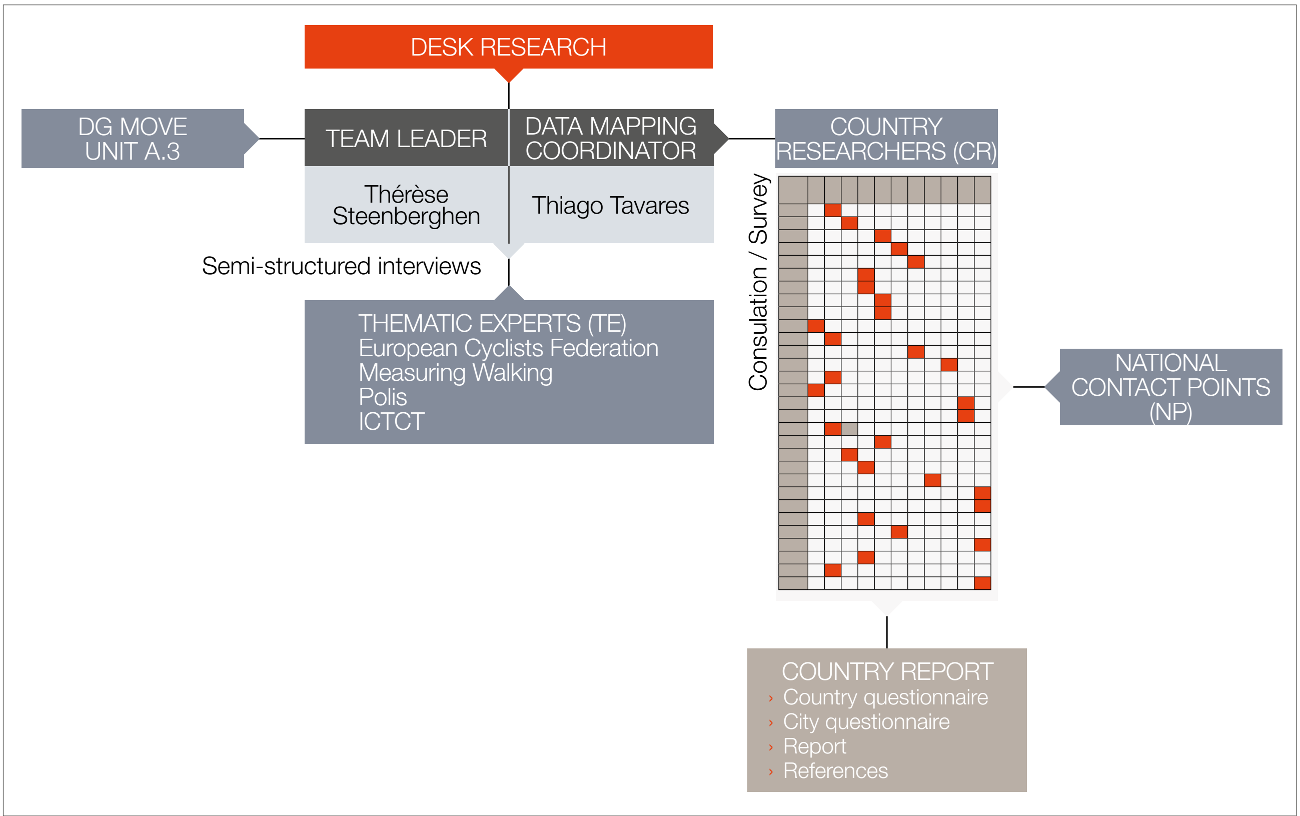
Here the frequency with which data is updated or new data is introduced to the data set is considered. Often a data source will provide a "real time stream" of data through an API (application programming interface).

VARIETY

Variety refers to the coverage of the data source and the synthesis (or fusion) of the often many underlying data sources that are pulled together. This can introduce technical challenges later on when using the source for analysis, as the fusion of different sources can introduce statistical errors that should be corrected.

[1] Only contacts who accepted to have their name published in this study are included in the list.

FIGURE 1
COUNTRY RESEARCH CONSULTATION PROCESS



SOURCE
Own elaboration

Some authors include a fourth "V" for "Veracity" to this definition. Here the intention is to say something about the "truth" or "quality" of the data. However, there is no widespread agreement as to how well most Big Data sources meet this last criterion and so the focus is typically on the first three of the V's.

2.3.2 BIG DATA COLLECTION AND ANALYSIS METHODS FOR ACTIVE TRANSPORT MODES

Here we present a broad overview of the "types" of Big Data sources available and discuss some of the methods of analysis.

SERVICE PROVIDERS AS AGGREGATORS – OPPORTUNISTIC SENSING

Today there are a number of different types of services that can aggregate information about active transport. For example, mobile phone users will typically choose to share information about their location or travel with service providers in order to take advantage of certain services. These data can be aggregated to generate estimates of traffic metrics such as speed, volume, or origin-destination trips. Other services such as Bike Sharing systems where users "check out" and "check in" a bike that they use for a limited amount of time can also be mined to provide data about active transport.

SENSING AGGREGATORS – PURPOSELY SENSING

Sensing aggregators are platforms that actively collect data on cycling and walking via sensor networks. There are many technologies available for this purpose. Most sensors are based on physical detection of motion such as via inductive loop sensors, pneumatic tubes, or cameras. Sensors can be embedded in existing infrastructure such as traffic light masts. Other types of sensors detect movement via signals emitted from electronics that users carry such as via Bluetooth and WiFi signals. These systems can aggregate data such as measurements of speed, flow, and travel time and the data can be analysed either offline or in real time.

SOCIAL MEDIA AND APPS - CROWDSOURCING

Pereira et al. (2015) have been investigating how unstructured data from social media sites and the Internet can be used to understand travel behaviour. While this is not yet a widely used Big Data source for active transport modes, in the future it may be a relevant source. For example, by analysing Facebook or Twitter posts it could be possible to better understand travel behaviour.

ANALYSIS METHODS

Analysis methods for working with Big Data sources typically require the use of computing infrastructure such as database systems, statistical programming, web programming, API interface, and so on. Using this infrastructure and techniques, Big Data sources can be used to generate estimates of flow, speed, travel time, origin destination matrixes, heat maps and density maps for active transport modes.

2.3.3 TYPES OF STATISTICS AVAILABLE FROM BIG DATA SOURCES

This section presents an overview of the types of travel statistics found with many Big Data sources. Availability of these statistics is dependent on the source of the data. The average of each measure is typically computed and in some cases a measure of variance may be available.

LINK BASED MEASURES

- Speed (km/h, mph) – typically one of the more robust statistics available, generally with less bias and variance than other statistics.
- Flow (vehicles per hour) – a statistic that indicates the number of users of a link but will typically have a negative bias due to undersampling of the true population.
- Turning at Intersections (percentage) – a statistic that indicates the turning percentages at an intersection but is not as widely available as the other statistics.

ROUTE BASED MEASURES

- Travel Time (seconds) – similar to speed but expressed in units of time (e.g. seconds) and measured over a specific route in the network which can cover one or several links. Travel time can also be computed as the inverse of the harmonic mean of speeds over links.

NETWORK BASED MEASURES

- Origin-Destination (OD) matrix – A NxN size matrix of zones in a network that contains the number of trips between each zone. An OD matrix can be computed from Big Data sources where there is supporting data (e.g. GPS based systems). OD data can suffer from the same systematic bias that link Flow suffers from.
- Heat maps – show the relative intensity of trips between points of interest in a network. A heat map can show where users typically begin and end their journeys.

2.3.4 DATA COLLECTION CHALLENGES

Technical Considerations

There are at least three technical considerations that typically should be addressed when using Big Data sources. Anagnostopoulos et.al. (2016) categorise these considerations as a hierarchy of "Get, Save, Analysis". Here a brief overview of these technical considerations is presented.

Data retrieval

Here one should consider the methods for retrieving the data from a source, handling the data, cleaning the data of errors and potential problems, and preparing the data for storage.

Data storage

Storage of the data must consider the amount of data to be stored, security, longevity, and accessibility.

Data analysis

Analysis of the data deals with extracting the desired "information" from the data, use of statistical methods, visualisation, and presentation of results.

These technical considerations should be seen in light of the organisational capacity. This requires technical understanding of the hardware, software, and skill competencies to handle this type of data.

Sampling bias

Bias in the sampled data is an often discussed challenge with Big Data sources. One of the main challenges with Big Data sources is that the degree and magnitude of sampling bias is often not known and therefore presents a challenge when applying analysis to the data. For example, while it is known that the popular website Strava can provide data on cycling based on the trips recorded by its users it is not known to what extent that data is representative of cycling behaviour in the general population. Sports enthusiasts might be overrepresented, whereas older adults or children might be underrepresented. Therefore, bias correction techniques might be necessary when working with these data sources.

Position accuracy

Big Data sources that rely on positioning information from GPS or WiFi signals introduce a possible error due to inaccuracies in the location report. Devices that report a position do so with some possible error. The amount of correction that the Big Data source applies to these errors should be considered when using this type of data. For example, some sources will correct position reports by applying a map matching technique that considers the most likely position given a user's other position reports and additional factors. The degree to which these correction techniques improve data quality is an important consideration.

Privacy

An important consideration and challenge with Big Data sources is often privacy protection. Many Big Data sources collect data from individuals sharing information about their location, their activities, and their preferences. Their participation is often based on the benefits they receive by sharing the information such as personalized services. Service providers that wish to utilise personal data of their users will typically ensure that privacy is protected: this can be done through a number of filtering and encryption techniques so that aggregated statistics generated from individual data cannot be used to "track" specific individuals. For this reason, Big Data sources can be limited in the typology of data that they can provide for transportation planning, for example travel journals for transportation planning models. This would typically not be information that could be derived from a Big Data source.

2.3.5 BIG DATA CASE STUDIES

Two alternative approaches for gathering big data on active Two alternative approaches for gathering big data on active modes use were selected: Google Better Cities project and COWI City Sense for further investigation. These case studies were chosen to analyse the challenges identified in section 2.4.4 because of their richness in terms of statistics and maturity in applying big data solutions in practice.

The consultant investigated both Google Better Cities project and COWI City Sense data providers by looking at openly available information and targeted interviews with stakeholders, in order to identify existing critical gaps, good practices and lessons learned on deriving walking and cycling statistics. For Google Better Cities an interview was conducted with the project manager of Google location history platform while for COWI's City Sense, an interview was conducted with the chief specialist, ITS manager.

The analysis of their potential for providing comparable data and analyses of active modes use (presented in Section 4.3 – Task 3) is based on the following questions:

- Can this big data source be used for measuring walking/ cycling?
- What types of statistics are available? (i.e. link based, route based, network based measures)
- What are the main data collection challenges? (i.e. technical considerations, sampling bias, position accuracy, privacy)
- How can these statistics be used to validate or possibly replace travel surveys at country or city level?
- What are the resources required to implement comparable active mode indicators across different European countries?

Other providers of cycling data based on big data collections are:

- EU Cycling Challenge: http://www.cyclingchallenge.eu/
- Eco-counter: http://www.eco-compteur.com/en/
- See.sense: http://seesense.cc/smart-cities/
- Strava: http://metro.strava.com/
- BikePrint: http://www.bikeprint.nl/

2.4 DESK RESEARCH ON OPEN ACCESS DATA ON WALKING AND CYCLING RELATED INFRASTRUCTURE

The main open access data source found on cycling infrastructure is the OpenCycleMap, a global map for cyclists, based on data from the OpenStreetMap (OSM) project which is a free, editable map of the whole world that is being built by contributors and released with an open-content license. There are currently over three million registered OSM users. OSM includes cycle features, thus making it possible, in principle, to produce a cycling infrastructure map of Europe. As a crowd sourcing initiative, OSM depends on contributions by individual members, and by commercial and government bodies either contributing or allowing their data to be included.

OpenCycleMap started in 2007 with the mapping of south west London and is now on a worldwide scale. The map is updated every few days with the latest data from OSM. The global OSM planet file is processed into a PostgreSQL database. Maps are then generated on-demand using the Mapnik map rendering library. All cycling-related data is from OpenStreetMap.org contributors and is licensed under the Open Data Commons Open Database License (ODbL).

OpenCycleMap was originally hosted on a single server, but has now expanded to almost a dozen machines in a datacentre in Germany. The OpenCycleMap map tiles allow access and process specific areas. The map tiles are available for re-use under the Creative Commons Attribution Share-Alike 2.0 License.

The map includes worldwide cycling infrastructure data, but it is far from harmonised. This creates comparability issues, which affect the potential of using the OpenCycleMap for data collection on cycling infrastructure. Comparability issues when dealing with cycling infrastructure data from different sources are presented in Task 3 (section 4.1.2), the assessment of the OpenCycleMap potential for crowd sourcing data collection on cycling infrastructure based is presented in section 4.4. The main issues encountered when attempting to produce comparable cycling infrastructure are addressed in Task 5 (section 6.4). Details on the coding of cycling infrastructure are presented in the introduction of Appendix J.

3 TASK 2. DATA COLLECTION

The main purpose of this task was to provide a complete mapping of data sources on walking and cycling use and infrastructure at urban and national level in the EU28, Switzerland and Norway. The mapping consisted of a consultation with contacts from the countries and respective capitals to gather information about their current data collection methods used.

3.1 DEVELOP QUESTIONNAIRE AND GUIDELINES FOR CONSULTATION

For each country, two questionnaires were developed in Excel, one for the active modes statistics at the country level and one for the capital. Each questionnaire consisted of:

- P0 - General information on data collection and analysis and its challenges
- P1 - Data collection and information availability
- P2 - Statistics on walking and cycling
- P3, P4, P5 - Methods used to produce these statistics (factors population, trips, distance)
- P6 - The use of Big data to produce statistics on walking and cycling
- P7 - Statistics obtained from pedestrians and cyclists counts
- P8 - Data on walking and cycling collected by national census
- P9 - Walking and cycling infrastructure standards and statistics

The documents used by the country researchers consisted of:

- An introduction letter from the European Commission, DG for Mobility and Transport, Directorate A – Policy coordination and security, Unit A.3 Economic Analysis & Impact Assessment, signed by Mr. R. Diemer, Head of Unit;
- A template for the initial contact email;
- The final questionnaire and guidance note.

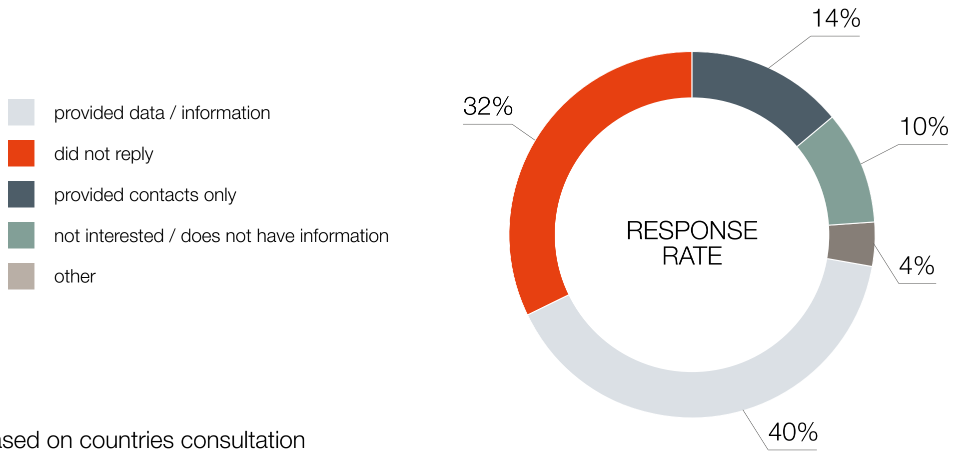
These documents are presented in Appendix D. The countries consultation was launched on May 20, with an informative workshop involving the 11 country researchers. Further, small modifications were made to the questionnaire and guidelines, which were finalised and approved on June 13.

3.2 CONSULTATION WITH DATA PROVIDERS/ GENERATORS (NATIONAL CONTACT POINTS)

3.2.1 OVERVIEW OF THE RESPONSES

The country researchers first filled in the questionnaires based on published statistical reports and websites. Then they contacted national contact points (NP) to identify those respondents having a good knowledge of one or more data collection methods in the country. Different responses to the questionnaire were compiled by the country researchers to produce a country questionnaire (Excel workbook), a city questionnaire (Excel workbook) and a country report. These were further processed into a geodatabase (Task 4). In total, 213 persons/organisations were contacted during the consultation. 40% of the contact points replied positively and contributed to the study by providing information or data. Almost a third of the contact points did not reply to the emails/phone calls and around 10% were not interested in participating or did not have information to provide. In some cases, the contact details initially provided were not correct. These and other particular situations are presented as 'others'.

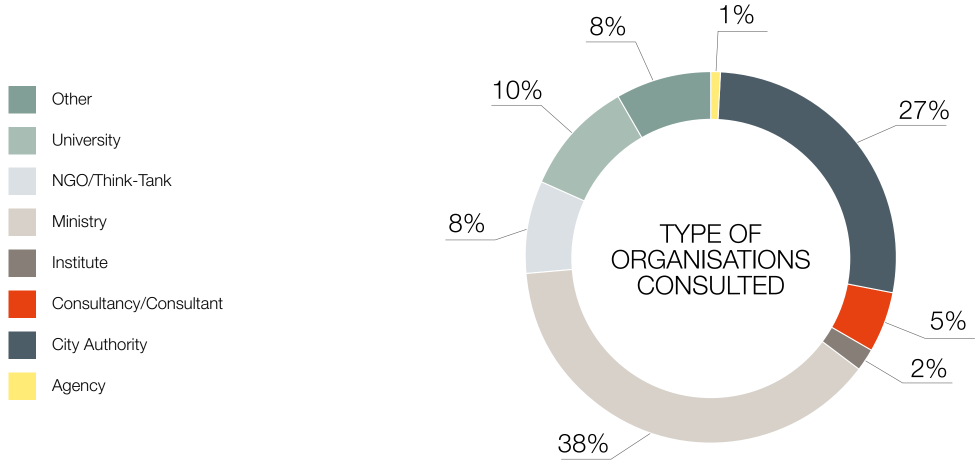
FIGURE 2
RESPONSE RATE OF NATIONAL CONTACT POINTS



SOURCE
Own elaboration based on countries consultation

FIGURE 3

TYPE OF NATIONAL ORGANISATIONS/INSTITUTIONS PROVIDING DATA

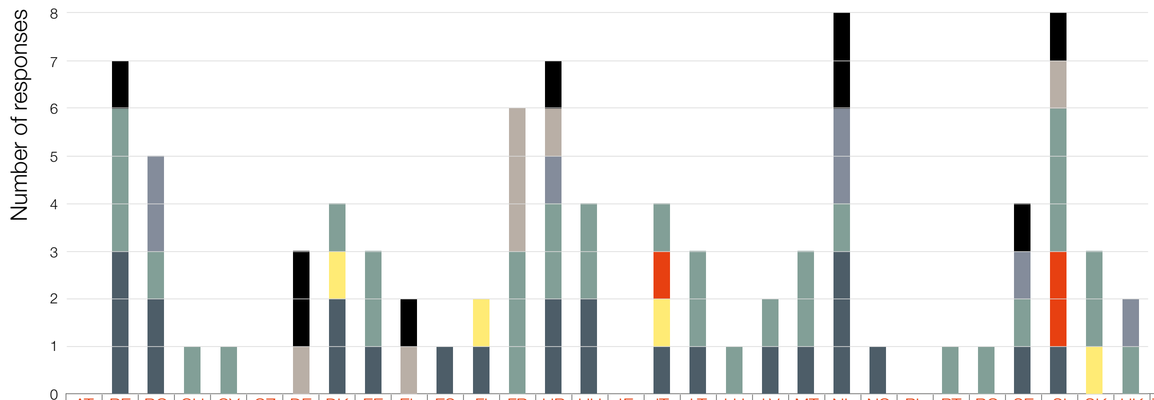


SOURCE

Own elaboration based on countries consultation

FIGURE 4

OVERVIEW OF TYPE OF INSTITUTION PROVIDING DATA/INFORMATION PER COUNTRY



	AT	BE	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK	TOTAL
University		1					2			1				1								2					1	1			9
Other							1			1			3	1														1			7
NGO / Think-Tank			2											1								2					1			1	7
Ministry		3	1	1	1			1	2				3	2	2		1	2	1	1	2	1			1	1	1	3	2	1	33
Institute / Agency																	1											2			3
Consultancy / Consultant								1				1					1												1		4
City Authority		3	2					2	1		1	1		2	2		1	1		1	1	3	1				1	1			23
TOTAL		7	5	1	1		3	4	3	2	1	2	6	7	4		4	3	1	2	3	8	1		1	1	4	8	3	2	86

Country

SOURCE

Own elaboration based on countries consultation

The consultation covered different types of organisations and institutions. The majority of the respondents were either from City Authorities (27%) or from Ministries or related agencies (38%).

For Luxemburg, Cyprus and Malta, only one questionnaire was filled in for both the national and city active modes statistics.
We further refer to all the urban statistics as being at capital level. However, for Switzerland, the city questionnaire was filled in for Zürich instead of Bern, and for Bulgaria, some statistics refer to Plovdiv instead of Sofia. In both cases this choice was made because although walking and cycling statistics was not available in the capital, they were provided by a different city in the country instead.
Figure 4 presents a detailed overview per country of the type of organisations/ institutions providing data to the study.
The list of National Contact Points is presented as Appendix B. The overview of the responses concerning information on data collection and analysis and its challenges is presented in Appendix E.

3.2.2 RATING OF FRIENDLINESS FOR WALKING AND CYCLING

19 countries and 12 cities rated walking and cycling friendliness (Figure 5). The low response rate can be explained by the reluctance of some respondents to present their own opinion in a questionnaire asking about official statistics. Several respondents explicitly mentioned that these numbers are not supported by data, which, indeed, is reflected in the lack of response on infrastructure statistics in the countries, and the low response for the cities. This suggests that in order to collect information on walking and cycling infrastructure, a satisfaction rating may provide a first indication. Adding such questions in a Eurobarometer could be an easier way of comparing countries and cities, than an attempt to collect and harmonise official statistics on walking and cycling infrastructure.

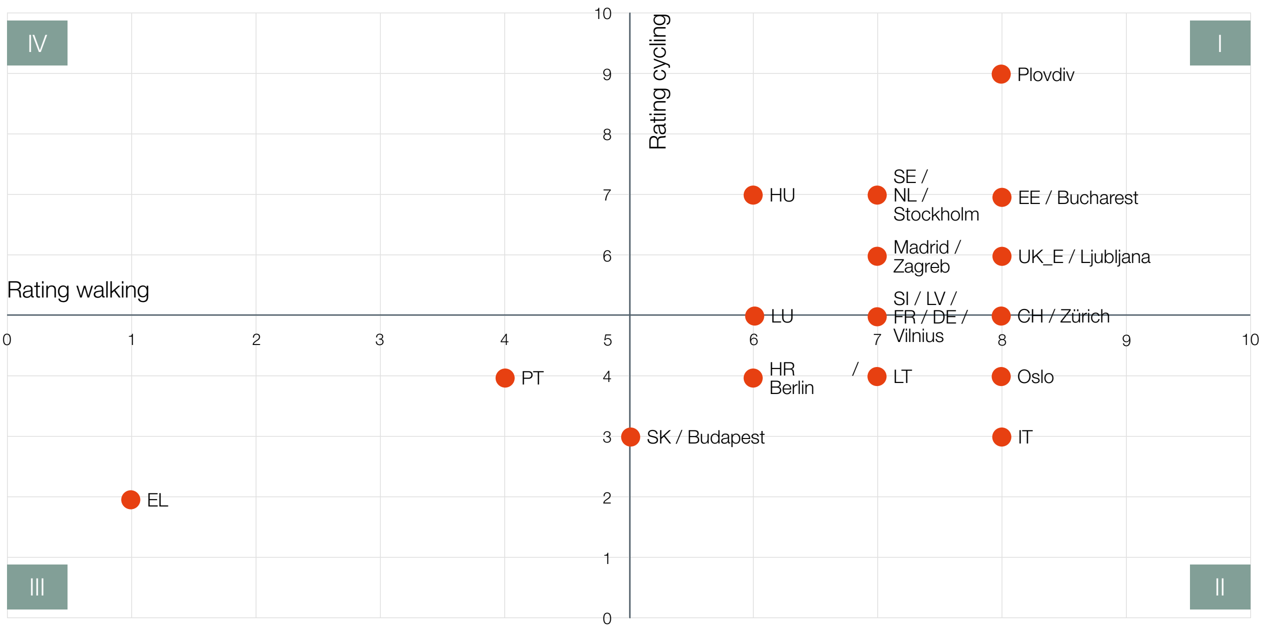
Most of the countries and cities rated both walking and cycling friendliness satisfactory (> 5) (group I). In general, walking friendliness is rated somewhat higher than cycling friendliness, with four countries and two cities rating walking satisfactory and cycling unsatisfactory (group II). In Portugal and Greece both walking and cycling friendliness were rated very low (group III). None of the countries and cities rated walking unsatisfactory and cycling satisfactory (group IV). More than half of the respondents considered cycling friendliness as unsatisfactory.

3.2.3 DIFFICULTIES ENCOUNTERED WHEN COLLECTING STATISTICS ON WALKING AND CYCLING

More than half of the countries (18/30) mentioned difficulties when collecting active modes data. In countries with a systematic data collection, difficulties due to underreporting and bias (DE, DK, NL, NO, PL, UK) or partial data[2] (LU, PT) were mentioned. Lack of systematic and consistent data collection was mentioned in Czech Republic, Croatia, Slovenia, Slovakia, France, Lithuania and Sweden. In

[2] Cycling data quality considered better than walking data.

FIGURE 5
RATING OF THE FRIENDLINESS FOR WALKING AND CYCLING IN THE COUNTRY/CITY. SCALE: 0–10, BEING "0" BAD AND "10" EXCELLENT.



SOURCE
Own elaboration based on countries consultation

Bulgaria, Estonia and Hungary, a complete lack of data was mentioned, due to limited budget, tradition and technical difficulties. We conclude that at country level, data collection on walking and cycling is not common practice, and even when available, the statistics tend to underestimate the active modes, due to underreporting.

Overall, cities reported fewer difficulties than at country level: only ten cities mentioned difficulties, and fewer issues were mentioned. Difficulties due to underreporting and bias were mentioned in Vilnius, Oslo, Warsaw, Ljubljana and Stockholm. Lack of systematic and consistent data collection was mentioned in Madrid, Zagreb and Brussels. In Budapest, a complete lack of data was mentioned. Prague mentioned having mostly problems for walking data, and in Stockholm there are difficulties due to the seasonal and spatial variation in behaviour throughout the year.

3.2.4 COMPARISON OF COUNTRY/CITY STATISTICS/ PERFORMANCE ON WALKING AND CYCLING WITH OTHER REGIONS/CITIES AND DIFFICULTIES ENCOUNTERED

Only Germany reports that they compare statistical key figures (such as modal split) as part of overall cross-regional and cross-country analyses. Comparisons between cities are possible based on (1) Mobilität in Städten – SrV: survey in selected German cities focusing on everyday mobility of private households and the NTS Mobilität in Deutschland (MiD): which includes sub-samples at ‘Länder’ level (i.e. for Berlin, Hamburg, Bremen) and for different spatial categories.

Comparisons have also been made in Norway. The difficulty is that the methodology used in the Oslo travel survey is somewhat different than the national travel survey. The city uses statistics from the Oslo travel survey, but when comparing the modal share with other cities, they need to use statistics from the national travel survey. This is not a problem per se, but it can be hard to communicate in a comprehensible manner.

In Denmark, there is no systematic benchmarking, but the data is very comprehensive so it would be possible to ask for data if there would be a wish for making a comparison. In the Czech Republic and in Slovakia some sporadic comparisons with other countries have been performed.

Other countries (CH, NO, SI, FR) and cities (Zürich, Madrid) indicate that comparisons with other countries are difficult because the statistics are different or insufficient (HU, SI). At capital level, the sample size or numbers of counting units may be insufficient (Stockholm). This may be related to ad hoc data collections for specific developments (Zürich). In Slovenia, comparison of results between cities of Ljubljana and Maribor will be done in the near future.

3.2.5 NEED FOR EU ACTION ON COMPARABLE STATISTICS ON WALKING AND CYCLING

The respondents at national level are, to a large extent, in favour of EU action on comparable statistics, varying from providing common definitions and methodological guidelines (BE, DE, EE, EL, FR, IT, LT, HR, LU, MT, NL, NO, PT, RO, SE, SI, SK), to making data collection mandatory (HR), stimulating campaigns such as the European Cycling Challenge (HU) (see Box 1).

On the other hand, there is also indication of some reluctance:

- *“Though some standardization to enhance comparability would be useful, e.g. a consistent definition of the modal split. It is too challenging in comparison to the potential gain (data quality, data amount)”. (CH)*
- *“(…) countries with a long tradition of NTS (…) tend to be reluctant to implement any changes to survey design in order to maintain long national time-series” (DE)*
- *“It is important to be clear about what is compared so that you do not compare “apples and oranges”. It is probably more relevant/realistic making a good comparison of walking to cycling since the cycling-culture and possibilities for cycling differ in a great way in different countries.” (DK)*

The response at city level is similar, with some more emphasis on the cost/benefits, e.g.:

- *“We see the need for comparable statistics to the extent that this would provide better knowledge about the effect of different measures that could be used in planning for better infrastructure. If comparable statistics don’t provide anything else besides a way of comparing modal share, etc., then we consider that the costs might likely be greater than the benefits. This is due to the importance of having a methodology within a country/city that ensures a comparable time-series and a way of benchmarking our own efforts.” (Oslo)*

The importance of having EU guidance is also mentioned, e.g.:

- *“Eurostat Task Force on Passenger Mobility Statistics Actual activities related to National Travel Surveys are also relevant for data collection and analyses at local/ city level.” (Berlin)*

3.2.6 OTHER STATISTICS COLLECTED ON WALKING AND CYCLING (E.G. SAFETY, ATTRACTIVENESS)

At country level

Many countries collect statistics on walking and cycling other than average daily distances and trips. Data about road accidents are collected in all countries, and include information about the involvement of cyclists and/or pedestrians. Also common are data on modal share, modal split, behaviour, number of bicycles in the household, frequency of bicycle usage, main reasons to use the bicycle, number of people in a household using public bicycle systems, etc. These are collected through NTS. Occasionally, regional travel surveys were mentioned as well.

BOX 1

EUROPEAN CYCLING CHALLENGE

The European Cycling Challenge – ECC is an urban cyclists' team competition taking place every year in May. In 2016, 52 cities from 17 Countries joined the Challenge. Participants track their bike-trips with a free tracking App contributing to their Team mileage, and through online leaderboards they can check their City Team position in real-time. The collected GPS data are used to produce bike-trips heatmaps which give an indication of the cyclists' behavior, the origins/destinations, time lost at intersections, congestion on cycle lanes, etc. These crowdsourced data provide maps of cycling networks in cities. Examples of the heatmaps produced for Roma, Dublin and Prague are presented below:

SOURCE
http://www.cyclingchallenge.eu

More exceptional figures include statistics on people's opinion about transport modes (FR), occasional statistics on specific topics such as security from theft, viability of cycling lanes, access to the road network, intermodal parking lots and opportunity to carry your bike on public transport (IT). The Norwegian department of safety and environment not only constantly assesses different mobile applications, but they have also developed their own application.

At capital level

Although many capitals mention a variety of statistics collected, a lot of these data collections are not used to produce walking and cycling statistics in a systematic way. The most commonly mentioned data refer to road safety (Prague, Zagreb, Madrid, Budapest, Warsaw, Stockholm, Zürich, Budapest). This is not limited to road accidents, but may also include personal behaviour and cycling vehicle characteristics, such as visible height, luggage carrying devices, child seats, helmets (Sofia).

Attractiveness and satisfaction are also mentioned (Zürich, Warsaw, Tallinn, Oslo):

- *"Residents' satisfaction with sufficiency of cycle paths, condition of cycle paths, maintenance of cycle paths in winter, parking possibilities for bicycles in the city centre, storage possibilities at home, state of traffic from the viewpoint of cyclists. Walking: resident satisfaction with conditions of walking paths, maintenance of walking paths in winter, state of traffic from the viewpoint of pedestrian." (Tallinn)*
- *"In January 2014, Oslo municipality held a survey the purpose of which was to map the attitudes towards cycling, how the public perceive the cycle infrastructure and the maintenance of it, and how safe they consider it to cycle in Oslo. This survey is biannual, and was repeated in 2016." (Oslo)*

Some data collections are systematic, such as the bicycle accounting every two years in Oslo, the use of the bike sharing scheme in Madrid, the number of cyclists on bridges in Riga, the frequency of bicycle usage and bicycle traffic in Warsaw, the trip purpose, length and duration (including start & end point of the trips) in Ljubljana.

Other, more ad-hoc, data collections are: walking audits (City of Koprivnica, HR - CIVITAS), operational data collections, for traffic engineering (Budapest), Feasibility studies for structuring the Component "Design and construction of bike lanes" of a specific project "Modernization and development of sustainable urban transport" (Plovdiv).

The use of big data to produce walking and cycling statistics is limited. Some respondents mention that although they don't use big data, they are aware of its potential.

3.3 COUNTRY REPORTS AND SUMMARY OF FINDINGS PER COUNTRY

The countries have been divided in seven groups according to the data collection method and reporting used concerning walking and cycling:

TABLE 1
CLASSIFICATION OF COUNTRIES ACCORDING DATA COLLECTION AND REPORTING METHOD

	GROUPS	COUNTRIES
G1	**Group 1 – regular national surveys provide all key indicators** Countries that have reported a regular walking and cycling data collection system (e.g. yearly, 5 years, 10 years), and that collect and report all key indicators.	Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, United Kingdom (England)
G2	**Group 2 – regular national surveys that partially provide key indicators** Countries that have reported a regular walking and cycling data collection system (e.g. yearly, 5 years, 10 years), and which partially/do not report key indicators but could allow for an estimation based on the data collected.	Belgium, Malta, Sweden, Switzerland
G3	**Group 3 – regular national surveys that do not provide key indicators** Countries that have reported a regular data collection system (e.g. yearly, 5 years, 10 years), which include walking and cycling but which is NOT detailed enough to allow estimation of the key indicators. Most of these countries only report the percentage of the population walking or cycling with a certain frequency or collect data for work or educational trips only.	Croatia, Estonia, Hungary, Luxembourg, Portugal, Spain
G4	**Group 4 – Ad-hoc national surveys** Countries that have reported only ad-hoc national surveys that include statistics on walking and cycling.	Austria, Cyprus, Greece, Latvia, Poland, Slovakia
G5	**Group 5 – Regular surveys at city capital level only** Countries that do not have national surveys including walking and cycling but statistics are collected in the capital through regular surveys.	Lithuania, Slovenia
G6	**Group 6 – Ad-hoc surveys at capital level only** Countries that have not reported any regular system in place for the collection of data on walking and cycling but have reported the existence of ad-hoc surveys at capital level.	Czech Republic, Romania
G7	**Group 7 – No surveys including active modes** Countries that have not reported any survey, which included walking and cycling.	Bulgaria

SOURCE
Own elaboration based on countries consultation

The characteristics of the different groups are presented below. Full reports of the countries are presented in Appendix C.

3.3.1 GROUP 1 – REGULAR NATIONAL SURVEYS THAT PROVIDE ALL KEY INDICATORS

Countries that have reported a regular walking and cycling data collection system (e.g. yearly, 5 years, 10 years), which collects and reports all key indicators.

The Netherlands is Europe's leading country in terms of cycling, with approximately four in ten respondents (43%) of the Eurobarometer survey cycling daily, and only 13% never cycling. For walking, the country is at the other end of the spectrum, with fewer than half (42%) of respondents reporting that they walk every day (Eurobarometer, 2013).

The main source of statistics on walking and cycle use is the OVIN survey. The most recent survey was conducted in 2015. The publication is expected in July 2016. The questionnaire is based on the published (July 2015) reports from OVIN 2014. OVIN is based on a sampling of the total population, i.e. every person registered in a municipality. The sampling is not based on households, but on individuals.

Denmark is world famous for being a cycle friendly country where several people are biking every day. The capital of Denmark, Copenhagen, was the first city to be awarded the UCI Bike City Label which internationally recognizes and reward cities who invest in the development of cycling and cycling infrastructure.[3]

[3] Copenhagen awarded to the most bicycle friendly city in the world http://www.uci.ch/cyclingforall/copenhagen-the-most-bicycle-friendly-city-the-world/

The main source of statistics in the country is the National Travel Survey – *Transportvaneundersøgelsen* (TU). TU covers 365 days a year and main results are presented each year. Municipalities often request data from TU in order to look at statistics for specific cities. Detailed data on walking and cycling is collected and published online by the Department of Transport.

In **the United Kingdom**, there are two main national data collection methods for Walking and Cycling, the National Travel Surveys and the Active People Survey. From 2013, the National Travel Survey only covers England and the other countries are covered by similar surveys: Household Survey Travel Diary in Scotland, National Survey for Wales and Travel Survey for Northern Ireland.
The National Travel Survey for England is undertaken annually and it presents detailed data on walking and cycling for daily activities while the Active People Survey is more focused on information on sports and physical activity.

The National Travel Survey (NHS) in **Ireland** is conducted every five years as a module of the Quarterly National Household Survey (QNHS). The QNHS is a comprehensive nationwide survey of households. The primary purpose of the survey is to produce quarterly labour force estimates. It also covers topics of specific social interest in additional modules each quarter. The travel survey was last conducted in the fourth quarter of 2014.

Italy collects data on mobility behaviour of Italian citizens, which is presented annually in a report entitled *AUDIMOB - Survey on mobility behaviour of Italian citizens*.[4] Data have been collected since 2001 to date. Data are reported at urban level, so that statistics from the different cities can be extracted. Results are separated per city on a residency basis and depending on the origin/destination of the person at the time of the survey.

Statistics in **Germany** are mostly collected through two national surveys. Firstly, there is the survey *Mobilität in Deutschland* (MiD), which was carried out by the DLR. Data is available for 2002 and 2008, and there is currently data collection in progress for the year of 2016. There is no regular periodicity of this data collection exercise. Secondly, there is the German Mobility Panel (MOP) implemented by KIT in Karlsruhe, which provides information for the year of 2015. Data are collected on a yearly basis. As some national data sources (such as MiD) allow for 'urban' sub-samples of sufficient size, these national sources can also be used for analysis at city level.

In **Norway**, the National Travel Survey (RVU) is carried out every fourth year. From 2016 the RVU will be collected on an ongoing basis. The most recent year of data collection was 2013/2014 for RVU. Detailed statistics are reported at urban level, covering the four biggest cities (i.e. Oslo, Stavanger, Trondheim and Bergen) and microdata is publicly available.

The main data collection method in **Finland** is the National Travel Survey (NTS), carried out every 5 years. The NTS is commissioned by the Finnish Transport Agency and it provides an overall picture of Finnish passenger mobility, including walking and cycling. The results are reported only at regional level, however micro data include the information about the location of the respondents, which would allow for reporting at urban level.

France carries out a detailed data collection on transport and mobility every 10 or 15 years. The *Enquête nationale transports et déplacements* (ENTD).[5] The most recent one, refers to year 2008 and the next one is planned for 2018. In addition, the National Institute of Statistics and Economic Studies (INSEE), Direction des Statistiques Démographiques et Sociales (DSDS), conducts a population census annually (French cities are surveyed for the census each year) and it provides statistics on inhabitants and their characteristics, including means of transportation to go to work. Walking and cycling are both possible answers.

3.3.2 GROUP 2 – REGULAR NATIONAL SURVEYS THAT PARTIALLY PROVIDE KEY INDICATORS

Countries that have reported a regular walking and cycling data collection system (e.g. yearly, 5 years, 10 years), and which partially/do not report key indicators could provide an estimation based on the data collected.

In **Belgium**, there are two main sources of data on walking and cycling use. The main source of statistics is the Belgian Daily Mobility Survey (BELDAM). Data related to distance and number of trips per person is collected but not published as standard statistics, however it can be calculated based on the microdata. A second source of statistics is the *'Diagnostiek woon-werkverkeer 2014'*. This is based on a mandatory survey (every three years) for all employers of more than 100 employees, about the commuting mobility.

Sweden continuously collects data on walking and cycling through the *Den Nationella Resvaneundersökningen* (RVU). From 2016, there will be a break in collecting data until at least 2019 due to an increasing number of non-responses to the survey. Therefore, Sweden is planning to make extensive changes to the survey to increase the response rate and engagement in the survey. The most recent year of reported data is 2014-2015. Although detailed data are collected separately for walking and cycling, only combined data are published as standard statistics.

Data on cycling and walking in **Switzerland** is collected every 5 years through the *Mikrozensus Mobilität und Verkehr* (Micro census Mobility and Transport) that concerns various issues, amongst others, cycling and walking. The latest micro census was carried out in 2015; however, data will not be available before 2017. The most recent data stems from the micro census in 2010. Although data on the number of trips

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[4] ISFORT (2015), AUDIMOB - Survey on mobility behaviour of Italian citizens 2011-2014, ISFORT, Rome

[5] *Ministère de l'environnement, de l'Energie et de la mer, ENTD Sources et methodologie* – available at the web site http://www.statistiques.developpement-durable.gouv.fr/sources-methodes/enquete-nomenclature/1543/139/enquete-nationale-transports-deplacements-entd-2008.html

are collected in the survey, the average number of trips per person is not reported.

Malta has a regular National Household Travel Survey that is carried out every 10 years (approximately). The task of carrying out the survey is assigned to external consultants under the guidance and supervision of Transport Malta and the Ministry for Infrastructure, Transport and Communications. The latest mobility survey was carried out in 2010 and previous surveys were undertaken in 1986 and 1998. Although the methodology applied includes questions on number of trips, duration and distance, the statistics reported are focused on the split of the different modes, including walking and cycling.

3.3.3 GROUP 3 – REGULAR NATIONAL SURVEYS THAT DO NOT PROVIDE KEY INDICATORS

Countries that have reported a regular data collection system (e.g. yearly, 5 years, 10 years), which include walking and cycling but is NOT detailed enough to allow estimation of the key indicators. Most of these countries only report the percentage of the population walking or cycling with a certain frequency or collect data for work or educational trips only.

The national travel survey in **Spain** – *Encuesta de Movilidad de las Personas Residentes* (Mobility Survey of the Population in Spain) was carried out for the last time in 2006/2007 and it was then discontinued. The methodology applied to the survey was very comprehensive and allowed a good analysis of the distance and duration performed by the population using different modes of transport, including walking and cycling. Ever since, the only information available on walking and cycling is provided by the results of the National Census, which includes questions regarding the frequency of walking and cycling for the purpose of work or education, number of trips and average duration.

Data on walking and cycling in **Estonia** is collected at national level through the Estonian Labour Force Survey (hereafter ELFS). The survey assesses the main mode used by people to commute to work from home or their place of stay without taking into account the number of trips taken.

In **Croatia**, no comprehensive travel or traffic surveys have been conducted at national level. Statistics on active modes is limited to the modal split for going to work or school collected through the National Census. The most recent data are from 2011. The national census includes information on the percentage of the population that uses a bike as a mode of transport for travelling to work or school.

Data collection on cycling is limited in **Luxembourg** and no data is collected on walking. Data on Cycling is collected through the *Sondage Mobilité Douce du MDDI*, carried out every three years and the latest survey was undertaken in 2014.

In **Portugal**, the only statistics available at country level on walking and cycling are based on the result of the National Census. The question included in the Census asks the respondents to indicate the main mode of transport used for commuting. The data available is restricted to the percentage per mode and does not include more detailed information with regards to distance, duration nor frequency. The most recent data are from 2011.

Statistics on walking and cycling are insufficient in **Hungary.** Collection methods are not standardized and methodology is not defined. Just a part of the data is available and their comparison limited, due to quality and different types of data. Main sources of traffic data can be National Census, minor surveys (made before infrastructure projects), and counting information. National Census is organised every 10 years and data are only related to the daily commute to work. A National Cycling Survey was undertaken in 2015 on an ad-hoc basis and it included a household survey, roadside interviews and traffic counts. It only covered cycling trips.

3.3.4 GROUP 4 – AD-HOC NATIONAL SURVEYS

Countries in this group have reported ad-hoc national surveys that include statistics on walking and cycling.

In **Slovakia**, traffic counts and national census are the regular methods used to collect data on walking and cycling. Nevertheless, the recent National Mobility Survey conducted in 2015 provided the most relevant statistics. The survey was undertaken within the National Transport Model but a repetition of the survey has not been indicated. Traffic counts are carried out periodically (every 5 years). A limited amount of data is also available from project-related surveys and assessments or from traffic counts.

Latvia does not collect data on walking and cycling on a regular basis however, data from mobility surveys are available. The most recent statistics are from the Mobility Survey of Latvian People carried out in 2008 by the Central Statistical Bureau of Latvia. The survey evaluated the daily mobility needs of the population and it covered all the trips undertaken by each respondent, including information on the origin, destination, mode of transport and purpose of the trip. The next survey on passenger mobility will possibly be carried out in 2018 and Eurostat Guidelines on Passenger Mobility Statistics 2016 will be used as methodology.

Information is collected in **Austria** regarding walking and cycling, however not on a regular basis. Among others, the Federal Ministry for Transport, Innovation and Technology has commissioned several data collection exercises related to walking and cycling. In 2012, two comprehensive statistical summaries on walking and cycling were published: *Fußverkehr in Zahlen* (Foot traffic in numbers) and *Radverkehr in Zahlen* (Cycling in numbers). The two reports present various statistical data from various sources on walking and cycling, including EU-wide comparisons.

Currently, a household mobility survey called *Österreich Unterwegs* (Austria on the Move)[6] is being carried out with the objective of capturing the mobility behaviour of all population groups in order to create future-oriented basic

[6] https://www.oesterreich-unterwegs.at/index.php

data for traffic planning and mobility research in Austria. The survey phase is completed but results were not yet available by the date of publication of this report.

Active modes use data was collected in **Cyprus** thought the Short Distance Passenger Mobility Survey conducted by the Cyprus Statistical Authority. The survey was very comprehensive and results include duration, distance travelled and number of trips. The survey was carried out yearly between 2007 and 2009, but it has been discontinued.

In **Poland**, data on walking and cycling at the country level are quite scarce. However, a recent Pilot Mobility Study was carried out at national level with a focus on the usage of cars and public transport but it also included some data on walking and cycling. The study was published in October 2015[7] and there is no indication with regards to the periodicity of the study.

There is no systematic/official data gathering efforts in **Greece** by national government authorities focused on walking/cycling (or more generally on the modes of transport) per se at the national or urban levels. Nonetheless, the recently conducted Time Use Survey (TUS) in households with reference period March 2013 to February 2014 by the Hellenic Statistical Authority (ELSTAT, 2014a), collected information on how Greek population use and allocate their time doing various activities and among other things collected and reported information on the time allocated to walking and cycling as sports activities.

3.3.5 GROUP 5 – REGULAR SURVEYS AT CITY CAPITAL LEVEL ONLY

Countries that do not have national surveys including walking and cycling but statistics are collected in the capitals through regular surveys.

In **Slovenia**, no travel surveys have been conducted at national level. On the urban level, however, Ljubljana undertakes good-quality travel surveys approximately every 10 years (1994, 2003, and 2013). The Statistical Office of Slovenia (SURS) is planning to carry out a survey on passenger mobility in 2017. This survey might provide data such as the share of walking and cycling in the total passenger mobility.

The situation in **Lithuania** is similar. Data on active modes is not collected at a national level but it is partially collected in the capital, Vilnius. The survey in Vilnius is conducted regularly in connection to the 'Vilnius Plan' and ' Vilnius City Bicycle Paths Special Plan'. Data only includes cycling and no reference to walking is made. The most recent data were collected in 2014 and it is repeated every six years.

3.3.6 GROUP 6 – AD-HOC SURVEYS AT CAPITAL LEVEL ONLY

Countries in this group have not reported any regular system in place for the collection of data on walking and cycling but have reported the existence of ad-hoc surveys at capital level.

The **Czech Republic** Statistical Office does not collect any data on walking or cycling. The national census collected data on cycling (i.e. modal split by bicycle to work or study) until 2001 but the most recent census (2011) did not include any question in this regard. In Prague, a survey on cycling was conducted in 2012 . From this survey, it was possible to extract the modal split, number of trips and distance travelled per person.
A similar survey was conducted in 2002, 2008 and 2010.

Romania also does not have any systematic data collection method that covers walking and cycling. In the capital Bucharest, data collection on active modes is not undertaken on a regular basis, however travel surveys were carried out as part of the preparation of the Bucharest Master Plan for Urban Transport, where information on walking and cycling was collected.

3.3.7 GROUP 7 – NO SURVEYS INCLUDING ACTIVE MODES

Countries in this group have not reported any survey that includes walking and cycling.

In **Bulgaria**, there are no data collection methods at national level that gather information on active modes. Data collection in the country was undertaken only under the framework of European initiatives, for example, European Health Interview Survey carried out it 2013.

Country Reports are presented in Appendix C.

Geographically, the groups divide Europe in 2 parts: Western and Scandinavian countries have travel surveys providing active modes key indicators, while Eastern and South-eastern countries tend to have ad hoc or no national surveys. In the capitals of some countries that do not have national data collections, there are surveys providing active modes statistics: Riga and Ljubljana have regular surveys that partially provide key indicators, Prague and Bucharest have only ad-hoc surveys.

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[7] "Badanie pilotażowe zachowań komunikacyjnych ludności w Polsce", October 2015 (http://stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultstronaopisowa/5851/1/1/raport_koncowy_badanie_pilotazowe_zachowan_komunikacyjnych.pdf)

[8] GfK (2012). Cyklistická doprava v Praze 2012 (Study on cycling in Prague; similar studies carried out in 2002, 2008 and 2010): http://www.sfdi.cz/soubory/obrazky-clanky/poskytovani-prispevku/cyklo-balicek/cb_d2.pdf

FIGURE 6
MAP OF THE COUNTRIES ACCORDING TO NATIONAL DATA COLLECTION AND RECORDING METHODS/GROUPS

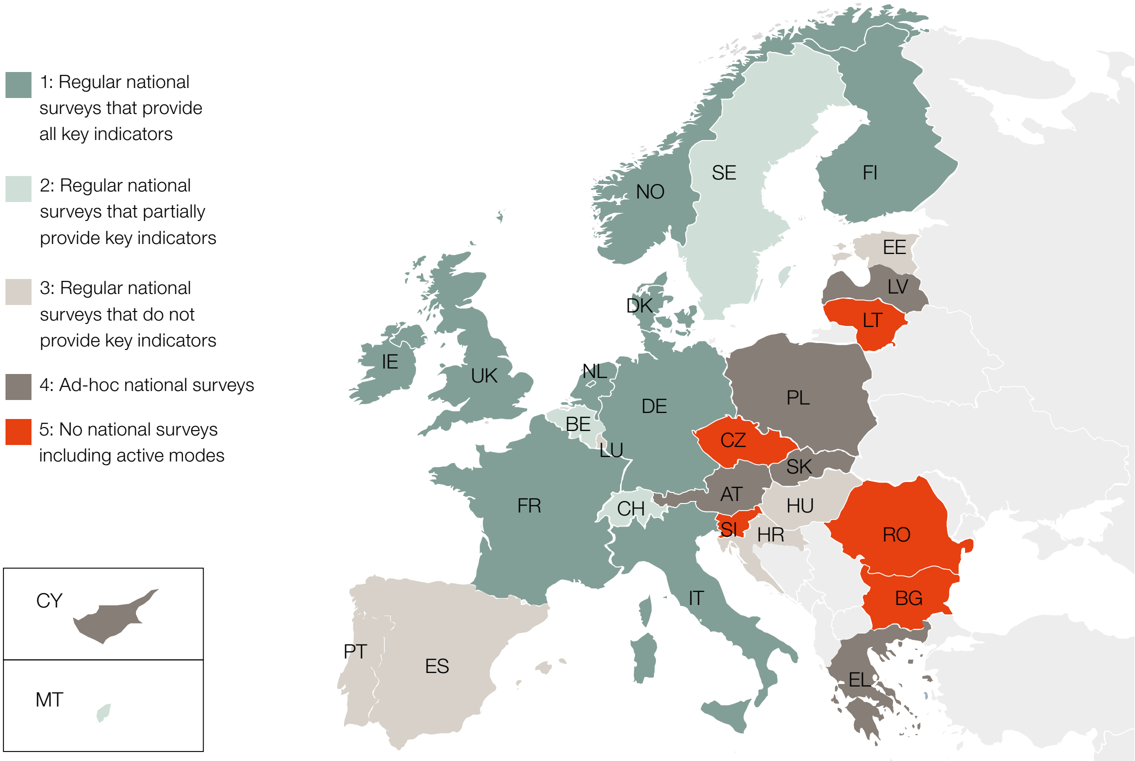
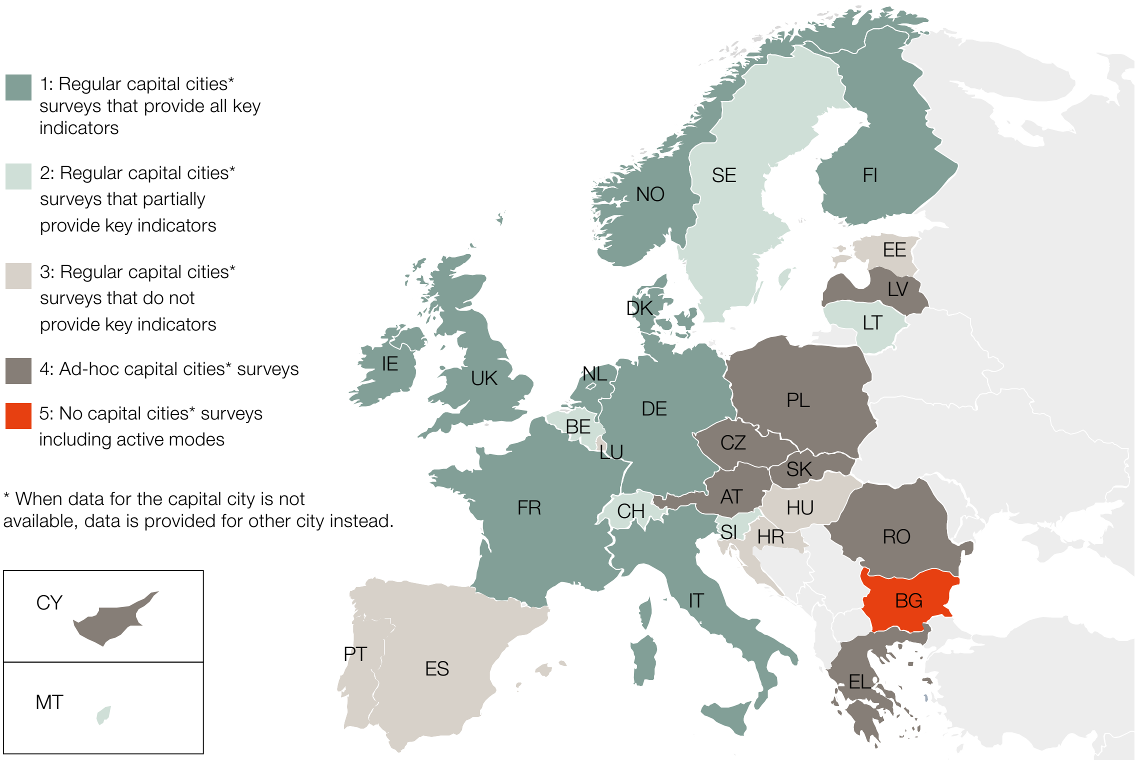


FIGURE 7
MAP OF THE COUNTRIES ACCORDING TO URBAN COLLECTION AND RECORDING METHODS/GROUPS



SOURCES
Own elaboration based on countries consultation

4 TASK 3. ANALYSIS OF DATA SOURCES AND COLLECTION METHODOLOGIES

The main purpose of this task was to analyse and document strengths and weaknesses of data sources and data collection methodologies. The analysis is presented in three stages: (i) firstly, the reported data collections from the countries consultation are presented and documented in terms of their usefulness in providing comparable statistics of walking and cycling use (in pkm and trips) and related infrastructure; (ii) then, the key indicators on active modes published in European statistics are compared. These are available from the Eurobarometers 406[9] and 419[10] and from the European Health Interview (EHIS) surveys[11]; (iii) finally, other potential sources of active modes statistics are introduced: Google Better Cities and COWI City Sense -and Signal Re-identification for walking and cycling, and OpenCycleMap for infrastructure statistics.

4.1 REPORTED DATA COLLECTIONS FROM THE COUNTRIES CONSULTATION

4.1.1 TYPES OF DATA COLLECTIONS IDENTIFIED

The country consultation included travel surveys, census, traffic counts, infrastructure databases as sources of active modes on walking and cycling use and infrastructure. A complete overview of the identified data collections is presented in Appendix F. The strengths and weaknesses of different data collection methods are presented in this section. Gaps and challenges discovered when producing the comparative overview are presented in section 6 – Task 5.

4.1.2 COMPARABILITY OF DATA FROM DIFFERENT SOURCES

Travel surveys

Most of the countries calculate active modes statistics based on travel surveys. Similarly, travel surveys are the main source of statistics on walking and cycling at urban level. All countries producing statistics on average walking distance per person per day, and average number of walking trips per day at country and capital level, obtain these statistics from travel surveys. This is also the case for cycling. These data need to be further refined based on the percentage of the population that cycles, as (eventually) reported differently in the census from the statistics produced by travel surveys.

The data collected from travel surveys allowed for the production of the first comparative overview (section 5 – Task 4).

Census

In 2011, European legislation defined in detail a set of harmonised high-quality data from the population and housing censuses conducted in the EU Member States[12]. The database has statistics at national and regional level, however, it does not systematically produce walking and cycling statistics.

In the countries where walking and cycling data are collected as part of the National Census, data collected refers to commuting trips and mostly main mode only.

The overview of the findings is presented in Appendix G.

Traffic counts

No pedestrian counts were reported at national level.

When counts are reported for both walking and cycling, it means that they are calculated separately. Some good practice examples were identified: automatic pedestrian and cycle counts in Oslo and in Zürich, and cycling counts at national level using an app in the Netherlands and Belgium.

Walking infrastructure

The interpretation of what is walking infrastructure can vary, therefore there are no statistics on walking infrastructure at national level. The proxy of asking which cities (>50,000 inh.) have dedicated pedestrianised zones and/or shared space areas, provided very low and incomparable response (Table 2).

At city level, statistics were provided for seven cities (Table 3). It is not clear whether the total area of the neighbourhoods were counted, or if only the pedestrian areas such as squares, streets and parks were considered. Therefore, these statistics are not comparable and were not used to produce a comparative overview.

Some contact points (i.e. UK, CH, Walk21) and experts interviewed in task 1 argued strongly not to use such zones as

[9] Special Eurobarometer 406: Attitudes of Europeans Towards Urban Mobility, EC, 2013.
[10] Flash Eurobarometer 419: Quality of Life in European Cities, EC, 2015.
[11] Only preliminary results from EHIS have been made available by the publishing date of this report.

[12] http://ec.europa.eu/eurostat/web/population-and-housing-census. Last consulted July 29, 2016

TABLE 2
REPORTED CITIES HAVING DEDICATED PEDESTRIANISED ZONES AND/OR SHARED SPACE AREAS

COUNTRY	CITIES HAVING PEDESTRIANISED ZONES AND/OR SHARED SPACE AREAS (TOTAL AREA/LENGTH)	METHODOLOGICAL DIFFERENCES
Estonia	2 cities	Tallinn and Tartu mentioned, area not available
Greece	Dedicated pedestrianized zones: 24 cities (7.0 km^2) Shared space areas: 14 cities (2.3 km^2)	Full overview of cities + total surface
France	53 cities (182 km)	Full overview of cities (2013) + total surface
Lithuania	4 cities	Vilnius, Kaunas, Klaipeda and Siauliai mentioned, area not available
Norway	Most on Oslo 11.8 km	Total distance pedestrianised street; one pedestrian street might be recorded as more than one section
Slovakia	11 cities (0.5 km^2)	All Slovak cities over 50,000 inhabitants have pedestrianised zones.

SOURCE
Own elaboration based on countries consultation

TABLE 3
REPORTED SURFACE OF PEDESTRIANISED AREAS IN EUROPEAN CAPITALS

CITY	REPORTED SURFACE PEDESTRIANISED ZONES AND/OR SHARED SPACE AREAS (KM^2)
Vienna	0.320
Copenhagen	0.136
Athens	0.004
Madrid	0.319
Zagreb	0.800
Oslo	0.005
Ljubljana	0.100

SOURCE
Own elaboration based on countries consultation

an indicator of pedestrian infrastructure quality. The pedestrian friendliness is determined by many parameters (e.g. security, accessibility to public transport, urban geography and form, parking facilities and connectivity) other than infrastructure alone.

Cycling infrastructure
Five countries have databases providing statistics per type of cycling infrastructure, eight countries provided total numbers of kilometres. When only totals are available, it is difficult to interpret these numbers because it is not clear what is included. For example, contraflow cycling[13] is not considered as cycling infrastructure in some countries (e.g. the Netherlands), while it is included in others (e.g. Poland). Some countries have partial cycling infrastructure statistics because the local administration is in charge of local roads, while regional or national administrations are in charge of regional and national roads. The overview of available cycling infrastructure statistics is presented in chapter 5.3.

The Dutch cyclist association has the only database in the Netherlands having all the cycling tracks (Zeegers & Kamminga, 2014). These are used in the route planner (Routeplanner. fietsersbond.nl) and are permanently updated by approximately 500 volunteers, who also map all the new cycling tracks, and 15 characteristics. These cycling infrastructure statistics were used to assess the potential of using crowd sourcing to collect infrastructure data (see section 4.4).

Thirty city administrations provided cycling infrastructure statistics which were used to produce a comparative overview (Section 5 – Task 4). The comparability issues encountered are:

[13] Contra-flow cycling is when cyclists are allowed to ride against the flow of one-way streets.

- Different classifications are used;
- Distance is calculated for actual routes (i.e. recreational routes, cycling corridors) rather than dedicated cycling infrastructure;
- Contraflow cycling is not considered as cycling infrastructure and therefore not included in the cycling infrastructure databases;
- It is not clear which definition is used for city/urban areas (e.g. own agglomeration criteria, degree of urbanization, etc.).

4.2 ACTIVE MODES PUBLISHED IN EUROPEAN STATISTICS

The identified sources for a complete overview of walking and cycling statistics in Europe are the Eurobarometers 406 and 419, and the European Health Interview Survey. They do not provide daily average pkm and trips for walking and cycling, but other indicators which were used to compare walking and cycling in different countries, regions and cities.

Attitudes of Europeans Towards Urban Mobility (Special Eurobarometer 406)

The Eurobarometer 406 gives an indication of walking and cycling in the EU28 from a survey addressed directly to the people (27,680 respondents in 2013). The statistics provided are walking and cycling frequency per year, classified in: i) at least once a day, ii) a few times a week, iii) a few times a month or less and iv) never. The statistics of the Eurobarometer 406 were used to produce a comparative overview of walking and cycling frequency in Task 4 (section 5.4).

The European Health Interview Surveys

The European Health Interview Surveys are forecast to run every five years. EHIS 2 was held in 2014[14]. Eurostat provided the following indicators:

- Percentage distribution of persons aged 15 or over according to the number of days spent on walking to get to and from places;
- Percentage distribution of persons aged 15 or over according to the number of days spent on cycling to get to and from places;
- Average number of minutes per week per inhabitant spent on walking or cycling to get to and from places (all population aged 15 or over). This average is calculated over the entire population 15+, i.e. the indicator includes the population not doing the activity at all.

This was used to produce a different comparative overview of walking and cycling frequency in Task 4 (section 5.5).

The Quality of Life in Cities Survey (Flash Eurobarometer 419)

The Eurobarometer survey on the Perception of Quality of Life in European Cities is conducted every three years, with the most recent publication in 2015. For this survey, more than 40,000 people were interviewed in 79 cities and in 4 greater cities. People were asked which mode of transport they use most frequently (up to two modes could be selected), and this was published as a percentage of the respondents who used walking and cycling as a mode of transport most often. The Quality of Life in Cities Survey was used to produce a comparative overview of walking and cycling as main mode in Task 4 (section 5.6)

4.3 THE POTENTIAL OF BIG DATA

4.3.1 GOOGLE BETTER CITIES

Description of the program

The Google Better Cities program aims at exploring how urban areas are making data driven decisions and how specific mobility related projects can benefit from access to Google's location data of Android mobile operational system users. The main goal of the program is research & development on the back end to illustrate the potential use of location history data provided by Android users for feeding a series of mobility measures. This translates into two focal points: firstly, the work in progress is focused on the analysis of global statistics of how people travel. The aim is to understand which mobility related statistics are derivable from the data content and how comparable are these to traditional measures. Secondly, with regard to the design of privacy measures, this paragraph explores how to collect data safely, how to aggregate data in a way such identification of individual users is avoided and how the data is safely shared.

Cities or researchers that wish to participate in the program can apply to become a partner and receive access to Google data for their area. In return they are asked to publish the research and lead the communication to slowly build a body of proof on how valuable the information is. One out of twenty proposals was accepted into the program. Currently, the Google Better Cities project is no longer accepting new applicants into the program. However, a follow up call will be sent in a similar fashion as before[15].

Alternatively, Google's spin-off company Sidewalklab focuses on providing front end services for urban developments including mobility solutions. Both teams are working closely together with the Google Better Cities project aiming at privacy and quality related developments.

Statistics Available from Google's location history data

Google Better Cities is a big data provider that can generate travel statistics for vehicles, cyclists and pedestrians. Google can compute the following types of statistics:

- Average Speed;
- Flow;

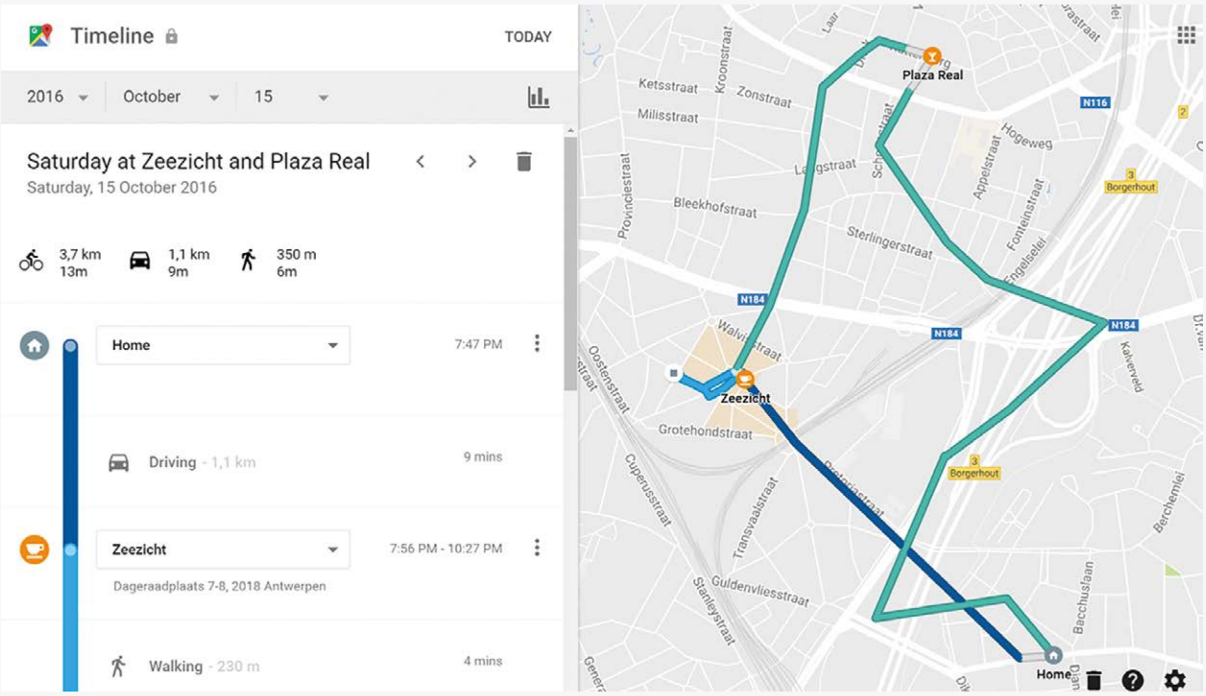
[14] http://ec.europa.eu/eurostat/web/microdata/european-health-interview-survey. Last consulted December 27, 2016.

[15] http://googlepolicyeurope.blogspot.dk/2015/11/tackling-urban-mobility-with-technology.html ;
https://docs.google.com/forms/d/e/1FAIpQLScWgpuW48CpvArnegTxrsSjdcmtp7zAN2ya3s2nmnariFKjgw/viewform

BOX 2
GOOGLE LOCATION HISTORY

Every user can manage, create and delete the data collected with his/her device on the Location History website: https://www.google.be/maps/timeline

FIGURE 8
GOOGLE LOCATION HISTORY WEBSITE SHOWING THE INFORMATION GATHERED BY A SINGLE USER



SOURCE
https://www.google.be/maps/timeline

› Travel Time;
› Turning percentages (percentage);
› Origin and Destination matrix.
›

Data Collection
Google currently collects data from Android users that have opted to provide location data and volunteer to provide user contributed content. At any point users are able to stop providing data or delete partial or full contributions of their data. The collected data is composed of a combination of location history, activity recognition, geospatial context and socio-economic characteristics.

The location history of a mobile phone is provided by a combination of on-board sensors. The location is reported by integrating data from GNSS (global navigation satellite systems), WLAN BSSIDs (unique identifiers broadcasted by a networks access points), Cell towers (based on signal strength and identification), etc. The resulting coordinates are combined with a time stamp of the observation and a measure that indicates the accuracy of the location estimate. This way a time line is built of positions measured by the mobile phone.

The accuracy of the location varies across a day depending on the available sensors within reach. It is assumed that location errors are normal distributed in space. The accuracy measure provides the radius such that it is 68% probable that the true location is inside the defined circle.

During the day also an estimate of the mode of transport (i.e. idle, walk, bike, and car) is made. The estimates are based on periodically reading short burst of low power sensor data (e.g. motion sensors such as accelerometers). This data is processed by trained machine learning models to estimate the user's activity. The estimates are provided in the form of scores for each category (that add up to 100) to indicate the confidence in the classification.
Additional geospatial contextual and socio-economic information is in principle also available. Android users are able to increase the precision of a location estimate by adding geospatial context to the measurement. This is done by selecting the name of a bar/restaurant/museum/public building. Most android phones are linked to an individual user profile. The additional data contains information such as home or work location, age, occupation, etc.

Privacy

The Google's history location data is composed of unique individuals sharing information about their location and their activities. Google protects the privacy of the user through a number of filtering and encryption techniques such that the aggregated statistics generated from individual data cannot be used to "track" a specific individual.

The most important data protection protocol is called differential privacy. This technique adds random noise to a data source to ensure that it is not possible to identify whether an individual is present within the queried data base. Google's differential privacy protocol is based on the RAPPOR[16] mechanism. RAPPOR stands for Randomized Aggregatable Privacy-Preserving Ordinal Response. Simply put, it flips the bytes of a digital report (like the location history) based on a two-step randomization algorithm. First, deterministic noise (linked to a private security key) is added by performing two pseudo random coin flips. If the first is true the bit is replaced with the result of the second coin, otherwise the bit is left as it is. Second, fresh random noise is added to the result by performing two new fresh random coin flips with different weights. If the bit is true the first coin flip is reported, otherwise the second result is reported.

A large amount of randomness is added to the data to protect the Android users. This means that no meaningful conclusions can be drawn from a small number of reports. Good statistics should therefore be based on a sufficient amount of data. Results in regions with low coverage and sparse data are heavily influenced by the random noise. This is also important with respect to the temporal resolution of mobility measures. Most statistics are time dependent and aggregates over shorter time periods will typically consist of lesser data points. This clearly affects walking and cycling statistics for short time periods or restricted spatial areas. As such, an average statistic such as average person km/day or average number trips per person per day seems to be an appropriate approach to this limitation.

Data distribution

Cities and researchers participating in the Google Better Cities program are able to download processed data locally or perform queries through Googles Bigquery portal[17]. The latter allows for the usage of Google's cloud computing facilities to enable fast SQL queries on the extremely large data base of location histories. Only some agencies possess the facilities to process the downloaded data locally and importing it in this way into their existing services. For others the Bigquery portal presents an alternative to analyse the data.

Data is requested by submitting a manifest stating collection period, polygon of the region(s), data type(s) and modalities. For an average cycling/walking trip measure of a country or a city, a sample over multiple days and various areas is required. Further research is required to identify clear minimal requirements for these samples.

[16] Ú. Erlingsson, V. Pihur, and A. Korolova, "RAPPOR: Randomized Aggregatable Privacy-Preserving Ordinal Response," 2014, arXiv:1407.6981.
[17] https://cloud.google.com/bigquery/

Inferred mobility data

The vast majority of the projects within the Google Better Cities program focus on vehicle movements. The main reason being the abundant amount of ground truth data available for this type of transport in most European countries. Nonetheless, the data source can generate travel statistics for cyclists and pedestrians. Because of the current focus of the program (e.g. verifying data quality), cycling and walking statistics are less available. Therefore, an overview of the currently available aggregate measures is given from a cycling and walking perspective:

- Link based speeds measures: typically, one of the more robust statistics available. Generally less bias and variance is observed than with other statistics. This statement holds with respect to vehicle based traffic as cars are limited in differentiating their speed within an urban environment or highly congested corridors. On highways during free flow conditions a difference between truck users and car users is expected because of different vehicle characteristics. The results are directly comparable with traditional link based ground truth data (as provided by camera systems or detector stations). A similar observation is expected for cycling behaviour as increasing speed differentiation is expected for a fleet of bicycles that consists of a mixture of classical and electrically assisted bikes.
- Link based volume measures: a statistic that indicates the number of users on a link. Typically, it has a negative bias due to undersampling of the true population. As a result, these volumes do not present a direct measure of total volumes. Volumes based on android users are useful as a relative measure or when scaled to appropriate levels. The scaling factor is not a constant in the network and therefore there can be different scaling factors for different links. Total link volumes and therefore scaling factors could be derived from traditional detectors stations like induction loops. For collecting cycling and walking ground truth data, (heat) cameras are used more often.
- Link to link turning fractions: a statistic that indicates the turning percentages or rates. This measure indicates how users are distributed locally over the network (at intersections). The relative measure is comparable with measures traditionally also available if loop detectors are present on different turn movements. This measure is highly interesting for the identification of cycling and walking movement at an intersection and how they interact with vehicles. Left turning behaviour typically conflicts with many other turn movements across right hand driving countries. This measure is thus relevant in combination with safety statistics.
- Route based travel time measures: similar to speed but expressed in units of time (e.g. seconds) and measured over a specific route in the network which can cover one or several links. Travel time can also be computed by integrating link based speed measures. Because walking and cycling activities are identified by on board sensors on the android phone multimodal routes are identifiable. Transitions are never accurate; activity sensing is limited to short bursts to preserve battery life.

- Network based origin – destination relations: matrix that contains the number of trips between zones in the network. The data suffers from the same systematic bias that link flow suffers from. Results are thus useful as a relative measure or when scaled appropriately. Additional work is being conducted by distinguishing between the purposes of trips. The main remaining challenge is defining the legs of a tour. For example, in tours that include a drop off or pick up point.

All these statistics are time dependent, which means that the aggregates can cover a range of several minutes to hours or even total daily commutes. Different applications often require different levels of data quality and spatiotemporal precision. The current focus of the project is on understanding when location history data is able to replace, append or enrich current data support for decision making related to mobility. Unfortunately walking & cycling data are often scarcer when compared to vehicle data. This makes verifying the accuracy of related statistics more difficult.

Potential of Google's location history data to validate or possibly replace travel surveys at country or city level
Ongoing research focuses on assessing the feasibility of using Google location data to identify pedestrians and cyclists and produce data on walking and cycling, however results have not yet been published.

It is paramount that data are fully protected with respect to privacy. Once the data are downloaded or queried it is no longer in the hands of Google. Based on the available data it has to be decided how much and what kind of information is provided. This is one of the main cornerstones in sharing and collaborating with partners because one data breach might potentially affect the entire sector.

A possible innovative use of Google Better Cities to collect harmonised walking and cycling statistics and reduce the burden on respondents to complete travel surveys, could be to ask a representative sample of the urban population in Europe to voluntarily provide their location history instead of filling in travel diaries. Such a method could also be combined with satisfaction surveys. Using a similar approach it has been shown[18]
that individual records allow for the identification of walksheds (the area within walking range at a specific location).

Resources required to implement comparable active mode indicators across different European countries
A research in the Netherlands (Amsterdam) shows that this data source has the potential to cost-effectively replace more traditional measurement systems[19]. For a 30km highway stretch, costs can be reduced by 364,000 Euros if 20% of all sensors are replaced by Google data. The gain nearly doubles if 20% of the sensors would be installed during construction.

Increasing the data quality of other modes is currently under development. One of the remaining challenges is mapping pedestrians to infrastructure and distinguishing between indoor and outdoor walking. One example in York (UK) shows that it is important to differentiate between crossing a busy road and using the underpass. It also remains to be proven that travel times are unbiased for walking or cycling statistics where for example age has a significant influence on speed and android phones are not evenly spread over the population.

4.3.2 COWI CITY SENSE AND SIGNAL RE-IDENTIFICATION

Description of the platform
The COWI's City Sense platform is a combination of data collection, data processing and data presentation aimed at increasing the quality of traditional mobility measures through Big Data. The system is composed of a network of sensors that can measure flow and speed using re-identification of Bluetooth and WiFi signals. The system is similar in design to a number of other systems deployed around the world. The system anonymously detects individuals by locating and relocating the MAC address of a Bluetooth or WiFi signal in a network. Given these two reports, the speed and travel time can be inferred from the location and time of the reports.
Statistics Available from COWI City Sense
Signal re-identification is a relatively simple use of technology that can be utilised to map cycling and walking. Today many pedestrians and cyclists carry mobile phones. By applying statistical filters to the data collected in the field, the data for active modes can be extracted and statistics for walking and cycling can be separated out from motor vehicles. If the monitoring devices are deployed at a number of points in a network, a more general picture of walking and cycling can be derived. The main limitation with this technology is that it requires that devices are deployed in the network, for example at intersections. The types of statistics that can be derived are:
- Speed;
- Flow;
- Travel Time;
- Turning percentages (percentage);
- Origin and Destination matrix.

Data collection
This system was originally developed by Blip systems to identify and track Bluetooth devices in Airports. In collaboration with COWI the technology was moved to road networks and validated in the second largest municipality of Denmark (Århus). In current applications, Bluetooth & WiFi are the two main sources of data. WiFi is becoming more useable as Bluetooth observations are becoming less available. This is because on most smartphones, Bluetooth is turned off regularly to increase battery life.

The sensor system is composed of a network of measuring nodes mounted along roads. The nodes are positioned in

[18] Mark Linquist, Paul Galpern, Crowdsourcing (in) Voluntary Citizen Geospatial Data from Google Android Smartphones. Journal of Digital Landscape Architecture 1-2016.
[19] W.P van den Haak, M.F. Emde, Validation of Google floating car data for applications in traffic management, TNO white paper, 2016.

such a way that a connection between neighbouring nodes is always along the shortest routes available to the users. To illustrate the placement of sensors, consider an intersection. The standard setup is to equip each connecting road with a sensor so that by re-identification, the observed turn movement is uniquely defined. For a typical intersection at the crossing of two roads, four sensors are required to recognize the twelve turn movements. By positioning the sensors upstream of the intersection it is possible to estimate delays for moving across an intersection. On corridors it is more straightforward to estimate travel times by comparing the time stamp of devices that are observed both upstream and downstream of the corridor within a valid time frame. In Åa rhus, 1,000 individual routes are observed using this setup. This is also the main limitation of this technology. Observation stations have to be actively deployed within the network.

The system observes a variety of different mobile devices: phones, tablets, cars, navigational equipment, etc. The observed devices are typically within approximately 100 meters of the measuring station. In general, 90% to 99% of the devices are re-identified. The loss of devices is attributable to different sources i.e. devices being turned off, a device moving too fast and hence not being within detection range for a required time. In some cases, multiple devices can be linked to a single user. For example, most luxury cars are equipped with multiple observable devices. To remove biases, these have to be filtered by combining observations at different sensing stations.

Signal re-identification is a relatively simple use of technology that can be used to map cycling and walking. Today many pedestrians and cyclists carry mobile phones. By applying statistical filters to the data collected in the field, the data for active modes can be extracted and statistics for walking and cycling can be separated out from motor vehicles. Again, some of the filtering is based on combining observations at different sensing location. If, for example, a device is observed on a highway it will be linked to a car or truck. If later it is re-identified on a road with mixed traffic it is highly likely that this device will still be linked to a car or truck. The same holds for pedestrianised streets or devices exiting public transport buildings such as train stations. Here it is more likely the device is linked to a walking individual. If the monitoring devices are deployed at a number of points in a network (including highways) a more general picture of walking and cycling can be derived. This also requires good digital maps of roads, pedestrian streets, cycling roads, etc.

COWI is currently looking at alternative sources of location data that can be integrated into the current system. For example, the identification of mobile phones through cell phone towers. The accuracy of this data source is too low for applications that map data on roads but it could be feasible to derive more general mobility statistics in larger areas.

Privacy

The COWI City sense data is composed of MAC addresses of devices observed by different sensor stations. COWI protects the users' privacy through a double encryption technique such that individual data cannot be used to identify a specific device or the person carrying it. Each observed MAC address is encrypted and truncated by a unique identifier that is shared in the sensor network. Only the encrypted observation is stored on a central server. Every 24h the encryption of unique MAC addresses is changed to avoid recognizing individual movement patterns on a day-to-day basis. The double encrypted and double truncated procedures make it impossible to trace back the original MAC address.

Data distribution

All data is collected dynamically, in general a rolling window looking back 10 minutes is updated every 1 minute with fresh data. With a low latency and high data quality the data source is valuable for real-time applications. On longer time frames the same data is useful for control and planning applications. This analysis comes at an increased computation cost as much more data has to be compiled for this reason.

The minimal solution provided is a web page utility. This package is aimed at designing, setting up, assessing the quality and presenting the data. The data is typically presented in a web-based format that consists of different dashboards to visualize the information. This information is designed to be used by traffic or urban planners. Examples of these dashboards are: i.e. travel times along specific routes, delays at specific turns of an intersection, distribution of an origin by destinations (Box 3).

Built upon the basic web tools, additional analysis is available. This consists of longer term planning analysis such as presenting statistics over months or even years or making strategic conclusions about, for example, the level of congestion during the current year compared to the previous year. Typically this analysis comes at an increased computation cost. Reports are delivered using interactive applications or documentation depending on the specific project needs.
Finally, it is also possible to provide the data stream through an IPA interface on a daily basis. Usually a service contract of several years is agreed upon. Typically, 2, 3
or 4 year contracts are made. If the contract is no longer renewed, an option to buy the system without support is available.

Inferred mobility data

The City Sense data source can generate travel statistics for vehicles, cyclists and pedestrians. Within each class, the following types of aggregated statistics are available:

- Link based speeds measures: One of the more robust statistics available. In general, less bias and variance is observed than other statistics. It is even possible to identify speed differences between trucks and cars. These results are compared to traditional data collection methods to assess performance in terms of quality.

- Link based volume measures: these measures are too volatile to use as absolute measures. The percentage of different collection methods (WiFi vs Bluetooth) vary across locations and time periods between 15% and 30%. Zooming in on a specific situation, it is possible to use these statistics if the data is compared with other data sources like manual counts or traditional count stations (loop detectors or cameras).
- Link to link turning fractions: a statistic that indicates the turning percentages or rates. This measurement indicates how users are distributed locally over the network (at intersections). The relative measure is comparable with measures traditionally also available if loop detectors are present on different turn movements.
- Link to link turning delays: a static that describes the delay at an intersection for different turns. The City Sense data collection strategy is unique with respect to these measures because of the placement of the detectors. The results are important for making design decisions with respect to optimizing priority at signalized and non-signalized intersections.

BOX 3

COWI CITY SENSE DASHBOARD DEPICTING TRAVEL DATA OF KOLDING CITY

The figures below present examples of outputs from COWI City Sense based on an example for the City of Kolding. COWI City Sense recorded the number of registered records per day (Figure 9) and per hour within one selected week (Figure 10) and on average over a year.

FIGURE 9

NUMBER OF REGISTERED RECORDS PER DAY

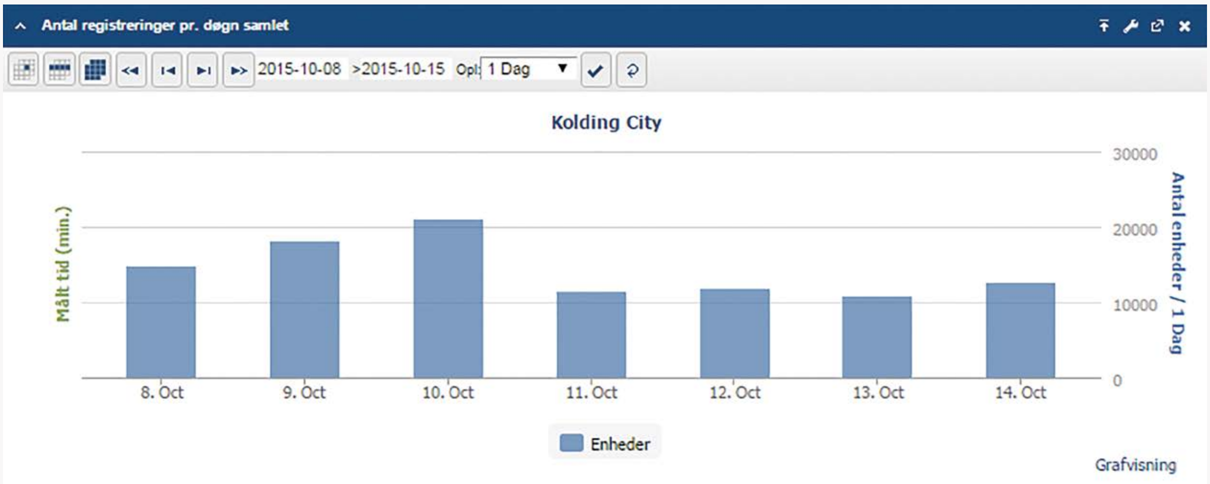
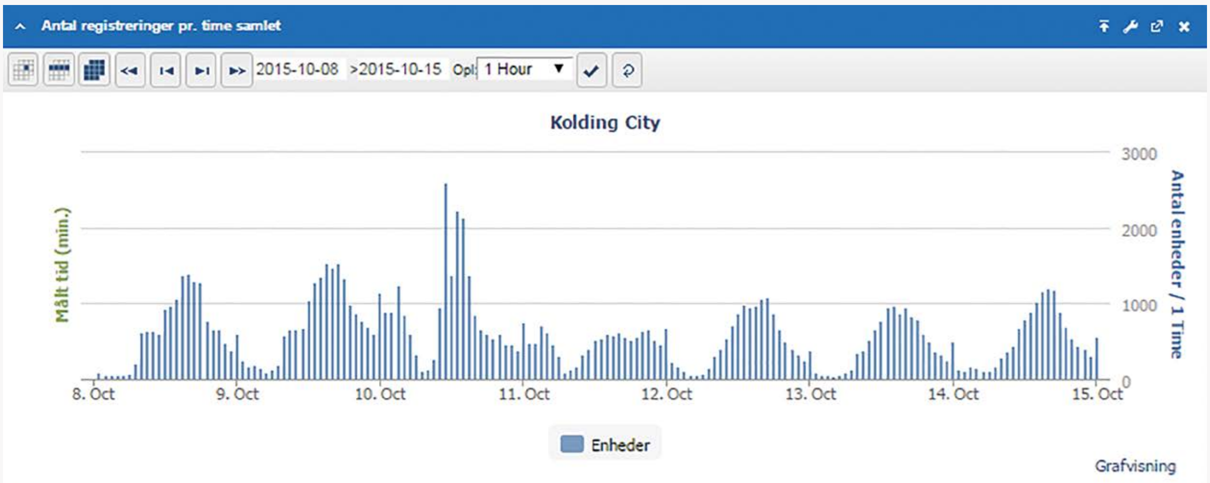


FIGURE 10

Number of registered records per hour within one selected week



SOURCES

COWI CitySense

- Route based travel time measures: similar to speed but expressed in units of time (e.g. seconds) and measured over a specific route on the network which can cover one or several links. Travel time can also be computed by integrating link based speed measures.
- Network based origin – destination relations: matrix that contains the relative distribution of trips between zones in the network. It is even possible to identify tour based measures. These measures describe relations between zones that are consecutively visited. However, the reliability of the data is highly sensitive to the actual spatial context. Often no prior estimate can be made of this accuracy and location specific tests have to be performed.
- Trip distribution within a network: a measure for the relative distribution over routes. It is possible to identify route choice distributions between different zones. This is valuable for identifying through traffic in city centres or for validating route guidance through VMS systems (applications in Viborg and Aalborg).

Potential of COWI's City Sense system to validate or possibly replace travel surveys at the country or city level
The main disadvantage of the City Sense system is the active placement of measuring stations throughout the network. In order to sample statistics at a country or city level, more attention will need to be given to accurate comparisons and calibrations because of the level of bias provided by the local estimates.

In the past two years COWI has observed fewer projects focusing on road usage and more projects on pedestrians. This is explained by two observations: first GPS based systems are becoming more accurate. This is still at a rate of 5% of the data provided by active sensing, making the COWI City Sense systems still valuable for smaller projects. For example, now the system is applied for identifying how people use the city centre by looking at the network relationship between public station hubs, parking zones, parks, CBD, etc. Alternatively, the system is being used to analyse human mobility around sporting events or community gatherings possibly even within buildings. In this case heat cameras are coupled with Bluetooth and WiFi data to track and trace individuals.

Currently the City Sense system has only been applied in Denmark. The reason for this is the demand-driven business model. The goal of COWI is to provide higher level mobility solutions. The use of re-identified mobile devices as a data source is only aimed at increasing the data quality to support these solutions. If in the future, more cost efficient qualitative data becomes available, COWI will explore integrated solutions or consider replacing the data model as a whole.

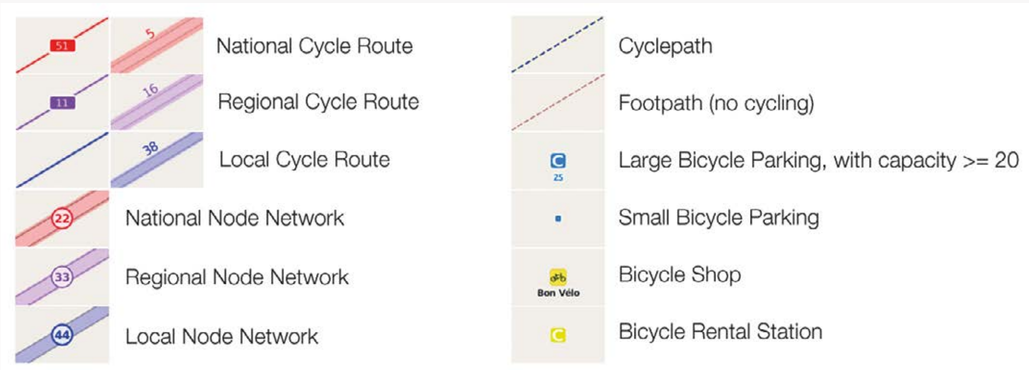
4.4 THE POTENTIAL OF CROWD SOURCING

4.4.1 OPENCYCLEMAP

The OpenCycleMap was selected as a potential source to provide a comparative overview on cycling infrastructure. The map includes dedicated cycle tracks and lanes. The definitions used are: "A cycle lane lies within the roadway itself (on-road), whereas a cycle track is separate from the road (off-road)" (OpenCycleMap, 2016).

The categories used by the OpenCycleMap (Box 4) are not the same as the infrastructure types of the European Cycling Lexicon. In order to assess the potential of OpenCycleMap to produce infrastructure statistics, a comparison is needed of the 'tags' added as a description of each line segment. This in depth analysis was performed for one case study, the city of Amsterdam.

BOX 4
OPENSTREETMAP CYCLING INFRASTRUCTURE KEYS



SOURCE
https://www.opencyclemap.org/docs/

Tagging of cycle lanes and tracks in OSM: Cycle lanes lie within the road itself and therefore they are drawn with a single line. The main tag *"highway"* can be anything (i.e. motorway, residential, road). The cycle *lanes* are specified mainly by the tag *"cycleway"* =lane, opposite_lane, opposite, share_busway, shared_lane. There are three ways to model cycle *tracks*: either draw separate ways along the roadway which are tagged as highway=cycleway (this allows for more detail), or add a cycleway=track tag to the existing highway (this is faster and sometimes just as accurate), or by adding a bicycle=yes tag on other types of highways (such as paths, footways, etc.). Other attributes can be added to the cycleway (e.g. one-way, surface, smoothness, foot, width, etc.)

4.4.2 CASE STUDY AMSTERDAM

A good practice example of cycling infrastructure statistics was found in the Netherlands. Three databases provide data on cycling infrastructure length: the public administration, the Dutch Cycling Federation (Fietsersbond) database compiled from contributions of 500 volunteers and covering the entire country and the OpenCycleMap. Issues of comparability were assessed by comparing the statistics from the city of Amsterdam road infrastructure database, the Fietsersbond database and the OpenCycleMap.

In order to extract the km cycling infrastructure from OSM the entire network needed to be downloaded first and then opened in QuantumGIS[20]. There, all the unnecessary features were removed. Tests performed for downloading and cleaning the entire OSM of Europe or even of one country failed due to the number and length of the segments, most of which were not related to cycling infrastructure. A more efficient approach was preferred: the map at city level was downloaded[21] and the line features were converted to a shapefile[22]. The line features of this shapefile were clipped to the OECD-EC city core[23]. Line features representing (tagged as) cycling infrastructure were selected and their length were summed up. The comparison between the European Cycling Lexicon definitions and the OSM cycling infrastructure tags recorded in Amsterdam is presented in Box 5.

For Amsterdam, the length of the cycling paths in the Fietsersbond database is 579.4 km. In the statistics provided by the city administration, it is 619.4 km. The cycling infrastructure data derived from OSM are presented in Table 4. The data received from the Fietsersbond database are presented in the categories of the European Cycling Lexicon 2016, used also in the countries consultation. While the total length is similar to that obtained from Fietsersbond database, the categories are not comparable: e.g. cycle lanes are 208 km long in OSM while 52.7 km long in Fietsersbond database. A possible explanation – apart from drawing errors – is the difference in defining the two types, as the tagging of cycle lanes and tracks in OSM is inconsistent with the European Cycling Lexicon.

The example of Amsterdam illustrates that the OpenCycleMap can potentially be used to generate overall cycling infrastructure statistics through crowd sourcing. However, the analysis also indicates that without common definitions the OpenCycleMap cannot produce comparable statistics on the types of cycling infrastructure in European countries and cities.

[20] A Free and Open Source Geographic Information System, available from www.qgis.org.
[21] from download.bbbike.org/osm/bbbike.
[22] A shapefile is a vector data format for geographic information system (GIS) software, commonly used for interoperability among GIS software products
[23] Downloaded from http://ec.europa.eu/eurostat/cache/GISCO/geodatafiles/URAU-2011-2014-SH.zip The Administrative Units as found in the Urban Audit 2011-2014 were used (scale 1:100 000). For Amsterdam, we used the boundaries of 'NL001C1' (NL = the Netherlands, 001 = Amsterdam, C = City level, 1 = version number).

BOX 5

COMPARISON OF CYCLING INFRASTRUCTURE FEATURES IN OPENCYCLEMAP AND IN THE EUROPEAN CYCLING LEXICON

OSM makes a difference between cycle lanes and cycle tracks. While the definitions are somehow similar as the one by the European Cycling Lexicon, there are some important differences.
The definitions by OSM are:

- Cycle lane: lies within the roadway itself (on-road)
- Cycle track: is separate from the road (off-road). Tracks are typically separated from the road by e.g. curbs, parking lots, grass verges, trees, etc.

According to the European Cycling Lexicon, the picture on the left is a cycle lane, while the picture on the right is a cycle track.


While the definitions look similar, there is an important mismatch. What is called a cycle track by the European Cycling Lexicon, is partially considered a cycle lane by OSM. The situations below are considered cycle lanes by OSM:




OSM cycle tracks need a more distinct separation like bushes or parking lots in between.
The conclusion is that the OSM numbers for cycle lanes will be higher than expected and the numbers for cycle tracks lower.

TABLE 4

CYCLING INFRASTRUCTURE STATISTICS IN AMSTERDAM ACCORDING TO FIETSERSBOND AND OPENCYCLEMAP

TYPE OF INFRASTRUCTURE	FIETSERSBOND	OPENCYCLEMAP
Cycle track[24]	525 km	366 km › Two-way: 163 km › One-way: 40 km
Cycle street	1.7 km	-
Bus and cycle lane	-	-
Contraflow cycling	-	-
Cycle lane[24]	52.7 km	208 km › Two-way: 24 km › One-way: 160 km
Advisory cycle lane	-	-
Total	579.4 km	574 km

SOURCE

Fietserbond, OpenCycle Map

[24] The categorisation of cycle tracks are different in Fietsersbond and OpenCycleMap.

4.4.3 COMPARISON BETWEEN CYCLING INFRASTRUCTURE STATISTICS FROM THE COUNTRIES CONSULTATION AND DATA DERIVED FROM OSM

To assess the feasibility of using the OpenCycleMap for the extraction of comparable cycling infrastructure statistics in other cities than Amsterdam, a visual screening was performed for the 20 cities providing statistics in the country reports (Appendix J). The criteria used in the visual screening were the number of cycling tracks (i.e. many cycling tracks, cycling tracks, few cycling tracks), their location (spread over the entire city, mostly in the city centre, specific neighbourhoods, mostly parks or green areas), and some apparent inconsistencies (e.g. between the location of cycling tracks and other cycling data infrastructures). The visual screening is consistent with the statistics on cycling infrastructure reported in the country reports, in the sense that cities with a lot of cycling infrastructure reported in the country report, also have an elaborate cycling infrastructure network with many cycling tracks in the entire city. For cities reporting very low km of cycling infrastructure, the OpenCycleMap is also limited. In the middle group (Dublin, Rome and Oslo), the OpenCycleMap may vary between an apparent network of cycling tracks (Oslo) to some concentrations of fragments in some neighbourhoods or parks (Rome)[25].

Since this visual screening of the OpenCycleMap provided an overall consistent image with the country reports, the cycling infrastructure statistics were calculated for six cities, based on the OpenCycleMap. The results are presented in Table 7. The differences are very significant, even in cities appearing to have a complete and consistent map (e.g. Brussels and Prague). The main reason is a systematic problem in the recording of one-way and two-way cycle tracks and lanes, for instance the length of a one-way cycle track on each side of the street may be counted only once or twice. The observed effect on the cycling infrastructure statistics (expressed in km) is so large that no further attempts were made to produce statistics for other cities.

[25] This apparent consistency needs to be interpreted with caution, for Athens the km produced in the country report were derived from OSM. This may be the case for other cities as well.

TABLE 5

SUMMARY OF THE VISUAL SCREENING OF OPENCYCLEMAP IN 20 CITIES PROVIDING CYCLING INFRASTRUCTURE STATISTICS IN THE COUNTRY REPORTS

CITY	CYCLING INFRASTRUCTURE REPORTED IN THE COUNTRY REPORTS (KM)	VISUAL SCREENING OF OPENCYCLEMAP
Amsterdam	579	Many cycling tracks in the entire city
Athens	83	Limited number of cycling tracks, spread over the entire city
Berlin	1,433	Many cycling tracks in the entire city
Brussels	598	Many cycling tracks in the entire city
Bucharest	6	Limited number of cycling tracks, cycling service points are not on streets with cycling tracks
Dublin	170	Limited number of cycling tracks, spread over the entire city, mostly along main roads, in parks and on riverside
Helsinki	1,200	Many cycling tracks in the entire city
Kosice	23	Many cycling tracks in green areas outside the city centre
Ljubljana	225	Cycling tracks in the entire city
Madrid	447	Cycling tracks in the entire city
Oslo	190	Cycling tracks in the entire city
Prague	454	Many cycling tracks in the entire city
Rome	120	Limited number of cycling tracks, mostly on riverside and concentrations of fragments in some neighbourhoods
Sofia	60	Limited number of cycling tracks, spread over the entire city
Stockholm	965	Many cycling tracks in the entire city
Tallinn	212	Cycling tracks in the entire city
Vienna	1,222	Many cycling tracks in the entire city
Vilnius	139	Cycling tracks in the entire city
Zagreb	250	Cycling tracks mostly in the city centre
Zurich	881	Cycling tracks in the entire city

SOURCE

Own elaboration based on countries consultation and OpenCycleMap

TABLE 6

COMPARISON BETWEEN CYCLING INFRASTRUCTURE STATISTICS IN THE COUNTRY REPORTS AND DERIVED FROM OPENCYCLEMAP

CITY	CYCLING INFRASTRUCTURE (KM)		DIFFERENCE[26] (%)
	OPENCYCLEMAP	COUNTRIES CONSULTATION	
Amsterdam	574	579	-0.9%
Berlin	788	1,433	-45.0%
Brussels	366	598	-38.8%
Prague	238	454	-47.6%
Sofia	146	60	+143.3%
Vienna	938	1,222	-23.2%

SOURCE

Own elaboration based on countries consultation and OpenCycleMap

[26] OpenCycleMap in relation to reported values from countries consultation.

5 TASK 4. COMPARATIVE OVERVIEW OF WALKING AND CYCLING USE (IN PKM AND TRIPS) AND RELATED INFRASTRUCTURE (IN KM)

The main purpose of this chapter is to show how feasible it is to produce an overview of walking and cycling use and related infrastructure in Europe, based on data collected at urban and national level. This was done by producing maps of the indicators ‘average daily distance travelled per person’ and ‘average number of trips per day’ for both walking and cycling, based on the statistics compiled in the summary tables of each country report. The analysis was performed in a geodatabase, containing the key statistics found during the country research. A description of the development of the geodatabase based on the country reports, and its full structure, is presented in Appendix I.

5.1 ACTIVE MODES USE OVERVIEW BASED ON COUNTRIES CONSULTATIONS

5.1.1 WALKING DISTANCES AND TRIPS PER DAY

A comparative overview of average distance walked (pkm/day) has been produced for 16 countries. In most cases, the overview was presented for both the country and the capital level but in some cases only for one or the other. The numbers are quite similar throughout Europe; calculating the averages for the mobile population gives higher numbers than for the total population because there is always a part of the surveyed population that didn’t make any trip on the surveyed days.

Table 7, Table 8 and the map representing the average pkm/day walking (Figure 11), show that normal walking behaviour in Europe ranges between 0.5 kilometres per day (CY, IE) and more than 2 kilometres per day (CH, IT, LV, NO). The differences may reflect different walking behaviour (e.g. due to culture, urbanisation level, geography), yet they may also be due to different data collection methods, such as including walking for professional purpose (e.g. mail delivery, tourist guides), or including leisure activities such as hiking.

BOX 6

COUNTRIES PRESENTING HIGH AVERAGE DISTANCES WALKED

Two countries/cities reported high average distances walked and have a large discrepancy between the country average and the city average. Italy reported an average of 3.55 pkm/day while in Rome the reported distance is 1.37 pkm/day, and Zurich reported 3.6 pkm/day while the average for Switzerland is 2.0 pkm/day. In Italy, this could be linked to the fact that waiting times are included in the walking time, so when travel distance is derived from walking time it may be over-estimated. This could eventually be cumulated with the effect of mobile population vs. total population. Another possible reason is the type of trips included; in Switzerland, leisure and professional trips such as mail delivery etc. are included in the survey. The leisure trips could increase the walking distance statistics at country level, and the professional trips the walking distance statistics at city level. This could explain the high scores in the Swiss Mikrozensus Mobilität und Verkehr (Micro census Mobility and Transport, 2010) as opposed to the average scores in other surveys where the same questions are asked in all the countries (see e.g. the Quality of Life survey).

TABLE 7
AVERAGE WALKING PKM PER DAY AT COUNTRY LEVEL

COUNTRY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
BE	1.415	pkm/day	mobile	2010	Belgian Daily Mobility Survey (BELDAM), 2009-2010
CY	0.558	pkm/day	total	2009	Short Distance Passenger Mobility Survey, 2009
DK	0.81	pkm/day	total	2015	Københavns Kommune Bylivsregnskabet, 2015
FI	0.99	pkm/day	total	2010-2011	National Travel Survey (NTS), 2010-2011
FR	0.8	pkm/day	total	2008	Enquête nationale transports et déplacements (ENTD), 2008
DE	1.3	pkm/day	mobile	2008	Mobilität in Deutschland (MiD), 2008
IE	0.56	pkm/day	total	2014	National Travel Survey (NTS), 2014
IT	3.55	pkm/day	total	2015	Survey on mobility behaviour of Italian citizens (AUDIMOB), 2015
LV	2.7	pkm/day	total	2008	Mobility survey of Latvian population, 2008
NL	0.81	pkm/day	total	2015	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	2.2	pkm/day	total	2013-2014	National Travel Survey (RVU), 2013-2014
SE	1.13	pkm/day	total	2011-2015	National Travel Survey (RVU), 2014-2015
CH	2	pkm/day	total	2010	Mikrozensus Mobilität und Verkehr (Micro census Mobility and Transport), 2010
UK	0.79	pkm/day	total	2014	National Travel Survey (only covers England), 2014

SOURCE
Own elaboration based on countries consultation.

TABLE 8
AVERAGE WALKING PKM PER DAY AT COUNTRY LEVEL

COUNTRY	CITY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
BE	Brussels	2.206	pkm/day	mobile	2010	Belgian Daily Mobility Survey (BELDAM), 2009-2010
DK	Copenhagen	1.31	pkm/day	total	2015	Københavns Kommune Bylivsregnskabet, 2015
FI	Helsinki	1.2	pkm/day	total	2010-2011	National Travel Survey (NTS), 2010-2011
FR	Paris	0.9	pkm/day	total	2010	Enquête Globale Transport (EGT), 2010
DE	Berlin	1.5	pkm/day	mobile	2008	Mobilität in Deutschland (MiD), 2008
HU	Budapest	0.266	pkm/day	total	2014	Budapest Transport Model, 2014
IT	Rome	1.37	pkm/day	mobile	2013	Mobility survey in Rome Municipality, 2013
NL	Amsterdam	1.19	pkm/day	total	2013-2015	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	Oslo	1.3	pkm/ weekday	total	2013	Oslo Travel Survey (ORVU), 2013
SI	Ljubljana	0.65	pkm/day	total	2013	Statistical survey on travel behaviour in the Municipality of Ljubljana and the Ljubljana wider urban region, 2013
SE	Stockholm	1	pkm/day	total	2015	Stockholm travel survey report, 2015
CH	Zurich	3.6	pkm/day	total	2010	Mikrozensus Mobilität und Verkehr (Micro census Mobility and Transport), 2010
UK	London	0.4	pkm/day	total	2013-2014	London Travel Demand Survey (LTDS), 2013-2014

SOURCE
Own elaboration based on countries consultation.

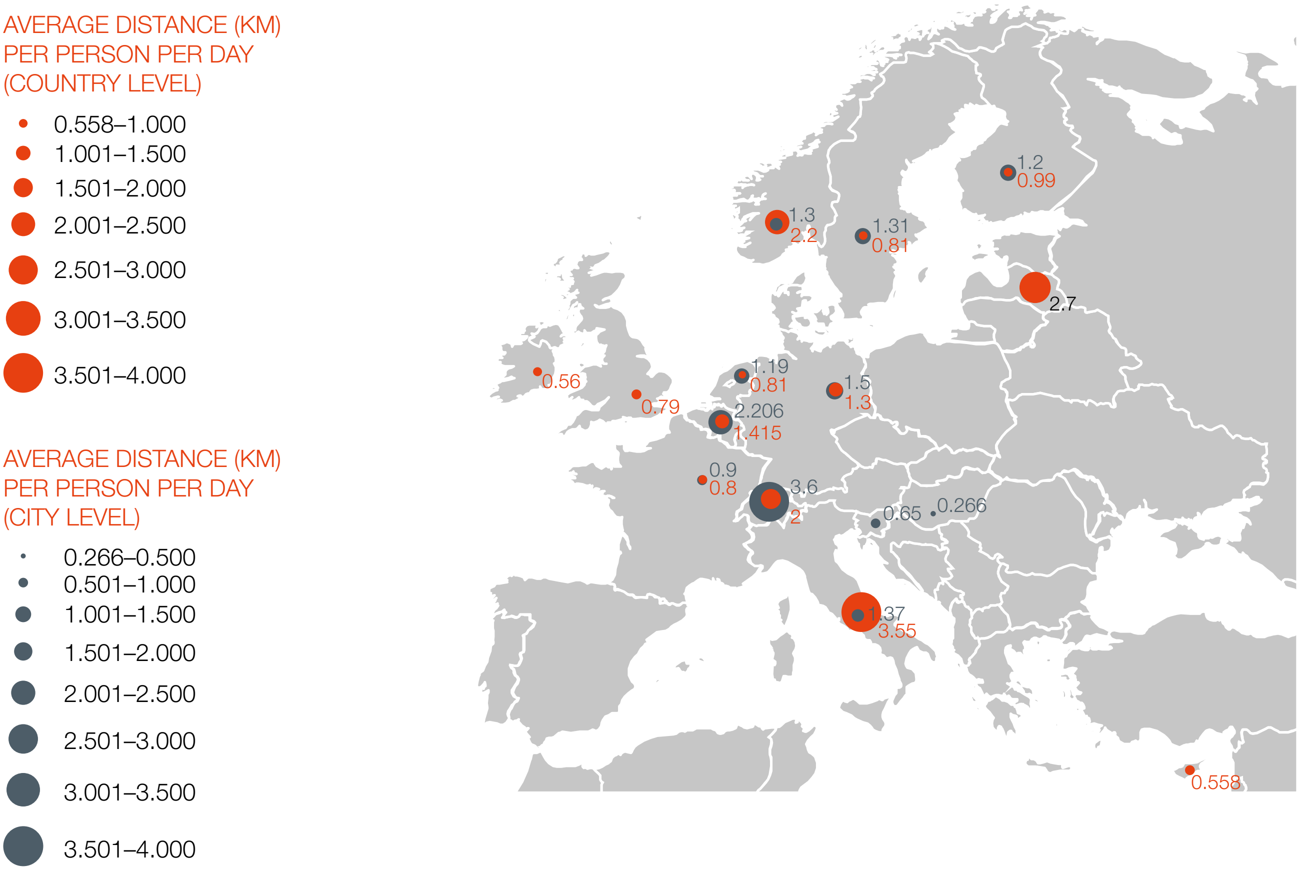
The data indicate that people make more walking trips per day in cities. However, because many countries have the trip data only at country or at capital city level, the European map of average number of walking trips/day is not suited for statistical comparisons.

The reported average numbers of walking trips/day are quite similar across Europe, mostly less than 1, meaning people don't walk every day, except for Slovakia and Italy (Figure 11).

Fifteen countries and cities have statistics on the average number of walking trips per day (Table 9, Table 10), five of them only have data at city level. For the countries having reported both walking distances and trips per day (IE, IT, NL, UK, SE, NO, DK,) there is a high correlation (0.89) between the walking distances and the walking trips. The reported average number of trips per day is generally higher in the city than the average for the country, but overall, the numbers are of a similar magnitude.

FIGURE 11

COMPARATIVE OVERVIEW OF WALKING (IN PKM/DAY) IN COUNTRIES AND CITIES ACROSS EUROPE



SOURCE

Own elaboration based on countries consultation.

TABLE 9

AMOUNT OF AVERAGE WALKING TRIPS/DAY IN 15 COUNTRIES

COUNTRY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
DK	0.88	trips/day/person	unknown	2013	Transportvaneundersøgelsen (TU), 2013
FI	0.61	trips/day/person	total	2010-2011	National Travel Survey (NTS), 2010-2011
DE	0.9	trips/day/person	mobile	2008	Mobilität in Deutschland (MiD), 2008
IE	0.24	trips/day/person	total	2014	National Travel Survey (NTS), 2014
IT	2.19	trips/day/person	total	2015	Survey on mobility behaviour of Italian citizens (AUDIMOB), 2015
NL	0.47	trips/day/person	total	2015	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	0.7	trips/day/person	total	2013-2014	National Travel Survey (RVU), 2013-2014
SK	1.4	trips/day/person	mobile	2015	Transport Mobility Survey, 2015
SE	0.56	trips/day/person	total	2011-2015	National Travel Survey (RVU), 2014-2015
UK	0.55	trips/day/person	total	2014	National Travel Survey (only covers England), 2014
UK	0.55	trips/day/person	total	2014	National Travel Survey (only covers England), 2014

SOURCE

Own elaboration based on countries consultation.

TABLE 10
AVERAGE NUMBER OF WALKING TRIPS PER DAY AT CITY LEVEL

COUNTRY	CITY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
AT	Vienna	1.125	trips/day/ person	unknown	2010-2014	Omnitrend – mobility survey, 2010-2014
FI	Helsinki	0.8	trips/day/ person	total	2015	Helsinki Mobility Habits, 2015
FR	Paris	2.2	trips/day/ person	total	2010	Enquête Globale Transport (EGT), 2010
DE	Berlin	1.0	trips/day/ person	mobile	2008	Mobilität in Deutschland (MiD), 2008
NL	Amsterdam	0.71	trips/day/ person	total	2013	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	Oslo	0.47	trips/ weekday/ person	total	2013	Oslo Travel Survey (ORVU), 2013
PL	Warsaw	0.36	trips/day/ person	total	2015	Warsaw Traffic Study, 2015
SI	Ljubljana	0.97	trips/day/ person	total	2013	Statistical survey on travel behaviour in the Municipality of Ljubljana and the Ljubljana wider urban region, 2013
SE	Stockholm	0.4	trips/day/ person	total	2015	Stockholm travel survey report, 2015
CH	Zurich	3.8	trips/day/ person	mobile	2010	Mikrozensus Mobilität und Verkehr (Micro census Mobility and Transport), 2010
UK	London	1.76	trips/day/ person	total	2014	London Travel Demand Survey (LTDS), 2014

SOURCE
Own elaboration based on countries consultation.

BOX 7
DIFFERENCES IN THE RECORDED WALKING TRIPS PER DAY

The difference in recorded walking trips per day in national statistics can reflect real differences among countries, but they may also be due to differences in the data collection method, such as:
Recorded trips. Countries indicated different recording methods for trips, either all the trip stages were recorded, or only the main mode. When only the main mode is recorded, walking and cycling can be derived (estimated) as part of multimodal trips.

Boundaries used. The boundaries considered for the data collection may be different. This mostly affects urban mobility statistic, where trips can only refer to trips within the core city area, or include a greater urban area. Other possibilities are the inclusion or exclusion of cross-border trips, trips made entirely in another city but in the same country, etc.

Reporting period. Different reporting periods can also influence the accuracy of the number of walking trips recorded. In the survey, the following options were mentioned: trips are recorded on a predefined survey day, a weekday before, 7-day diary, last weekend, other.

Seasonal variations. Some countries carry out the surveys throughout the entire year while others only collect data in a specific period/season of the year.

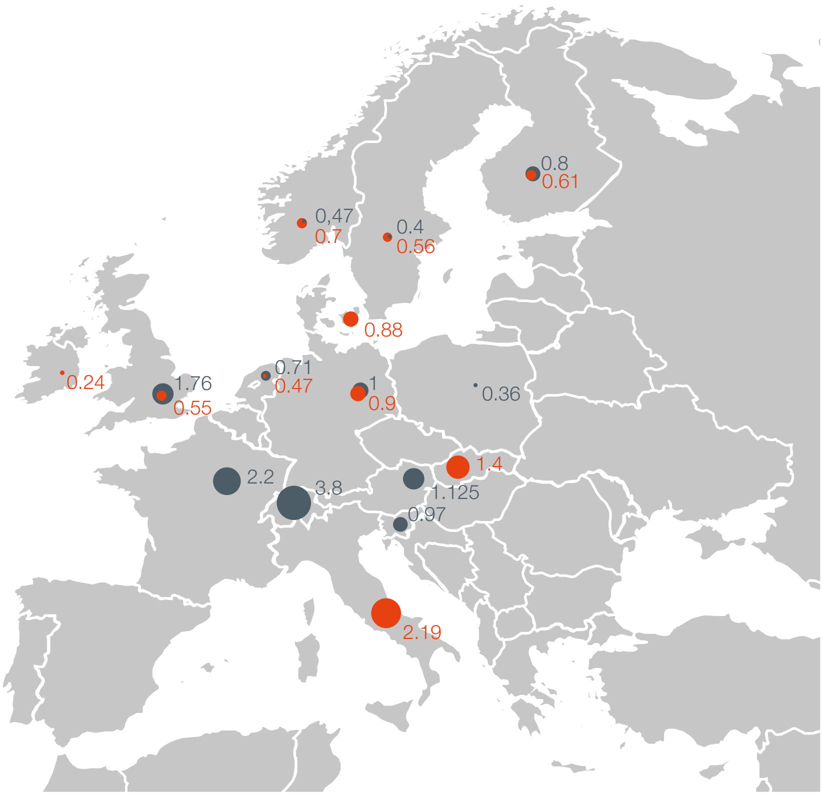
FIGURE 12
COMPARATIVE OVERVIEW OF WALKING (IN TRIPS/DAY) IN COUNTRIES AND CITIES ACROSS EUROPE

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (COUNTRY LEVEL)

- 0.240–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2001–3.000

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (CITY LEVEL)

- 0.360–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2.001–3.000
- 3.001–4.000



SOURCE
Own elaboration based on countries consultation.

5.1.2 CYCLING DISTANCES AND TRIPS PER DAY

The number of countries and cities having cycling statistics (Table 11, Table 12) is comparable to those having walking statistics (Table 9, Table 10).

The main conclusion derived from this comparative overview is that there are cycling statistics, but that the reported average distance cycled per day can be high in countries (LV) and cities (Bratislava) where cycling is traditionally not so common (see also the cycling friendliness rating in Figure 5). The statistics on the number of daily cycling trips have three outliers: Italy, Riga and Bratislava.

One explanation is the different methodology for calculating the average distance per person: total distance cycled divided by the total population or only by the population cycling, when the total kilometres reported are divided by the total population, the average per person is lower, because only a fraction of the population cycles (Table 12).

There was no unique definition of frequency allowing us to identify the percentage of the population that cycles in each country (Table 15). A selection was made from available frequency categories used in each country to produce the overview map presented in Figure 15. This provides a good reflection of the traditional cycling countries in European statistics (see section 5.2, e.g. The Netherlands, Belgium, Germany), but some countries are missing (e.g. Denmark). Because the definitions used across countries and cities vary a lot, these statistics are only used here to help the interpretation of the cycling pkm and trips. The 26% share of the population that cycles found as median from the reported numbers in 15 country reports, is similar to the 29% reported to cycle 'At least once a week' in the Eurobarometer 406[27].

A comparison of Table 15 with the cycling frequency reported in the Eurobarometer 406 (Table 18) shows the importance of clear definitions. When interpreting 'frequently' as 'at least once a day', 12% of the EU28 population cycles frequently. The interpretation of 'frequently' as 'at least a few times a week' (including those cycling at least once a day), brings this number to 29% (12% + 17%). We conclude that in order to derive useful information from the percentage of the population that cycle, it is important to clarify what is the corresponding frequency, so to avoid vague and ambiguous results. Data on cycling frequencies provide more comparable statistics, such as the ones presented in the Eurobarometers 406 and 419, and in the European Health Interview Survey (see sections 5.2.1, 5.2.2 and 5.2.3).

[27] Section 5.4, table 13, sum of EU28 frequencies "at least once a day" and "a few times a week".

TABLE 11
AVERAGE NUMBER OF CYCLING TRIPS PER DAY AT CITY LEVEL

COUNTRY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
AT	0.7	pkm/day	unknown	2011	VCÖ, 2012
BE	0.743	pkm/day	mobile	2010	Belgian Daily Mobility Survey (BELDAM), 2009-2010
CH	0.8	pkm/day	total	2010	Mikrozensus Mobilität und Verkehr (Micro census Mobility and Transport), 2010
CY	0.032	pkm/day	total	2009	Short Distance Passenger Mobility Survey, 2009
DE	1.2	pkm/day	mobile	2008	Mobilität in Deutschland (MiD), 2008
DK	1.6	pkm/day	unknown	2014	Transportvaneundersøgelsen (TU), 2014
FI	0.73	pkm/day	total	2010-2011	National Travel Survey (NTS), 2010-2011
FR	2.8	pkm/day	total	2008	Enquête nationale transports et déplacements (ENTD), 2008
IE	0.2	pkm/day	total	2014	National Travel Survey (NTS), 2014
LV	3.9	pkm/day	total	2008	Mobility survey of Latvian population, 2008
NL	2.55	pkm/day	total	2015	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	5.1	pkm/day	total	2013-2014	National Travel Survey (RVU), 2013-2014
SE	0.6	pkm/day	total	2011-2015	National Travel Survey (RVU), 2014-2015
SK	1.13	pkm/day	mobile	2015	Transport Mobility Survey, 2015
UK	0.25	pkm/day	total	2014	National Travel Survey (only covers England), 2014

SOURCE
Own elaboration based on countries consultation.

TABLE 12
AVERAGE CYCLING DISTANCE PER DAY AT CITY LEVEL

COUNTRY	CITY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
BE	Brussels	0.559	pkm/day	mobile	2010	Belgian Daily Mobility Survey (BELDAM), 2009-2010
CZ	Prague	0.54	pkm/day	unknown	2012	Cyklistická doprava v Praze (Study on cycling in Prague), 2012
DE	Berlin	1.6	pkm/day	mobile	2008	Mobilität in Deutschland (MiD), 2008
DK	Copenhagen	3.4	pkm/day	unknown	2014	Københavns Kommune, 2014
FI	Helsinki	0.66	pkm/day	total	2010-2011	National Travel Survey (NTS), 2010-2011
FR	Paris	0.3	pkm/day	total	2010	Enquête Globale Transport (EGT), 2010
NL	Amsterdam	3.27	pkm/day	total	2013-2015	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	Oslo	4.2	pkm/ weekday	total	2013	Oslo Travel Survey (ORVU), 2013
SE	Stockholm	0.9	pkm/day	total	2015	Stockholm travel survey report, 2015
SI	Ljubljana	1.69	pkm/day	total	2013	Statistical survey on travel behaviour in the Municipality of Ljubljana and the Ljubljana wider urban region, 2013
SK	Kosice	5	pkm/day	mobile	2014	Cycling Survey in Kosice, 2014
UK	London	0.20	pkm/day	total	2013-2014	source unknown

SOURCE
Own elaboration based on countries consultation.

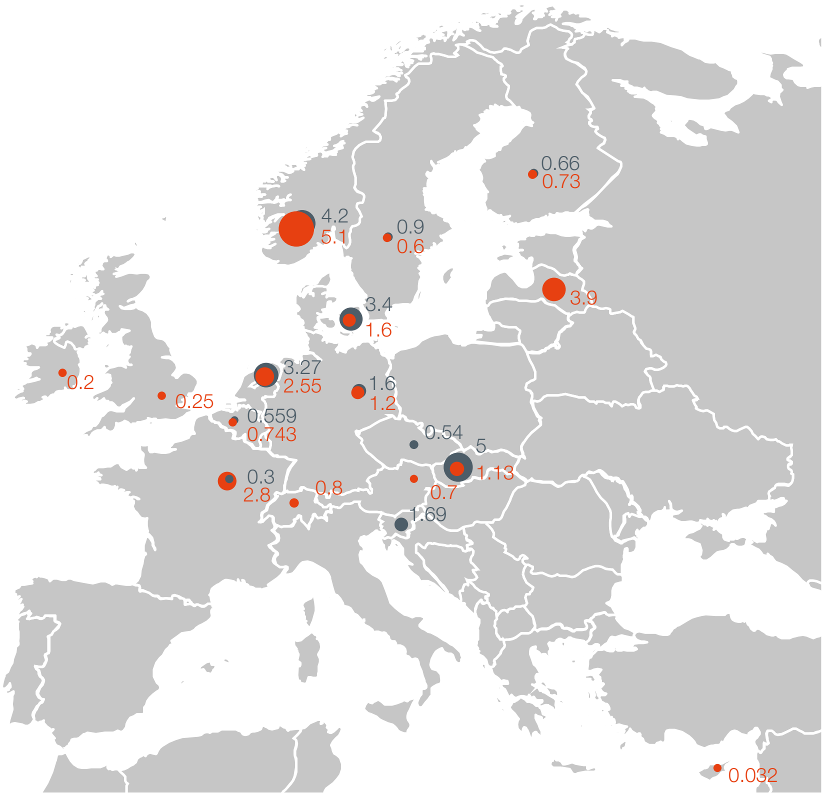
FIGURE 13
COMPARATIVE OVERVIEW OF CYCLING (IN PKM/DAY) IN COUNTRIES AND CITIES ACROSS EUROPE

AVERAGE DISTANCE (KM) PER PERSON PER DAY (COUNTRY LEVEL)

- 0.032–1.000
- 1.001–2.000
- 2.001–3.000
- 3.001–4.000
- 4.001–5.000
- 5.001–6.000

AVERAGE DISTANCE (KM) PER PERSON PER DAY (CITY LEVEL)

- 0.300–1.000
- 1.001–2.000
- 2.001–3.000
- 3.001–4.000
- 4.001–5.000



SOURCE
Own elaboration based on countries consultation.

TABLE 13
AVERAGE NUMBER OF CYCLING TRIPS PER DAY AT COUNTRY LEVEL

COUNTRY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
DE	0.4	trips/day/person	mobile	2008	Mobilität in Deutschland (MiD), 2008
DK	0.46	trips/day/person	unknown	2014	Transportvaneundersøgelsen (TU), 2014
FI	0.24	trips/day/person	total	2010-2011	National Travel Survey (NTS), 2010-2011
IE	0.02	trips/day/person	total	2014	National Travel Survey (NTS), 2014
IT	2.28	trips/day/person	total	2015	Survey on mobility behaviour of Italian citizens (AUDIMOB), 2015
NL	0.72	trips/day/person	total	2015	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	0.15	trips/day/person	total	2013-2014	National Travel Survey (RVU), 2013-2014
SE	0.2	trips/day/person	total	2011-2015	National Travel Survey (RVU), 2014-2015
SK	0.2	trips/day/person	mobile	2015	Transport Mobility Survey, 2015
UK	0.05	trips/day/person	total	2014	National Travel Survey (only covers England), 2014

SOURCE
Own elaboration based on countries consultation.

TABLE 14

AVERAGE NUMBER OF CYCLING TRIPS PER DAY AT CITY LEVEL

COUNTRY	CITY	AVERAGE	UNIT	REFERENCE POPULATION	REFERENCE YEAR	SOURCE
FI	Helsinki	0.3	trips/day/ person	total	2015	Helsinki Mobility Habits, 2015
FR	Paris	0.12	trips/day/ person	total	2010	Enquête Globale Transport (EGT), 2010
DE	Berlin	0.4	trips/day/ person	mobile	2008	Mobilität in Deutschland (MiD), 2008
LT	Vilnius	2.9	trips/day/ person	total	2011	Vilnius City Bicycle Paths Special Plan, 2011
NL	Amsterdam	0.85	trips/day/ person	total	2013-2015	Onderzoek Verplaatsingen in Nederland (OVIN), 2015
NO	Oslo	0.21	trips/ weekday/ person	total	2013	Oslo Travel Survey (ORVU), 2013
PL	Warsaw	0.1	trips/day/ person	total	2015	Warsaw Traffic Study, 2015
SK	Kosice	2	trips/day/ person	mobile	2014	Cycling Survey in Kosice, 2014
SI	Ljubljana	0.31	trips/day/ person	total	2013	Statistical survey on travel behaviour in the Municipality of Ljubljana and the Ljubljana wider urban region, 2013
SE	Stockholm	0.3	trips/day/ person	total	2015	Stockholm travel survey report, 2015
UK	London	1.15	trips/day/ person	total	2014	London Travel Demand Survey (LTDS), 2014

FIGURE 14

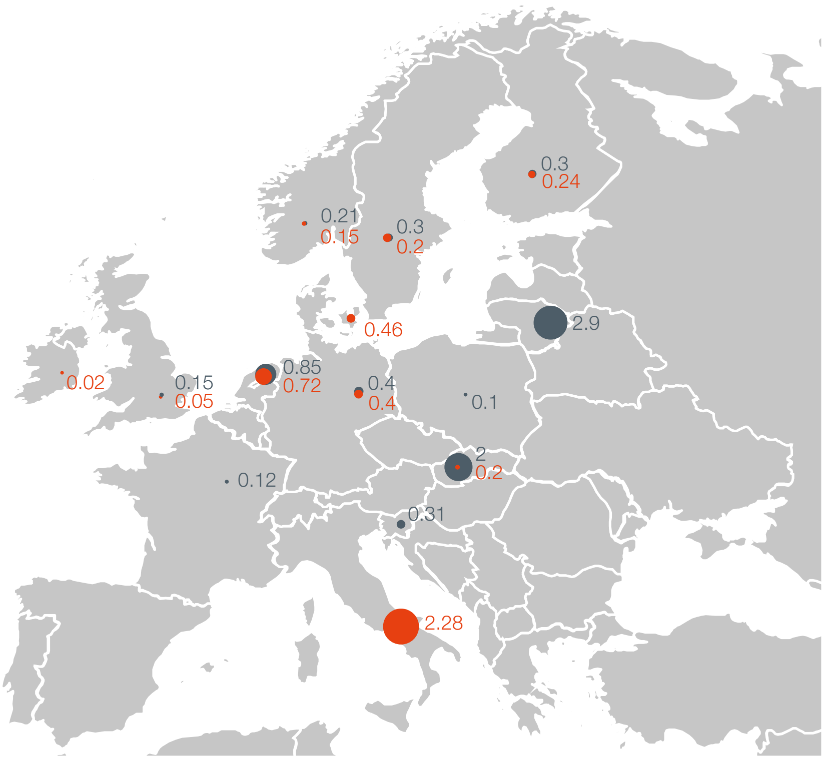
COMPARATIVE OVERVIEW OF CYCLING (IN TRIPS/DAY) IN COUNTRIES AND CITIES ACROSS EUROPE

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (COUNTRY LEVEL)

- 0.020–0.250
- 0.251–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2.001–3.000

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (CITY LEVEL)

- 0.100–0.250
- 0.251–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2.001–3.000



SOURCES

Own elaboration based on countries consultation.

TABLE 15
PERCENTAGE OF THE POPULATION CYCLING IN EUROPEAN COUNTRIES

COUNTRY	% POPULATION CYCLING	DEFINITION OF FREQUENCY	SOURCE
AT	24	at least once a week	VCÖ, 2012
BE	61	at least one day per year	Belgian Daily Mobility Survey (BELDAM), 2009-2010
CY	18	contrary to 82% that never cycle	Eurobarometer, 2013
DE	63	definition unknown	National aeronautics and space research centre of the Federal Republic of Germany (DLR), year unknown
HU	65	contrary to 35% that never cycle	Eurobarometer, 2013
IT	5	definition unknown	Survey on mobility behaviour of Italian citizens (AUDIMOB), 2015
LU	60	cycled in the past year	Sondage Mobilité Douce du MDDI, 2014
MT	0.1	definition unknown	Bicycle Advocacy Group (BAG), year unknown
NL	87	contrary to 13% that never cycle	Eurobarometer, 2013
PL	55	contrary to 45% that never cycle	Pilot study on the mobility behaviour of the population in Poland, 2015
RO	13	a few times a week	Eurobarometer, 2013
SK	7	definition unknown	Transport Mobility Survey, 2015
ES	27	at least once a week	Spanish Bicycle Barometer, 2015
SE	9	on an average day	National Travel Survey (RVU), 2014-2015
UK	26	at least once a month	National Travel Survey (only covers England), 2014

SOURCE
Own elaboration based on countries consultation.

TABLE 16
PERCENTAGE OF THE POPULATION CYCLING IN EUROPEAN CITIES

COUNTRY	CITY	% POPULATION CYCLING	DEFINITION OF FREQUENCY	SOURCE
AT	Vienna	21	at least once a week	VCÖ, 2012
BE	Brussels	14	at least once a week	Belgian Daily Mobility Survey (BELDAM), 2009-2010
DE	Berlin	61	definition unknown	National aeronautics and space research centre of the Federal Republic of Germany (DLR), year unknown
HU	Budapest	28	at least once in two weeks	Budapest transport model survey, 2015
IT	Rome	1	definition unknown	Mobility survey in Rome Municipality, 2013
LV	Riga	8	definition unknown	PTP-Cycle, 2015
SI	Ljubljana	13	definition unknown	Traffic counts for cycling, 2016
SE	Stockholm	17	September	Stokholms stad - Miljön i Stockholm, 2015
CH	Zurich	51	at least once a month	Mikrozensus Mobilität und Verkehr (Micro census Mobility and Transport), 2010
UK	London	3	definition unknown	London Travel Demand Survey (LTDS), 2014

SOURCE
Own elaboration based on countries consultation.

BOX 8

BIAS DUE TO SMALL PERCENTAGE OF PEOPLE CYCLING

In countries and cities where only a small percentage of the population cycles, the statistics on average daily distances cycled and numbers of cycling trips per day, are more likely to be outliers compared to the values in countries with a lot of cycling activity. For example, in Italy, on average only 5% of the population cycles, and 2.28 cycling trips per day are reported, which is three times more than 0.72 cycling trips per day reported in The Netherlands. In Slovakia, with 7% of the population cycling (and no clear definition of how this is calculated), the 1.13 km cycled per day refer to the mobile population only, so they are even less comparable to countries with statistics referring to the total population such as The Netherlands.

FIGURE 15

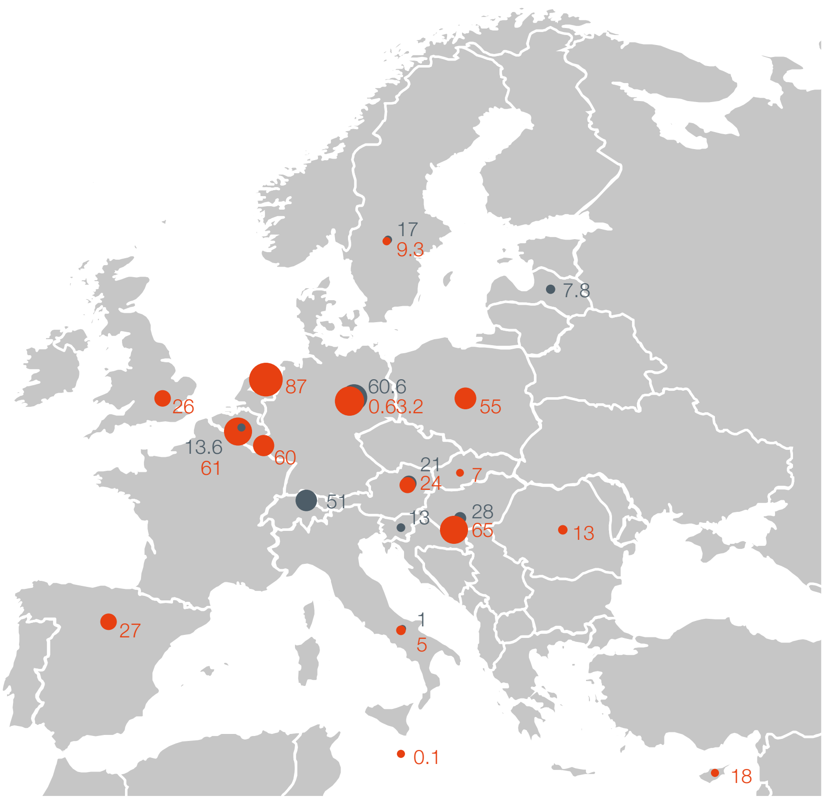
SHARE (PERCENTAGE) OF THE POPULATION CYCLING IN THE COUNTRY/CITY

CYCLING POPULATION IN THE COUNTRY (%)

- 0%–20%
- 21%–40%
- 41%–60%
- 61%–80%
- 81%–100%

CYCLING POPULATION IN THE CITY (%)

- 0%–20%
- 21%–40%
- 41%–60%
- 61%–80%
- 81%–100%



SOURCE

Own elaboration based on countries consultation.

5.1.3 CALCULATION OF MODAL SPLIT IN EUROPE

The daily walking and cycling distances and trips per country gathered during the countries consultation (sections 5.1 and 5.2) were used to calculate overall European indicators of active modes use. Due to the strong effect of outliers when calculating an average, the median was preferred to have a more robust indicator for Europe.

BOX 9

EUROPEAN INDICATOR OF ACTIVE MODES USE

Median daily walking distance per person in Europe (based on 14 countries): 1.06 pkm/day

Median daily cycling distance per person in Europe (based on 15 countries): 0.80 pkm/day

Median walking trips / day in Europe (based on 10 countries): 0.66 trips/day

Median cycling trips / day in Europe (based on 10 countries): 0.22 trips/day

Median share of the population cycling in (based on 15 countries): 26 %

These numbers are only **indicative estimates**, since they are based on a set of non-harmonised data without full coverage of the European Member States.

When generalising these numbers on a yearly basis to the European Union as a whole (daily pkm x 365 x 500 million European citizens), the total performance of the active modes can be roughly estimated as:

BOX 10

ANNUAL PERFORMANCE OF ACTIVE MODES IN THE EU

Km walked per year in Europe: 193 billion person – kilometres

Km cycled per year in Europe: 146 billion person – kilometres

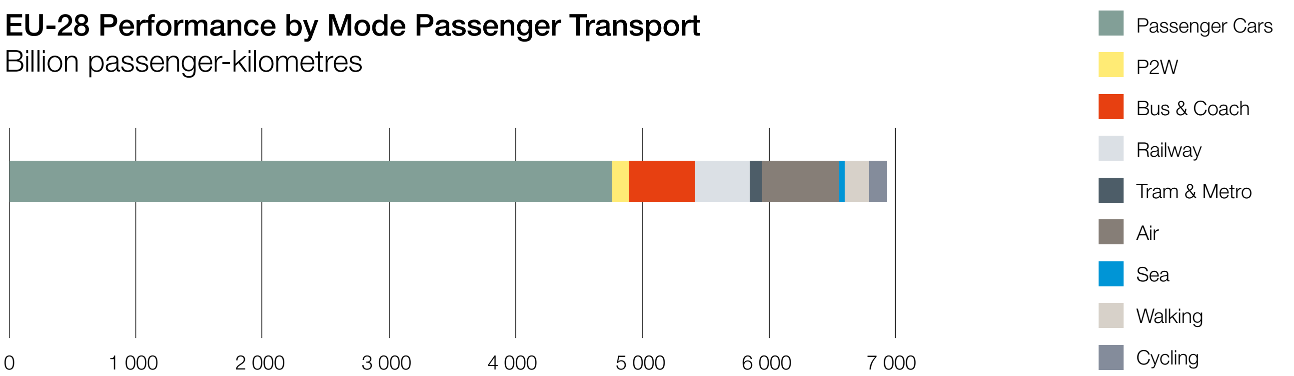
This first estimate of walking and cycling was then compared with the performance of other modes as presented in Figure 16. The statistics for the other modes of transport was based on the data published in the Statistical Pocketbook 2016 – EU Transport in Figures (passenger-km for base year 2014)[28]. Based on this rough estimate, active modes would represent around 4.89% of the overall passenger km.

[28] EU Transport in Figures 2016, chapter 2.3: http://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2016_en.htm

FIGURE 16

EU28 PERFORMANCE BY MODE, INCLUDING WALKING AND CYCLING

	PASSENGER CARS	P2W[29]	BUS & COUCH	RAILWAY	TEAM & METRO	AIR	SEA	WALKING	CYCLING	TOTAL
Billion passenger-kilometres	4,766	127	526	428	102	605	38	193	146	6,931
%	68.77	1.84	7.58	6.18	1.47	8.73	0.55	2.78	2.11	100



[29] P2W stands for powered two-wheelers (e.g. motorcycles and mopeds).

SOURCE

Own elaboration based on countries consultation and DG MOVE “EU Transport in Figures” 2016

5.2 ACTIVE MODES USE COMPARISON WITH EU STATISTICS

5.2.1 ATTITUDES OF EUROPEANS TOWARDS URBAN MOBILITY (SPECIAL EUROBAROMETER 406)

Walking and cycling frequencies from the Special Eurobarometer 406 are presented in Table 17 and Table 18, respectively. According to these statistics, almost 70% of Europeans walk every day. The highest numbers are reported in Eastern European countries, the lowest are in Cyprus, the Netherlands and Belgium.

TABLE 17
WALKING FREQUENCY IN THE EU28 COUNTRIES, IN % OF THE POPULATION

COUNTRY	AT LEAST ONCE A DAY	A FEW TIMES A WEEK	A FEW TIMES A MONTH OR LESS OFTEN	NEVER	DON'T KNOW
AT	66	24	9	1	0
BE	48	27	18	7	0
BG	84	10	4	1	1
CY	35	25	15	25	0
CZ	82	12	6	0	0
DE	68	21	8	2	1
DK	61	29	7	2	1
EE	83	10	5	2	0
EL	60	28	12	0	0
ES	78	12	5	4	1
FI	71	21	6	2	0
FR	64	22	9	5	0
HR	69	18	10	3	0
HU	74	15	7	4	0
IE	59	27	6	8	0
IT	56	22	12	9	1
LT	75	18	5	2	0
LU	56	27	11	6	0
LV	90	7	2	1	0
MT	57	23	10	10	0
NL	42	35	16	7	0
PL	85	11	3	1	0
PT	78	13	5	4	0
RO	81	11	5	2	1
SE	60	31	8	1	0
SI	56	27	14	3	0
SK	86	8	5	1	0
UK	67	21	8	4	0
EU28	68	19	9	4	0

SOURCE
Eurobarometer 406, 2013.

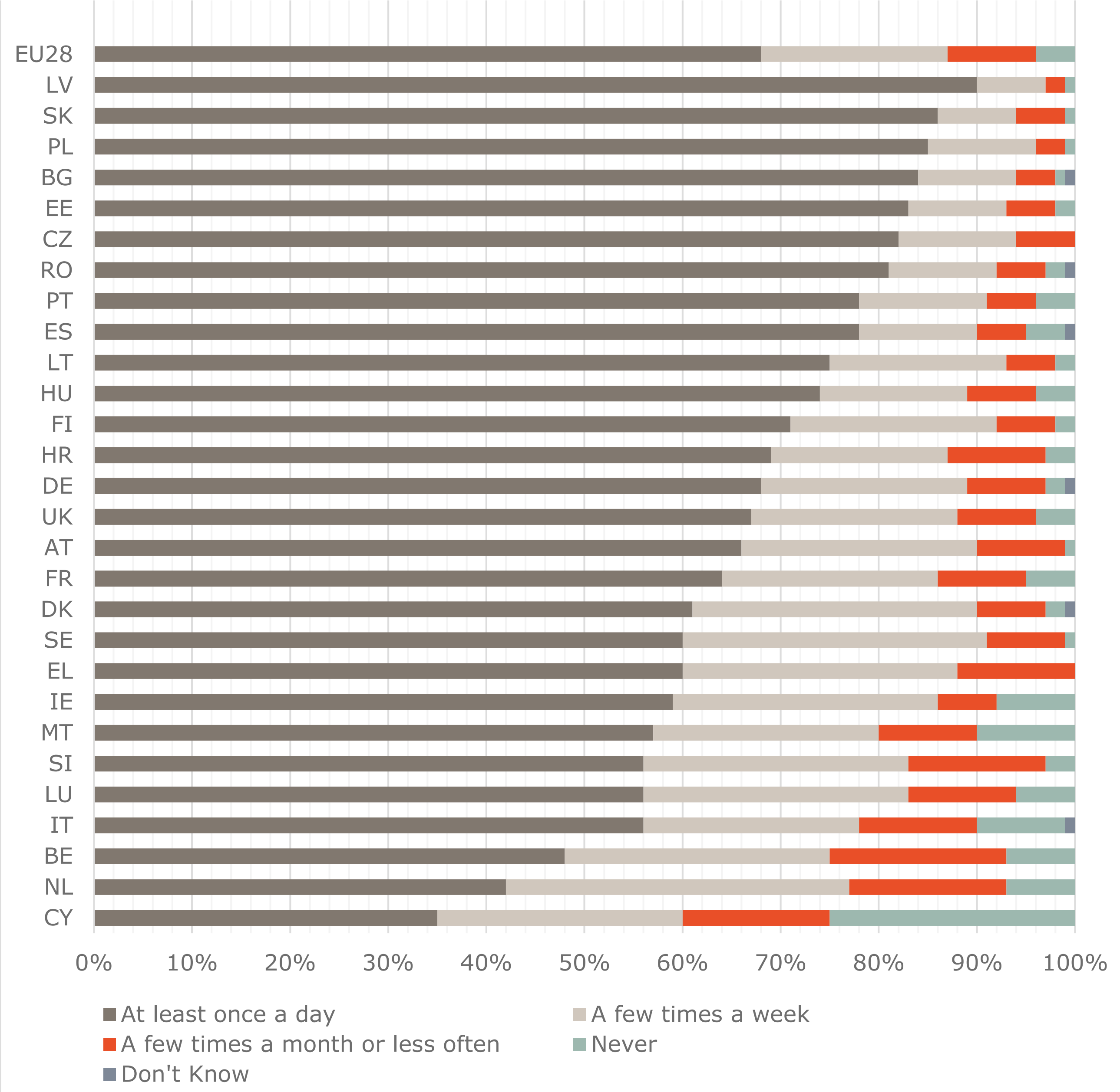
The ranking of countries according to walking and cycling frequencies from the Eurobarometer 406 are similar to the walking and cycling distances and trips produced from the country reports. More than half of the population walks daily, except for Cyprus, Belgium and The Netherlands. In Eastern European countries, people walk more frequently, yet cycle less.

Because most people walk every day or at least a few times a week, more detailed data on the daily walking (as presented in section 5.1.1) could help to better understand the active modes in different countries. However, as already discussed, there are too many differences among national travel surveys in the way walking is reported to produce comparable statistics at this level of detail.

For cycling, there is more variation among countries in terms of cycling frequency than for walking. This makes it possible to rank countries by 'how much people cycle' based on the Eurobarometer 406 classification. The average daily cycling trips and distances (as presented in section 5.1.2) are much more influenced by the share of the population that cycles, which makes it harder to compare the statistics among countries.

A comparison of the cycling frequency map derived from the Eurobarometer with the number of trips/day of the comparative overview is hardly possible, considering the different time reference and the low number of countries providing these cycling statistics.

FIGURE 17
WALKING FREQUENCY IN THE EU28 COUNTRIES



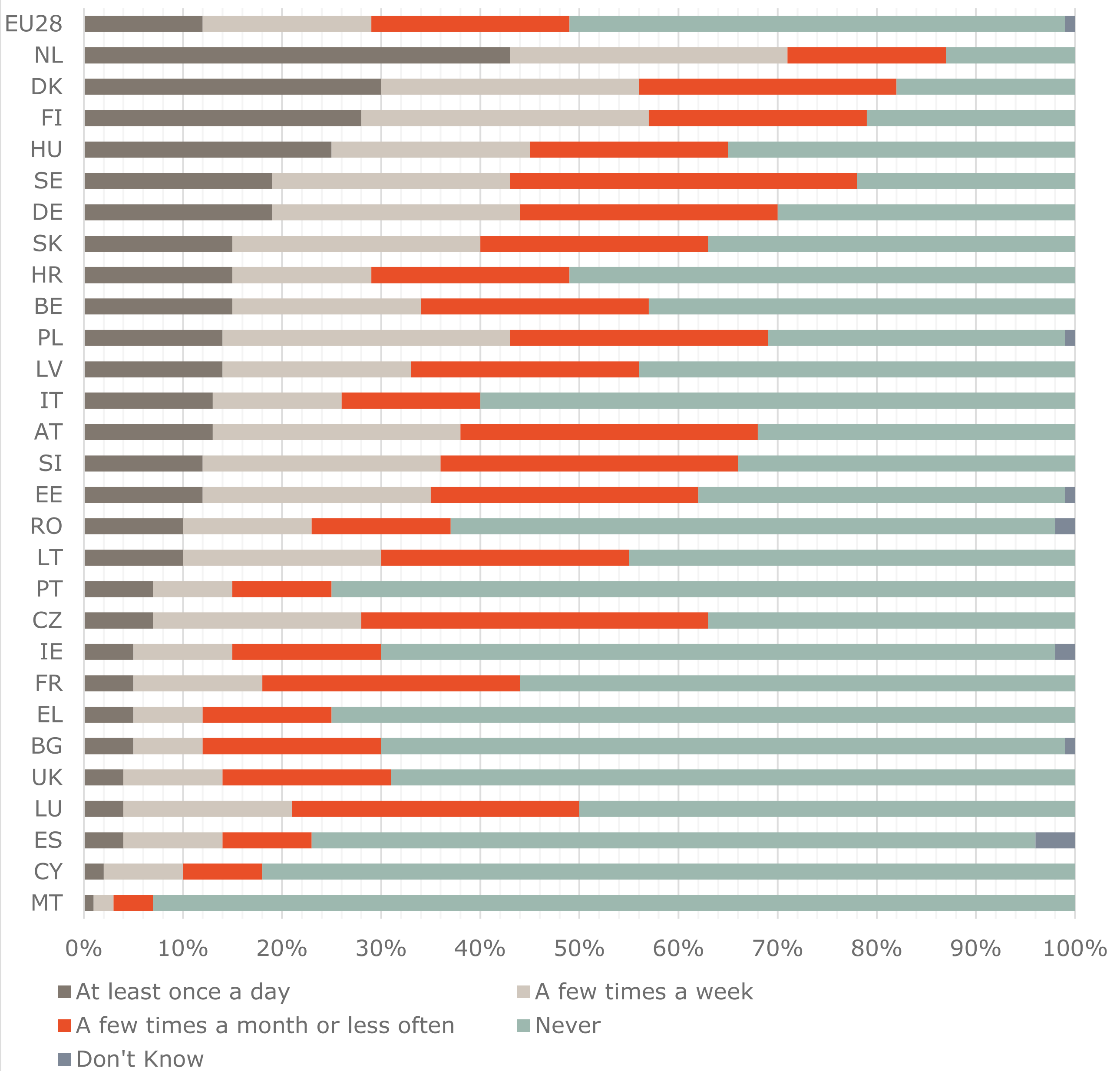
SOURCE
Eurobarometer 406, 2013.

TABLE 18
CYCLING FREQUENCY IN THE EU28 COUNTRIES, IN % OF THE POPULATION

COUNTRY	AT LEAST ONCE A DAY	A FEW TIMES A WEEK	A FEW TIMES A MONTH OR LESS OFTEN	NEVER	DON'T KNOW
AT	13	25	30	32	0
BE	15	19	23	43	0
BG	5	7	18	69	1
CY	2	8	8	82	0
CZ	7	21	35	37	0
DE	19	25	26	30	0
DK	30	26	26	18	0
EE	12	23	27	37	0
EL	5	7	14	75	0
ES	4	10	8	73	4
FI	28	29	23	21	0
FR	5	13	26	56	0
HR	15	14	20	51	0
HU	25	20	20	35	0
IE	5	10	15	68	1
IT	13	13	14	60	0
LT	10	20	26	45	0
LU	4	17	30	50	0
LV	14	19	23	44	0
MT	1	2	5	93	0
NL	43	28	16	13	0
PL	14	29	26	30	1
PT	7	8	11	75	0
RO	10	13	14	61	1
SE	19	24	35	22	0
SI	12	24	30	34	0
SK	15	25	23	37	0
UK	4	10	17	69	0
EU28	12	17	20	50	1

SOURCE
Eurobarometer 406, 2013.

FIGURE 18
CYCLING FREQUENCY IN THE EU28 COUNTRIES



SOURCE
Eurobarometer 406, 2013.

5.2.2 THE EUROPEAN HEALTH INTERVIEW SURVEYS

The European Health Interview Surveys are foreseen to run every 5 years. EHIS 2 was held in 2014. Eurostat provided the following indicators:

- Percentage distribution of persons aged 15 or over according to the number of days spent on walking to get to and from places;
- Percentage distribution of persons aged 15 or over according to the number of days spent on cycling to get to and from places;
- Average number of minutes per week per inhabitant spent on walking or cycling to get to and from places (all population aged 15 or over).

These indicators were added to the geodatabase, to produce comparative overview maps (Appendix K.2), evidencing that people spend more time walking than cycling. These walking statistics show major differences among countries, with as top: Estonia, scoring more than 8 hours (511 minutes) of active modes use per week. Latvia follows with about 6.5 hours per week, 6 countries report more than 5 hours per week: the Czech Republic, Bulgaria, Romania, Sweden, and Luxembourg. Cyprus score extremely low with 23 minutes of walking per week, which seems unrealistic. In Portugal, Malta, France and the UK, people walk less than 2.5 hours per week. Typical cycling countries (The Netherlands, Belgium) and some of the outliers identified in the country statistics (Italy) were not available.

TABLE 19

AVERAGE NUMBER OF MINUTES PER WEEK PER INHABITANT SPENT ON WALKING OR CYCLING TO GET TO AND FROM PLACES (ALL POPULATION AGED 15 OR OVER)[30]

COUNTRY	WALKING			CYCLING		
	WOMEN	MEN	TOTAL	WOMEN	MEN	TOTAL
AT	179	190	184	40	55	47
BG	309	382	343	7	34	20
CY	20	26	23	1	6	3
CZ	325	306	316	48	75	61
DE	179	181	180	39	54	46
DK	177	169	173	69	73	71
EE	448	425	438	48	81	63
EL	181	234	206	9	18	13
ES	214	251	232	8	29	18
FI	186	173	180	34	38	36
FR	134	168	150	9	25	16
HR	211	240	225	37	54	45
HU	212	239	225	55	78	66
LT	214	198	207	26	44	34
LU	283	303	293	9	36	22
LV	352	376	363	32	49	40
MT	128	168	148	2	11	6
PL	234	261	246	32	46	38
PT	120	158	138	3	16	9
RO	302	371	335	10	43	26
SE	284	304	294	40	46	43
SI	199	233	215	39	69	54
SK	261	262	262	39	66	52
UK	146	160	152	6	20	13

[30] This average is calculated over the entire population older than 15 years old (i.e. neither the mobile population, nor the entire population).

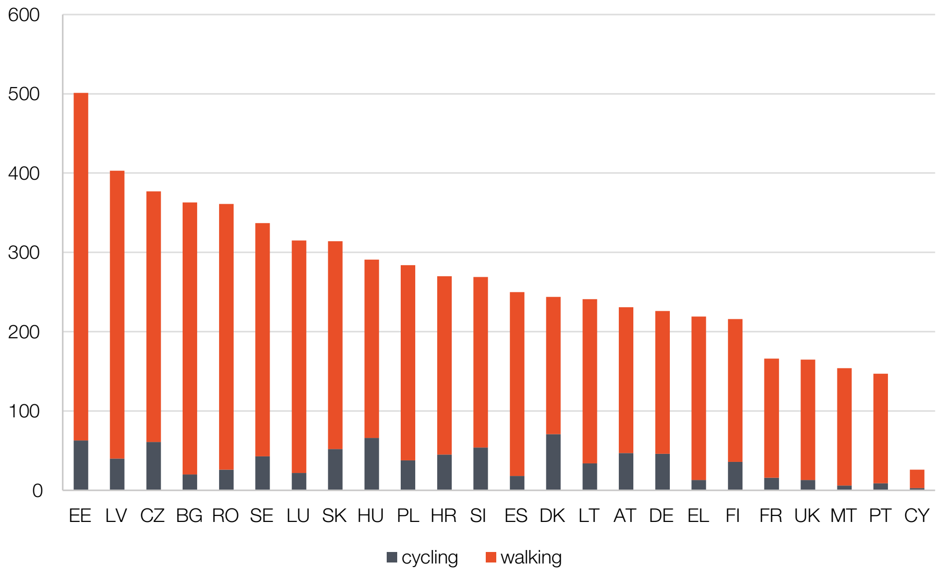
SOURCE

Eurobarometer 406, 2013.

A comparison between the EHIS walking times and the average walking distance travelled per day compiled in the overview in section 5.1.1 (Table 7, Table 10) is limited because most countries seem to have either the walking distance statistics or the walking time statistics. In countries where both are available, the results are very different. An example: for Finland 3 hours a week walking is an average of 0.43 hours a day. With an average distance of 0.99 km/day, this would mean a walking speed of 2.3 km/h; while for Lithuania 3.44 hour a week walking is an average of 0.49 hours a day. With an average distance of 2.7 km/day, this would mean a walking speed of 5.5 km/h. We conclude that walking distances in country statistics are insufficiently harmonised insufficient to compare average walking distances per person per day.

FIGURE 19

COMPARATIVE OVERVIEW OF ACTIVE MODES USE IN EUROPE IN MINUTES PER WEEK PER INHABITANT SPENT ON WALKING OR CYCLING TO GET TO AND FROM PLACES (ALL POPULATION AGED 15 OR OVER)

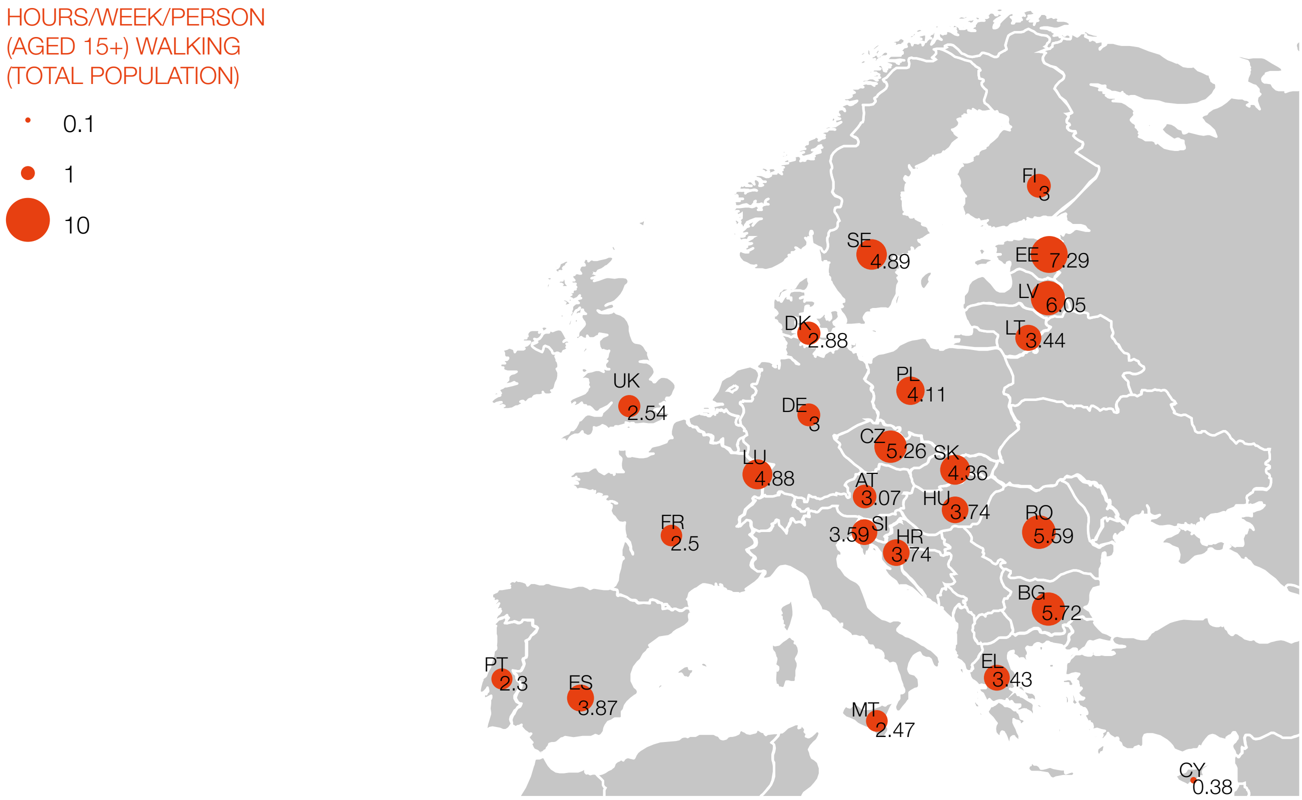


SOURCE

European Health Interview Surveys, 2014.

FIGURE 20

NUMBER OF HOURS PER WEEK PER PERSON SPENT ON WALKING IN EU COUNTRIES



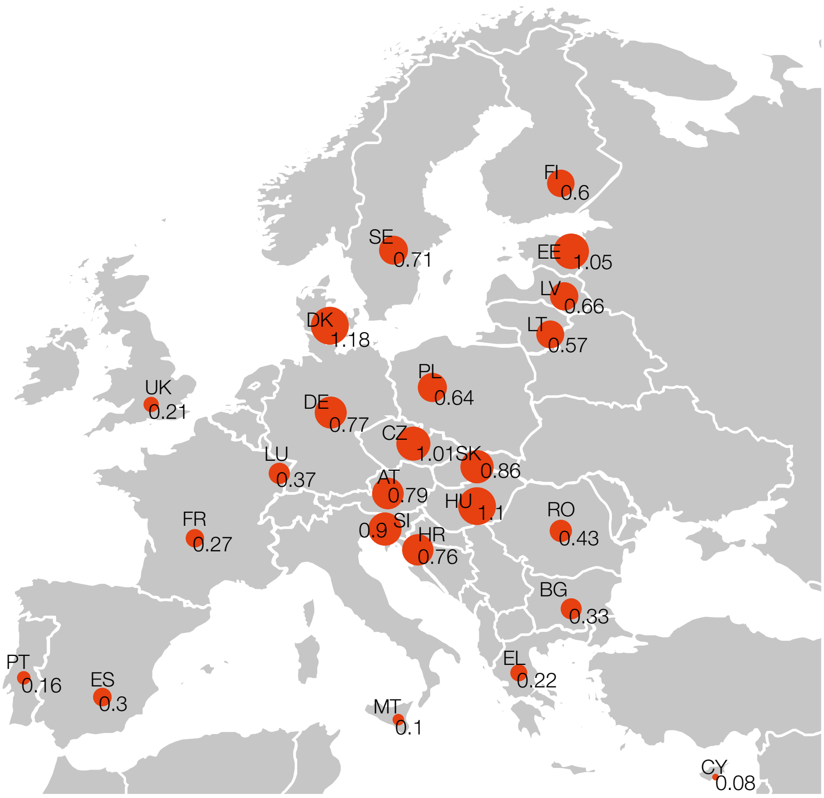
SOURCE

European Health Interview Surveys, 2014.

FIGURE 21
NUMBER OF HOURS PER WEEK PER PERSON SPENT ON CYCLING IN EU COUNTRIES

HOURS/WEEK/PERSON (AGED 15+) CYCLING (TOTAL POPULATION)

- 0.1
- 0.5
- 1



SOURCE
European Health Interview Surveys, 2014.

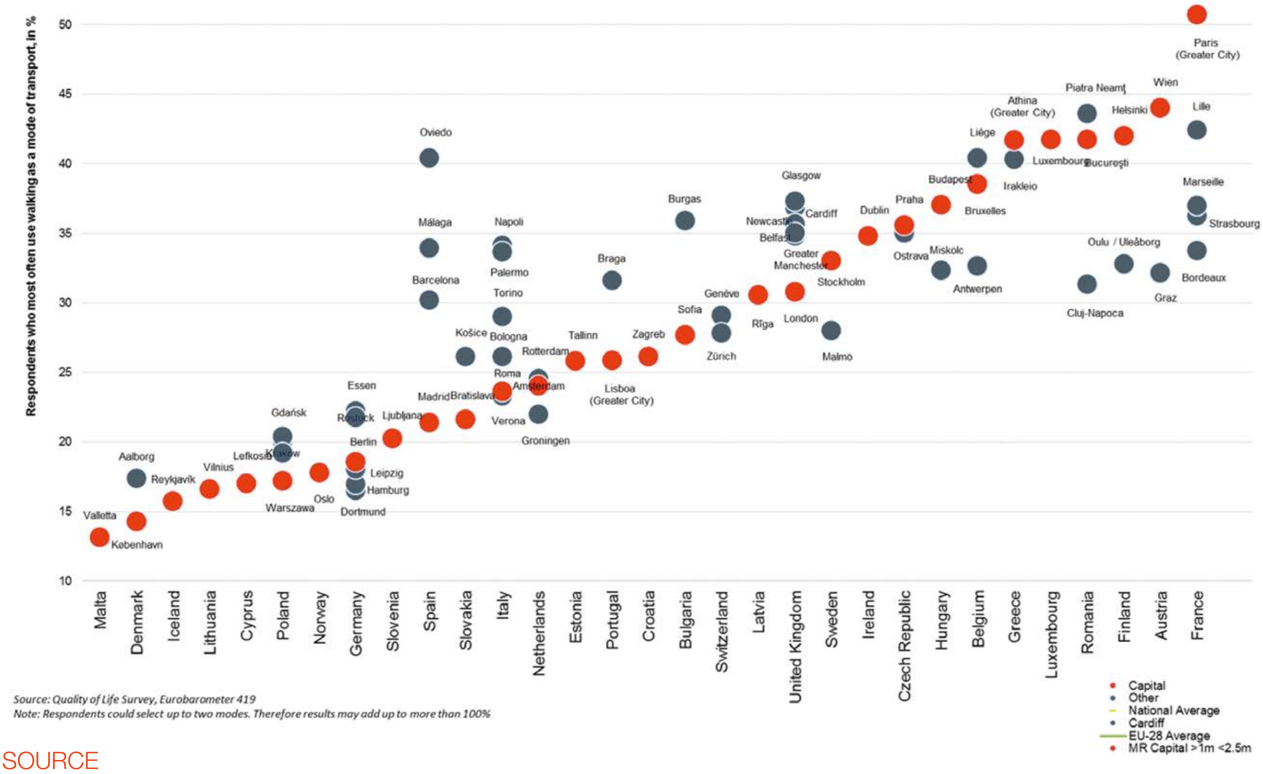
5.2.3 QUALITY OF LIFE IN CITIES (EUROBAROMETER 419)

The "Perception of Quality of Life in European Cities", is a survey conducted every three years since 2004. More than 40,000 people were interviewed in 79 cities and in four greater cities. People rated the quality of services and were also asked which mode of transport they use most frequently (Flash Eurobarometer 419, 2015). The resulting statistics on walking as main mode gives a comparative overview of cycling and walking in European cities including all the capitals of the 30 countries consulted in this study. The highest scores for walking are cities in France, Austria, Finland, Romania, Luxembourg and Greece. This is remarkable, because France has one of the lowest scores in the EHIS active modes statistics (Table 19) and an average score in walking frequency in the Eurobarometer 406 statistics (Table 17, Table 18). Apart from the methodological differences, this might suggest that there are major differences in terms of walking in the country and in the city: e.g. in France, people walk much more in cities. There are also major differences between cities within the same countries: in Paris walking is the main mode for 50% of the trips, while in Bordeaux, Strasbourg and Marseilles it is around 35%. Similarly, Vienna scores much higher than Graz and Helsinki much higher than Oulu. In Italy, Rome scores lower than other cities. We conclude that the capital is not always representative of the urban active modes use in a country.

In the cycling statistics, the range is much larger, from 0% as main mode of transport in Malta to more than 70% in Groningen. Although cycling scores very high in all the cities in The Netherlands and in Denmark, there are still considerable differences among cities. These differences among cities are noticed in other countries as well, e.g. in Belgium, only about 8% of the people use cycling as main mode of transport in Brussels, as opposed to 40% in Antwerp. Similarly, Graz scores more than 40%, while Vienna scores less than 15%. We conclude that active modes use is very much related to city characteristics.

FIGURE 22

Walking as main mode in European cities

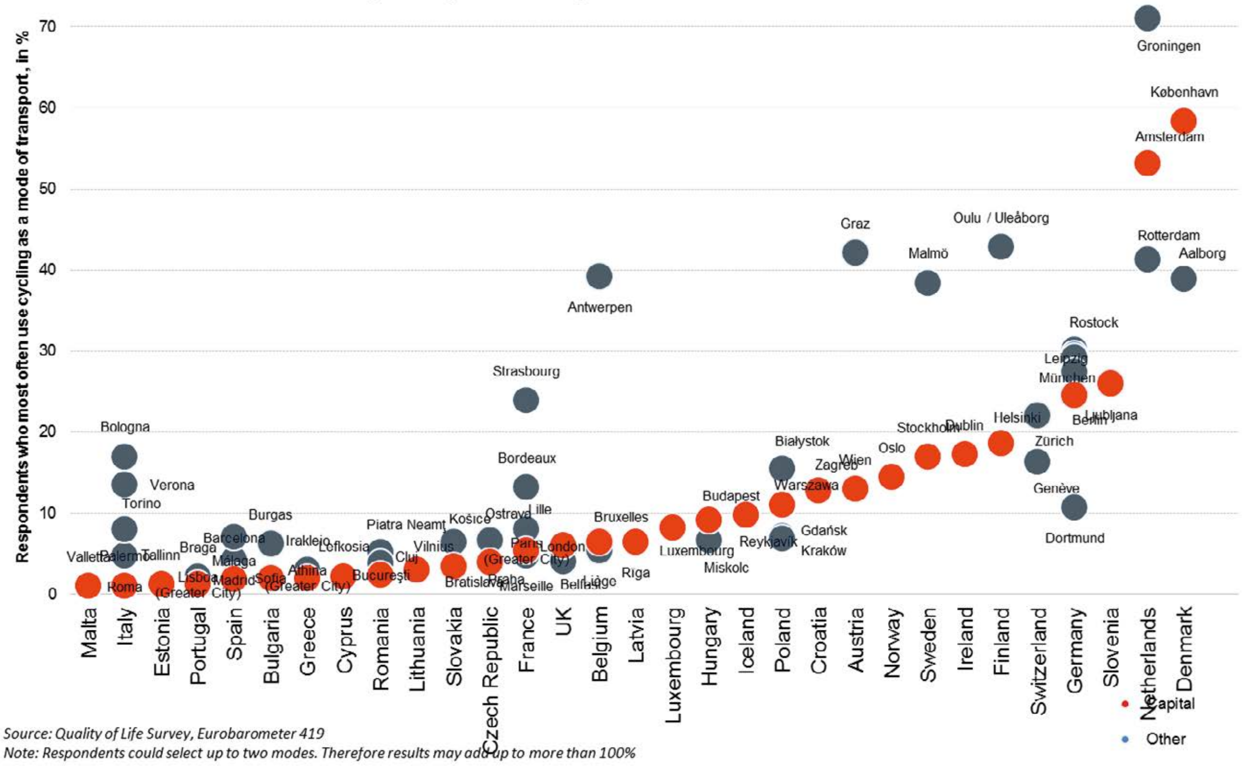


SOURCE

Eurobarometer 419, 2015.

FIGURE 23

Cycling as main mode in European cities



SOURCE

Eurobarometer 419, 2015.

TABLE 20
Cycling infrastructure statistics available at country level

COUNTRY	CYCLE TRACK (KM)	CYCLE STREET (KM)	BUS AND CYCLE LANE (KM)	CONTRAFLOW CYCLING (KM)	CYCLE LANE (KM)	ADVISORY CYCLE LANE (KM)	TOTAL[31] (KM)
AU							13,707
DK							4,200
EE							632
DE							60,000
EL	305	13	0	0	54	0	381
HU	1,035	0	336	0	71	0	N/A
LT							897
LU							612
MT	8		3		7		N/A
NL	30,203	181	0		6,554	0	36,938
PL	626			45		48	2,610
SI							919
SE							19,000

[31] This column refers to the total length reported and they are not necessarily the sum of the different types of infrastructure. This is an indication that different categorisations are used in the country statistics for some types of cycling infrastructure.

SOURCE
Own elaboration based on countries consultation

5.3 ACTIVE MODES INFRASTRUCTURE OVERVIEW

Due to the limited data and the lack of comparability, an overview of the walking infrastructure data in the different countries and cities could not be compiled.

For walking infrastructure, the response rate was too low and too diverse to draw conclusions; some cities consider the entire pedestrian neighbourhood, others just the public space.

As concluded in Task 3 (section 4.1.2), insufficient cycling infrastructure statistics were collected at country level to produce a comparative overview. The overview of cycling infrastructure statistics is presented in Table 19 and Table 20. The classification from the European Cycling Lexicon appeared to be a good reference to provide comparable statistics at capital city level. The comparability of urban statistics is limited because the reference area (i.e. agglomeration, region, commuting zone) is not clear. Another reason is the inconsistent recording of the length of one-way and two-way cycle tracks and lanes in different data sources.

TABLE 21

COMPARATIVE OVERVIEW OF CYCLING INFRASTRUCTURE IN 24 CITIES

CITY, COUNTRY	CYCLE TRACK (KM)	CYCLE STREET (KM)	BUS AND CYCLE (KM)	CONTRAFLOW CYCLING (KM)	CYCLE LANE (KM)	ADVISORY CYCLE LANE (KM)	TOTAL (KM)
Vienna, AU	121	286	13	219	7	-	1,222
Brussels, BE	100	4	7	404	46	37	598
Sofia, BG							60
Plovdiv, PL							60
Zagreb, HR							250
Prague, CZ	44		21.5	23		33	454
Copenhagen, DK	368				28		
Tallinn, EE							211.7
Helsinki, FI							1,200
Berlin, DE	964				253		1,433
Athens, EL	68,3			5.9	0.4	83.5	83.5
Budapest, HU	191	0	18	44	24	73	
Dublin, IE							170
Rome, IT							120
Riga, LV	25		19.1		6	4	
Vilnius, LT	34			1	57	20.8	139
Amsterdam, NL	525	1.7	0		52.7	0	579.4
Oslo, NO							190
Bucharest, RO	5.97						5.97
Kosice, SK							22.7
Ljubljana, SI							225
Madrid, ES	179	64		1	25	157.6	447.35
Stockholm, SE							964.95
Zurich, CH	155			68	117		881

SOURCE

Own elaboration based on countries consultation

6 TASK 5. IDENTIFICATION OF GAPS AND CHALLENGES

The main objective is to summarize the difficulties encountered when collecting and comparing data on active modes use and infrastructure in different European countries (Task 4).

The detailed gaps and challenges encountered by the countries and cities when collecting active modes use and infrastructure data, are reported in the country reports - Appendix C and they are not further discussed here. This section focuses on the gaps and challenges encountered when producing a comparative overview. First, the mapping comparative overview is compared to other European Active Modes statistics, and then the difficulties for walking, cycling and infrastructure statistics are further discussed.

6.1 DIFFICULTIES TO COLLECT AND COMPARE WALKING DATA

In all the countries, when active modes statistics in terms of daily trips per person are available, they can be provided for both walking and cycling. The most common calculation is to divide the number of trips by the total sample population, which gives lower distances and numbers of trips than the calculations for the mobile population. On the other hand, when trip stages are reported, the entire mobile population walks daily. There is a lack of standard approaches to calculate the mobile population.

Some countries include waiting times in walking times. This affects the derived estimated travel daily distances and tends to produce higher average travel distances for walking.

In Switzerland, the effect of including leisure walking and professional trips on the average daily walking distance is mentioned in the country report. It is not clear what that effect is in other countries, and how it affects the comparability of walking statistics.

In many countries, the walking statistics of cities differ from the national average. When oversampling of NTS is performed in cities, the comparison between a city and the country is possible because the same survey is used at national and city level. This, however, does not resolve the need for comparable statistics at urban level, which was mentioned in several consulted cities.
Some countries and cities (Brussels, Copenhagen) do not publish the daily walking distances and trip statistics but mention that they could calculate them on the basis of the available micro-data. This could also be the case for other countries, however since the consultation focused on published statistics, this information was not systematically collected. In Belgium, the pkm/day were calculated for this study from the micro-data of the NTS.

6.2 DIFFICULTIES TO COLLECT AND COMPARE CYCLING DATA

Types of bicycles were not included in the country questionnaire, to limit the response burden. Instead, questions were added on the definition of walking and cycling as applied to the surveys. Only in the Netherlands, e-bikes are recorded separately. The response indicates that walking and cycling are rarely clearly defined in the surveys.

Reporting the main mode of transportation biases the cycling performance and trips, e.g. if people cycle to and from a public transport stop, these kilometres are not included in the cycling statistics. In some NTS and most national census, the data represent the main mode used for commuting, thus excluding many cycle trips for other purposes.

The statistics for e-bikes in the Netherlands indicate that when only a small fraction of the population is included this can give the wrong impression of the average distance and trips cycled per day. The average trips performed daily by each person on e-bike (based on sample population) is extremely low since the total number of e-bike kilometres (from only very few people) is divided by the total population.

Comparisons between countries cannot be made in the current circumstances for the percentage of the population that cycle frequently. The calculation of this share of the population varies both across and within countries. In many countries, it had to be derived from cycling frequency statistics, and the chosen minimum frequency strongly affected the numbers. The example of Luxembourg illustrates this: 23% based on 'cycled past week', 60 % based on 'cycled past year'. Also, statistics on the percentage of the population cycling were not used for comparison with other countries when they only concern students and the working population.

As discussed in section 5.1.2 there is no common definition of 'cycling population' in terms of frequency and trip stages (Table 15). When "at least once a week" is used as criterion, such as in Austria, a lower share of the population cycles than when at least one day per year is considered, such as in Belgium. In many countries, the cycling population is not defined at all.

Another issue relates specifically to the urban cycling statistics: some cities measure the cycling performance based on:
› Urban population, Residency (travel surveys addressed to residents).

› Urban population, limited to urban perimeter (urban travel surveys asking people to only mention their local travel in the city)
› Any biker on the urban perimeter, whether resident or not (traffic counts, data from cycle apps).

The comparability of active modes data can be improved through post-processing methods to harmonise urban cycling statistics. This requires a comprehensive documentation of the above mentioned data collection methods.
Some countries (UK, NL, NO) have developed innovative methods to combine travel surveys and traffic counts. Further research is needed to assess the reliability of statistics obtained and the feasibility for a more generalised application of these approaches.

6.3 DIFFICULTIES TO COLLECT AND COMPARE WALKING INFRASTRUCTURE DATA

As presented in tasks 3 and 4, data on "dedicated pedestrianised streets/areas and/or shared space areas/street", asked in the country questionnaire, failed to produce a comparative overview, both at city and at country level. The main problem is the definition of walking infrastructure: for example, pedestrianised streets and areas may exclude city parks and covered streets, while shared space areas and streets can have a wide variety of forms and transition areas.

6.4 DIFFICULTIES TO COLLECT AND COMPARE CYCLING INFRASTRUCTURE DATA

Although the Cycling Lexicon allowed cities to provide statistics on different types of cycling infrastructure, the lengths of cycle tracks/lanes collected were not comparable (section 5.7). There are two main issues:

› There is no common definition on what is considered a city in the statistics, so the area included may vary from city centre to agglomeration or commuting zone.
› It is not clear how the statistics concerning cycling infrastructure cover the length of cycle tracks, lanes and on how to calculate lengths for cycle tracks on both side of the road.

In the analysis of the potential of using the OpenCycleMap to produce infrastructure statistics, the issue of determining the urban area can be resolved if the maps are clipped to a standard reference area. The issue of how contributors deal with cycle tracks on both sides of the road remains, thus making the calculated cycling infrastructure lengths incomparable. In addition, there are two other issues:
› The crowdsourcing databases are very dependent on the presence of active contributors and the maps can be biased (some parts of a city may be very well covered, others not) or of variable quality (depending on the skills and diligence of the contributor);
› The tags are not consistent with the European Cycling Lexicon.

7 TASK 6. RECOMMENDATIONS

7.1 RECOMMENDATIONS ON POSSIBLE DATA COLLECTION STRATEGIES

7.1.1 COMMON DEFINITIONS

Without a set of common definitions for the active modes it is difficult to make comparison indicators from national statistics, or other sources of data at European level such as Eurobarometers and EHIS.

The common definitions should start at a very basic level: “what is a pedestrian?” and “what is a cyclist?” There is an increasing variety of active modes support devices on the market, replacing the boundaries of what is active vs. motorised, what is walking vs. cycling, by a vast spectrum of gradations. In most NTS walking and cycling are treated as possible modes of transport in the context of a wider survey, without explicit definition (eventually with some examples) of what is included in this mode. Survey respondents may then have different interpretations, for example without a clear definition an e-bike can be considered as a powered two-wheeler or as a bicycle. The current lack of definitions in many active modes data collections at country and city level can be seen as an opportunity for Eurostat guidelines on Passenger Mobility Statistics (2015), to provide more clarity to this grey area. The definitions should also be consistently used in other data collections, i.e. the Eurobarometers and EHIS.

The definitions used in the sampling and data collection should also be explicit. A major issue is the definition of ‘urban population’. The response to the question in the questionnaire ‘What is the urban population size’ showed a variety of interpretations. It was not clear how the urban population is defined in each country. Common definitions, such as the ‘degree of urbanisation’ used in the Urban Audit or the OECD-EC definition of city in Europe have the advantage that it could help analyse relationships between active modes use and other socio-economic indicators, such as commuting. It could also help to improve the comparability of active modes statistics. Different levels of urbanisation are important for cycling and walking. For example, cycling may be underrepresented when suburbs are not included, while this is most likely less problematic for walking. For city level data it is useful to also include the commuting zone, where feasible. The Quality of Life in Cities Survey (Eurobarometer 419) only covers the city, not the commuting zone. Further research on this issue is needed prior to proposing specific definitions.

Another key issue is the definition of a trip. The responses to the open question in the questionnaire ‘What is the definition of a TRIP in your surveys?’ were generally very vague. The additional questions on how a trip is recorded (i.e. only main mode, all modes) and what the boundaries are (i.e. trips within core city area, trips within greater city area) proved essential to avoid incomparable statistics of ‘average daily distance travelled per person’ and ‘average number of trips per day’ in the geodatabase.

For a common understanding of cycling infrastructure characteristics, the European Cycling Lexicon proved to be very helpful in the countries consultation. Some categories (i.e. contraflow cycling, recommended cycle lane) are not considered as cycling infrastructure in some countries. A possible improvement of the definition could be to extend the cycling infrastructure of the European Cycling Lexicon with 30 km/h (20 mph) zones, an approach also found in the recently launched World Business Council for Sustainable Development methodology and indicator calculation method for sustainable urban mobility (WBCSD, 2016).

7.1.2 COLLECT DATA ON PEDESTRIAN-FRIENDLINESS OF THE URBAN ENVIRONMENT

Harmonisation of walking infrastructure definitions proves to be very difficult. The attempt to ask for statistics on dedicated pedestrianised streets/areas and shared-space streets/areas in the questionnaire, failed to produce comparable data. The WBCSD suggests 0.60 meters for sidewalks and 0.75 meters for bike, and includes the above mentioned 30 km/h (20 mph) zones. The recommendation is to avoid common definitions on walking infrastructure, and identify other measures of pedestrian-friendliness of the urban environment. An example is the WBCSD “Quality of public area” indicator. Measuring this indicator in a comprehensive way is challenging. The information can be collected through satisfaction surveys. This is a promising approach to integrating the walking characteristics of the urban environment as part of sustainable urban mobility indicators in one city. However, the comparability of this partial indicator measured in different cities, would need to be assessed after implementation in more European cities.

An alternative strategy could consist of sampling streets in European cities, and develop standard (audit) approaches to assess the quality and produce data. Eventually, such assessments/audits could be crowdsourced.

7.2 RECOMMENDATIONS ON DATA MANAGEMENT AND ANALYSIS

7.2.1 DEVELOP POST-PROCESSING METHODS FOR COMPARABLE STATISTICS

In this study, no harmonisation was performed, aside from selecting the data which were closest to the ‘common denominator’ (e.g. when available, statistics for the mobile population were preferred, statistics for only commuting trips were avoided). Although not harmonised, these data could already provide a first comparative overview of average daily walking and cycling activity and trips. When the definitions used are clear, post-processing methods can be developed to produce more comparable statistics of 'average daily distance travelled per person' and 'average number of trips per day', for both walking and cycling. For example, the 'average daily distance cycled per person' calculated for the total population can be transformed towards the indicator for the cycling population if the percentage of the population that cycles is known.

For some statistics, this will not be easy to accomplish. For example, the population sampling and the reporting methods for trip stages vary among national active modes statistics. This has most effect on walking, which is a frequently underreported trip stage. Estimating such underreported trip stages may introduce errors.

When harmonised transport statistics are available, the potential to use them for comparison or interpretation of active mode statistics collected by countries and cities should be examined. A comparison of the overview maps based on non-harmonised data (Figure 11, Figure 12, Figure 13 and Figure 14) with maps based on walking and cycling frequencies of the Eurobarometers (Figure 17, Figure 18) was hard to interpret, because the time reference scale in the Eurobarometer is different. Only the percentage of the population not cycling is similar. In the European Health Interview Surveys, walking time rather than walking distance is reported. The number of countries having both (EHIS and pkm/day from the country research) statistics was too limited for a comparison; and even where available, the statistics were not comparable. Both European surveys could only be compared to the national averages. Such comparisons require both more active modes data and statistics from countries and cities, and more harmonised European transport statistics.

Seasonal variations and climate conditions should be also taken into account: optimal cycling conditions are not the same in Scandinavia and the Mediterranean countries. Therefore, different surveying periods may be necessary.

When post-processing harmonisation methods for active modes statistics become available, harmonisation routines could allow comparing active modes statistics of cities collected through different means. The result would be comparable active modes statistics produced without need to standardise the data collection methodologies in the countries/cities.

7.2.2 SYNERGY AMONG DATA COLLECTION INITIATIVES

The country research shows that in countries having statistics on daily walking and cycling activity and trips, the national averages differ from those at city (capital) level. Also, there are more cities collecting these data than countries. In several country reports, the need for comparisons between cities is mentioned.

The city statistics could not be compared to European statistics, because there is no systematic active modes data collection in European cities. All these findings lead to a strong recommendation: to collect walking and cycling pkm/day and trips/day at city level in Europe making use of existing initiatives.

A possible synergy with existing initiatives could be the "Quality of Life in cities" survey conducted every three years since 2004 (DG REGIO). Adding questions on active modes use in this survey could provide harmonised data for 80 cities, and be comparable with other urban data, because the definition of the city and of the population would be the same, as well as the sampling method. By adding questions on where and why people walk and cycle, the relation between levels of urbanisation and active modes use can be researched, which can then further lead to comparable approaches to data collection by degree of urbanisation, city and commuting zones.

Recommendation on possible questions to be used in the "Quality of Life in cities" survey

To obtain a picture of how often and how long people walk in the city, comparable with the statistics at country level, we suggest using the same questions in the Quality of Life survey as those in the EHIS. This refers to walks taken over the past 7 days, which is considered to give reliable results since 68% of Europeans walk at least a few times a week (Figure 17), and people take more walking trips per day in cities (see Box 11).

BOX 11

RECOMMENDATIONS ON POSSIBLE QUESTIONS TO BE USED IN THE "QUALITY OF LIFE IN CITIES" SURVEY: WALKING FREQUENCY

1 During the past 7 days, on how many days did you walk for at least 10 minutes at a time to get to and from places?

______ Days per week ☐ don't know ☐ refusal to respond

2 During the past 7 days, how much time did you spend walking?

______ hours ___ minutes ☐ don't know ☐ refusal to respond

3 Where do you walk most frequently? (pick up to 2)

- ☐ In the city centre
- ☐ In residential neighbourhoods in the city, outside the city centre
- ☐ In suburbs
- ☐ Outside the city
- ☐ Near public transport stations (train tram metro stations, bus stops)

SOURCE

Own elaboration based on EHIS, 2014

Because cycling frequency is lower than walking frequency (Figure 18, Figure 17) we suggest using the same questions in the Quality of Life survey as those in the Eurobarometer 406 and World Business Council for Sustainable Development (WBCSD, 2016) (see Box 13).

BOX 12

RECOMMENDATIONS ON POSSIBLE QUESTIONS TO BE USED IN THE "QUALITY OF LIFE IN CITIES" SURVEY: CYCLING FREQUENCY

1 In General, how often do you ride a bicycle?

- ☐ Daily
- ☐ A few times a month
- ☐ (Almost) never
- ☐ refusal to respond
- ☐ A few times a week
- ☐ A few times a year
- ☐ don't know

2 During the past 7 days, on how many days did you cycle for at least 10 minutes at a time to get to and from places?

______ Days per week ☐ don't know ☐ refusal to respond

3 During the past 7 days, how much time did you spend cycling?

______ hours ___ minutes ☐ don't know ☐ refusal to respond

4 Where do you cycle most frequently? (pick up to 2)

- ☐ In the city centre
- ☐ In residential neighbourhoods in the city, outside the city centre
- ☐ In suburbs
- ☐ Outside the city
- ☐ Near public transport stations (train tram metro stations, bus stops)

SOURCE

Own elaboration based on EHIS, 2014

To capture people's opinion of the pedestrian friendliness of their neighbourhood, questions based on the World Business Council for Sustainable Development (WBCSD, 2016) are proposed in Box 13.

BOX 13

RECOMMENDATIONS ON POSSIBLE QUESTIONS TO BE USED IN THE "QUALITY OF LIFE IN CITIES" SURVEY: WALKING FREQUENCY

1 Please rank the following aspects of walking in the city starting with the item which is most important to you. (from 1 to 7, being 1 the most important)

- ☐ Availability of sidewalks in the city
- ☐ Width of sidewalks in the city
- ☐ Signposting of directions and destinations for walkin
- ☐ Feeling of personal security
- ☐ Availability of car free streets in the city
- ☐ Quality of the pavement of the sidewalks in the city
- ☐ Lighting of sidewalks and urban streets at night

2 Do you, in general, like walking?

- ☐ Like extremely
- ☐ Neither like nor dislike
- ☐ Dislike extremely
- ☐ Like very much
- ☐ Dislike very much
- ☐ refusal to respond

3 How do you feel about the ease of walking? Are you satisfied with the following items: Answer as follows;

a. Very Satisfied, b. Satisfied, c. Neutral, d. Dissatisfied, e. Very Dissatisfied

- ☐ Availability of sidewalks in the city
- ☐ Quality of the pavement of the sidewalks in the city
- ☐ Availability of car free streets in the city
- ☐ Signposting of directions and destinations for walking
- ☐ Width of sidewalks in the city
- ☐ Lighting of sidewalks and urban streets at night

SOURCES

Source: Own elaboration based on WBCSD, 2016

A similar approach is proposed to capture people's opinion of the cycling friendliness. Nevertheless, specific questions about satisfaction of cycling infrastructure should be different for people who cycle regularly and those who don't. The questions presented in Box 14 are also based on the World Business Council for Sustainable Development (WBCSD, 2016):

BOX 14

RECOMMENDATIONS ON POSSIBLE QUESTIONS TO BE USED IN THE "QUALITY OF LIFE IN CITIES" SURVEY: CYCLING FRIENDLINESS

A general question could be asked to all respondents:

1 Do you in general like cycling?

- ☐ Like extremely
- ☐ Neither like nor dislike
- ☐ Dislike extremely
- ☐ Like very much
- ☐ Dislike very much
- ☐ refusal to respond

However, questions about satisfaction with the cycling infrastructure and the cycling friendliness should be different for people who cycle regularly and those who don't.

For those answering that they ride a bike less than a few times a month:

2 What are the main reasons for you not to ride a bike in the city more often?

- ☐ There are too few dedicated lanes for biking
- ☐ The way other road users treat cyclists
- ☐ The bicycle parking facilities in the city are too few and too unsafe
- ☐ The risk of being involved in an accident
- ☐ Availability of car free streets in the city
- ☐ The roads are of poor quality for biking
- ☐ I don't feel safe from physical attacks
- ☐ None of these

For those answering that they ride a bike at least a few times a month:

3 Please rank the following aspects of cycling in the city starting with the item which is most important to you. (from 1 to 11, being 1 the most important)

- ☐ Availability of dedicated lanes for biking
- ☐ The way other road users treat cyclists when on mixed use roads
- ☐ Number and the location of shared bicycles
- ☐ Feeling of personal security
- ☐ Width of bike lanes
- ☐ Signposting of directions and destinations for biking
- ☐ Bicycle parking facilities in the city
- ☐ Quality of road surface of the bike lanes
- ☐ Lighting of biking facilities and urban streets at night
- ☐ Security of the bicycle parking facilities

4 How do you feel about comfort of cycling? Are you satisfied with the following items: Answer as follows;

a. Very Satisfied, b. Satisfied, c. Neutral, d. Dissatisfied, e. Very Dissatisfied

- ☐ Availability of dedicated lanes for biking
- ☐ The way other road users treat cyclists when on mixed use roads
- ☐ Number and the location of shared bicycles
- ☐ Feeling of personal security
- ☐ Width of bike lanes
- ☐ Signposting of directions and destinations for biking
- ☐ Bicycle parking facilities in the city
- ☐ Quality of road surface of the bike lanes
- ☐ Lighting of biking facilities and urban streets at night
- ☐ Security of the bicycle parking facilities

SOURCE

Source: Own elaboration based on WBCSD, 2016

7.2.3 SET UP MONITORING OF ACTIVE MODES USE

Existing monitoring such as the Road Safety Annual report of the OECD (ITF, 2015) currently presents road safety performance by inhabitant and per vehicle-km. The exposure of the pedestrians and cyclists should be systematically added. This requires data on daily walking and cycling distances. When launching new initiatives such as the questions on walking and cycling in the Quality of Life in cities survey, the collected data should be used to improve such monitoring by covering active modes.

The Ministers of transport, health and environment agreed in the Paris Declaration of the 4th High-level Meeting on Transport, Health and Environment (4HLM) in April 2014 to promote cycling at the pan-European level by developing a pan-European master plan for cycling promotion. The preparation of such initiative requires a reference of the current active modes use in Europe, and appropriate indicators to monitor progress.

7.2.4 STIMULATE AND HARMONISE CROWD SOURCING ACTIVE MODES DATA COLLECTION

The cycling infrastructure example of the Netherlands shows that it is possible to generate cycling infrastructure statistics through crowdsourcing. The comparison with the infrastructure data of Amsterdam demonstrates that it is possible to extract reliable urban cycling infrastructure statistics from volunteer contributions. This initiative might not be transferable to other countries where the cycling associations have fewer members and resources.

The comparison with OSM illustrates that contributions to such maps can also produce cycling infrastructure data. OSM is a worldwide initiative having contributions in all the 30 European countries examined in this study. However, the quality of OSM cycling infrastructure varies. Crucial for comparable data is the use of comparable definitions, guidelines for qualitative drawing and consistent tagging of one-way and two-way cycling infrastructure to allow comparable calculation of the length. The map style rules can be further developed to reflect these.

In order to stimulate further implementation of the good practice example identified in the Netherlands for cycling infrastructure statistics, a number of initiatives are possible:

- Further standardize the definitions of cycling infrastructure in the European Cycling Lexicon, for example by taking into account traffic calming measures;
- Harmonise definitions used for cycling infrastructure in Europe;
- Make the mapping rules in crowd sourcing initiatives such as OSM evolve towards these definitions for mapping cycling infrastructure in Europe;
- Stimulate participation in mapping cycling infrastructure. This could be combined with successful initiatives such as the European Cycling challenge.

7.2.5 FOLLOW-UP DEVELOPMENTS IN BIG DATA COLLECTION

Both Google Better Cities and COWI City Sense - Signal Re-identification appear to be promising for active modes use data collection in the future. In their current stage of development, neither big data collection method could provide active modes statistics for Europe.

The improvements to further resolve bias issues should be followed up in Google Better Cities. A possible innovative use is to collect harmonised walking and cycling statistics and lower the burden on respondents to travel surveys, could be to ask a representative sample of the urban population in Europe to voluntarily provide their location history instead of filling in travel diaries. Such a method could also be combined with satisfaction surveys.

In the past two years COWI has observed fewer projects focusing on road usage and more projects on pedestrians at very specific locations. The feasibility of extending this towards generating city-wide pedestrian data, could be researched in the future.

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APPENDICES

APPENDIX A

LITERATURE REVIEW ON WALKING/CYCLING DATA COLLECTION AND HARMONISATION METHODS

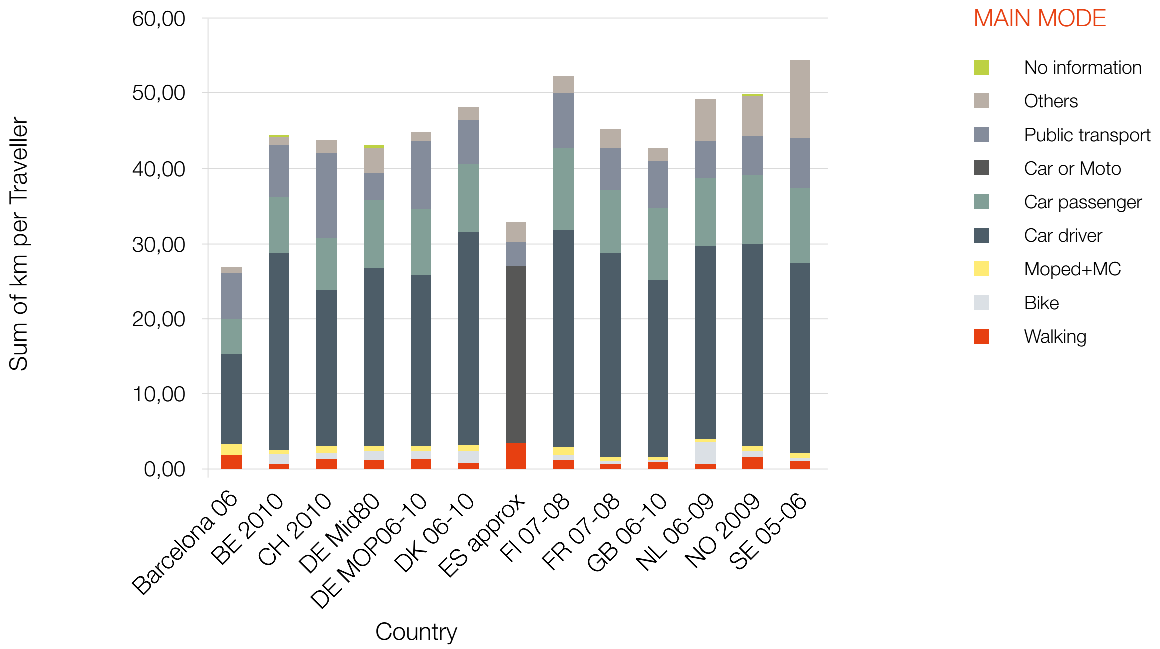
Several initiatives were carried out in the past, addressing issues of data availability and comparability. The study makes full use of the findings, both in terms of results and in terms of risks encountered during the process.
A preliminary overview illustrates some of the issues.

The COST-Shanti project analysed travel surveys in Europe, and their potential for harmonisation. The final report (2013)[32] provides an indication of what can be expected for walking and cycling, e.g. a comparative overview of walking and cycling in pkm as illustrated in Figure 24.

[32] Jimmy Armoogum (ed), 2014. Survey Harmonisation with New Technologies Improvement (SHANTI). COST Action Number: TU0804. Les collections de l'INRETS, France. ISBN: 978-2-85782-704-7. 203 p.

FIGURE 24
COUNTRIES WITH A SURVEY WHICH IS INCLUDED IN THE POST-HARMONISATION

KILOMETERS PER TRAVELLER DISTRIBUTED ON MODES
Note: Kllometers per traveller for Spain is an approximation.



SOURCE
COST-SHANTI Final conference, March 2013)[19]

This collaborative effort also identified issues concerning data availability and comparability, as summarised in Figure 25.

- Data don't exist;
- Data exist but these are not accessible;
- Data are outdated;
- Data are available at national or regional level, but not for individual cities;
- Data are available at city level, but not for the capital;
- No prior harmonisation of data collection with other European countries.

FIGURE 25
COUNTRIES WITH A SURVEY WHICH IS INCLUDED IN THE POST-HARMONISATION

COUNTRY / REGION	SURVEY	STATUS
Barcelona	2006	OK
Belgium	2010	OK
Switzerland	2010	OK
Germany, MiD	2008	OK
Germany, MOP	2006-10	OK
Denmark	2006-10	OK
Spain	2006	OK
Finland	2010-11	OK
France	2007-08	OK
Netherlands	2006-09	OK
Great Britain	2006-10	OK
Norway	2009	OK
Sweden	2005-06	OK
Cyprus	2009	Not remember of Shanti
Italy	?	Data are secret
Latvia	2007	Data cannot be delivered
Austria	1995 / 2013	Not actual

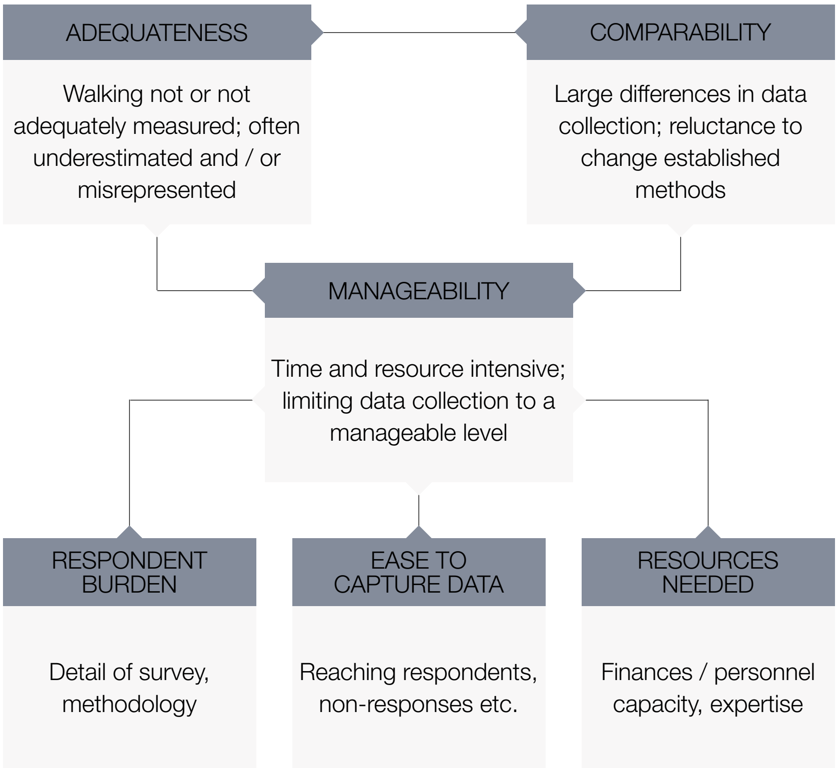
SOURCE
COST-SHANTI Final conference, March 2013[32]

[32] Jimmy Armoogum (ed), 2014. Survey Harmonisation with New Technologies Improvement (SHANTI). COST Action Number: TU0804. Les collections de l'INRETS, France. ISBN: 978-2-85782-704-7. 203 p.

In November 2015, the international walking data standard was presented at the Walk21 conference in Vienna. Figure 26 presents a classification of challenges related to measuring walking[33]. The development of this standard was the result of more than 10 years of collaboration among researchers and experts, starting with the COST Pedestrian Quality Needs (PQN)[34]. The walking standard is based on extensive research on the measurement of walking in travel surveys and various pedestrian count methods. The walking standard report addresses the risks identified in the COST-PQN and the COST Shanti projects, and offers some assessment methods and possible solutions for data collection and analysis on walking. The report provides an excellent basis for the desk research and for the analysis method of the project.

[33] Sauter et.al. (2015). International Walking Data Standard.
[34] http://www.walkeurope.org/

FIGURE 26
CHALLENGES IN CREATING AN INTERNATIONAL STANDARD FOR WALKING IN TRAVEL SURVEYS[34]



[34] http://www.walkeurope.org/

SOURCE
Walkeurope (http://www.walkeurope.org/)

In the international walking data standard, harmonisation issues are organised in four categories: sampling issues, data collection and reporting (analysis and presentation) issues, general methodological issues of travel survey, and special challenges for travel surveys at the regional and city level.
Sampling issues are particularly important for measuring walking. They are further divided into:

- Sampling issue 1 - Population included in sample: Residents only or also non-residents?
- Sampling issue 2 - Age: Persons with a minimum and/or maximum age?
- Sampling issue 3 - Survey days: All days of the week and periods of the year?

As an example, sample issue 1 is further elaborated on here. If only data of residents are collected (usually in travel surveys), the question arises "what happens with trips the residents made outside or across their municipal boundaries?". In the measuring walking standard, it is recommended to include all trips by residents, including those made across municipal boundaries (except for travel abroad). Double-counting has to be avoided when comparing travel behaviour between the residents of different jurisdictions. When travelling abroad, an exception can be made in cities near the border with lots of cross-border (walking) trips.

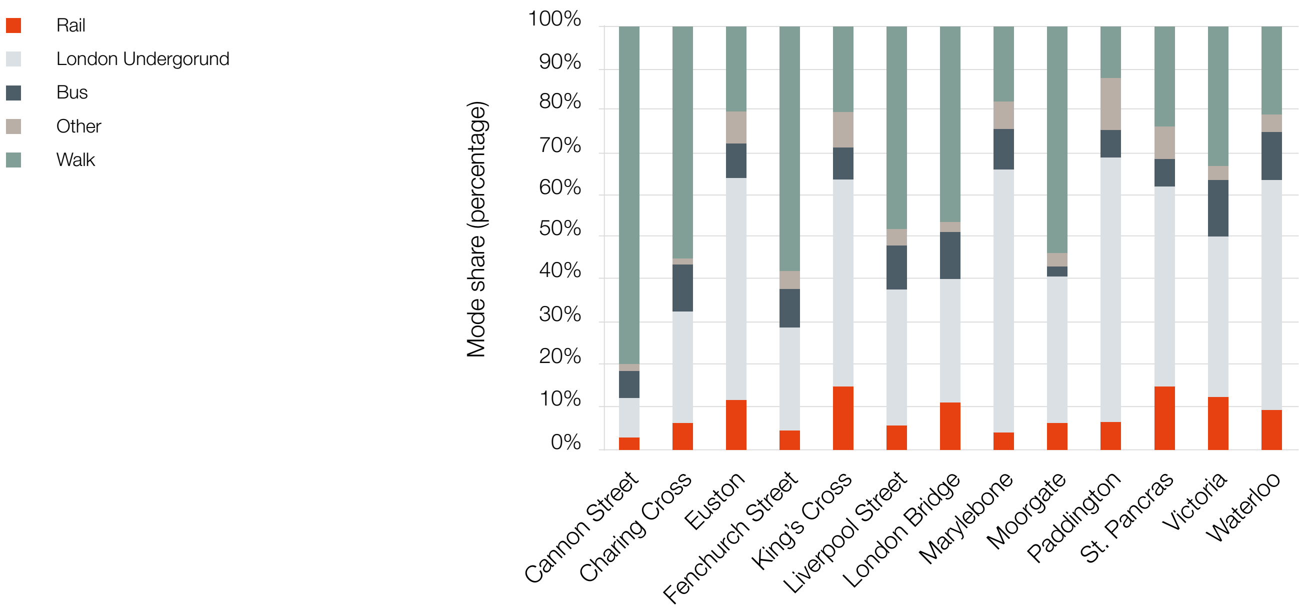
The increasing, so called multi-local living, poses additional problems. In Switzerland, for example, it is estimated that around 28% of the people live in at least two places for different reasons (see Schad and Hilti 2015).[35] This increases the difficulty in reaching them and some data may be lost when they spend their time on the assigned survey day in the other location.

Travel surveys give an indication of the travel behaviour by the residents, but make it difficult to capture the trips made by visitors to a city. In cities with large volumes of visitors, a considerable proportion of walking activity is made by non-residents and can have different characteristics other than those of residents' everyday habits. To capture all trips done within a specific area would mean that the trips of residents but also trips of non-residents, such as commuters, visitors and tourists coming in from outside need to be included. An example is presented in Figure 27, illustrating e.g. the outcome of taking into account walking even when it is not the main travel mode.

[35] Schad Helmut, Hilti Nicola, 2015: Die Mobilität multilokal Wohnender; In: Verkehrszeichen 2/2015, S. 4-8.

FIGURE 27

MODE SHARES FOR ONWARD TRAVEL FROM PRINCIPAL CENTRAL LONDON RAIL TERMINI. BOTH WEEKDAY PEAK PERIODS COMBINED



SOURCE

Transport for London, 2011b: Travel in London Report 4

The survey questionnaire needs to be sufficiently elaborated on to clarify how different factors are handled when different data collection methods are used, in order to understand which population, trips, and distances are included in the reported statistics (e.g. average daily distance travelled in pkm per person and average number of trips per day) on active modes used.

Another challenge resides in data on infrastructure. Open access data on cycling infrastructure is available in OpenStreetMap[36] (Figure 28). However, there are some major shortcomings:

- Incomplete geographic coverage;
- Reliability of the data varies;
- Lack of harmonisation.

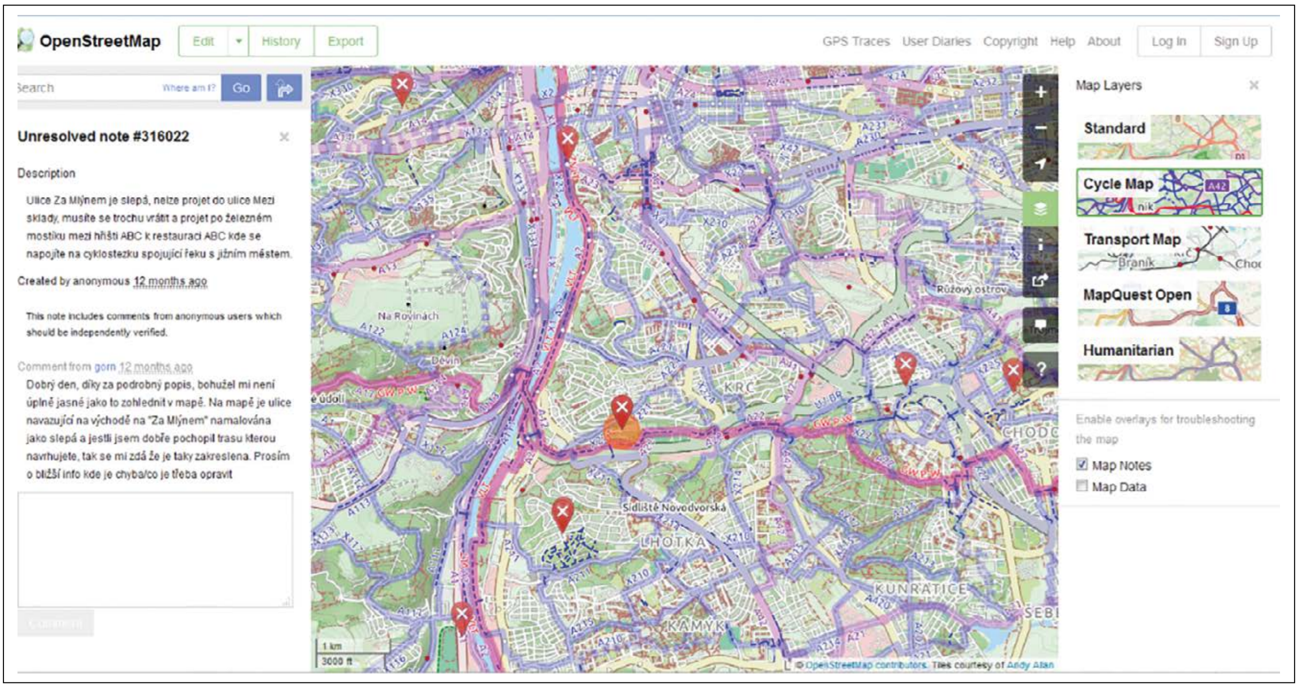
Some countries and regions have good quality standards, such as "Vademecum fietsvoorzieningen" in Flanders[37]. Another important challenge for the validation is that most of this information is not published in English.

[36] https://www.openstreetmap.org

[37] Vademecum Fietsvoorzieningen, 2014. http://www.mobielvlaanderen.be/vademecums/vademecumfiets01.php

FIGURE 28

OPEN ACCESS DATA ON CYCLING INFRASTRUCTURE[36]



SOURCE

OpenStreetMap

FIGURE 29

An example of cycling infrastructure measurement[37]

- HOOFDSTUK 3 - 875 kB : Definiëring en toepassingsgebied van fietsvoorzieningen binnen het globaal verkeersconcept

3.1 Definiëring van fietsvoorzieningen
3.2 Toepassingsgebied van fietsvoorzieningen

- HOOFDSTUK 4 - DEEL 1 - 7,2 MB

4.1 Maatvoering en afscherming
4.2 Materiaal- en kleurengebruik
4.3 Trillingscomfort van fietspaden
4.4 Verlichting van fietsvoorzieningen
4.5 Fietsvoorzieningen op kruispunten
4.6 Fietsen op rotondes
4.7 Ongelijkgrondse kruisingen (tunnels of bruggen)

- HOOFDSTUK 4 - DEEL 2 - 2,72 MB

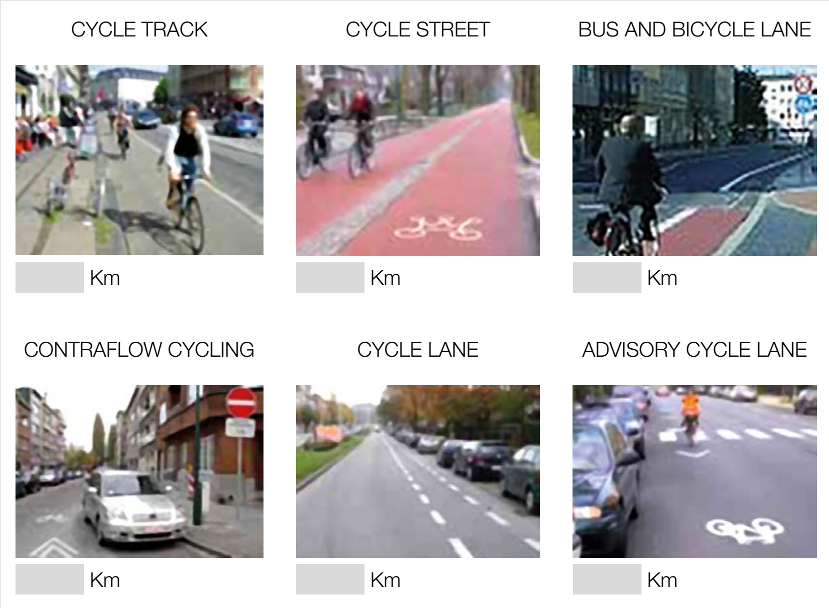
4.8 Fietshellingen
4.9 Fietsparkeervoorzieningen
4.10 Fietsen aan haltes voor openbaar vervoer
4.11 Overgangen en oversteekplaatsen
4.12 Bromfietsen al dan niet op fietspaden
4.13 fietsen in eenrichtingsstraten
4.14 Andere aanvullende fietsvoorzieningen

SOURCE

Vademecum Fietsvoorzieningen, 2014

The European Cycling Lexicon, developed by the European Economic and Social Committee, provides a reference which can be used to consistently identify cycling infrastructure in different countries and languages. The following types of infrastructures are considered in the Lexicon:

FIGURE 30
An example of cycling infrastructure measurement[37]



SOURCE
The Consultant, based on European Cycling Lexicon

There is no equivalent of the European Lexicon for walking. Therefore, it is difficult to consistently identify what is a pedestrian infrastructure because the quality of this infrastructure needs to be assessed at a micro-level e.g. absence of barriers, safety risks from motorised vehicles.

Countries such as the Netherlands and Belgium have evolved from streets and zones reserved for pedestrians, towards multifunctional shared spaces, where motorised traffic is allowed, yet the design is focused on pedestrians, and is sufficiently self-explanatory to obtain adequate behaviour from all road users (Hans Monderman, www.shared-space.org).

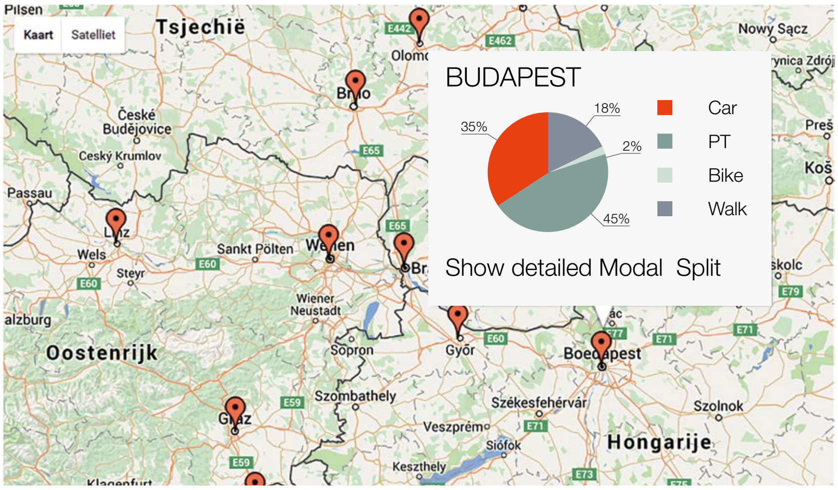
Thus, the concept of pedestrianised zones can be interpreted as sensu stricto (infrastructure dedicated to pedestrians) or sensu largo (shared spaces between different transport modes). To ensure a common interpretation, pictures are shown for both categories (see Figure 31). Once the type of infrastructure is identified, the total surface can be included.

FIGURE 31
DEDICATED PEDESTRIANISED ZONES (*SENSU STRICTO*) AND SHARED SPACE (PEDESTRIANISED ZONES *SENSU LARGO*)

The COST PQN also identified extensive literature on the problems of cities where few streets or squares are reserved for pedestrians, while entire neighbourhoods are unsafe, not well maintained, and therefore not pedestrian-friendly. This can be assessed only if there is evidence that some regulations or guidelines are applied about walking infrastructure quality requirements.

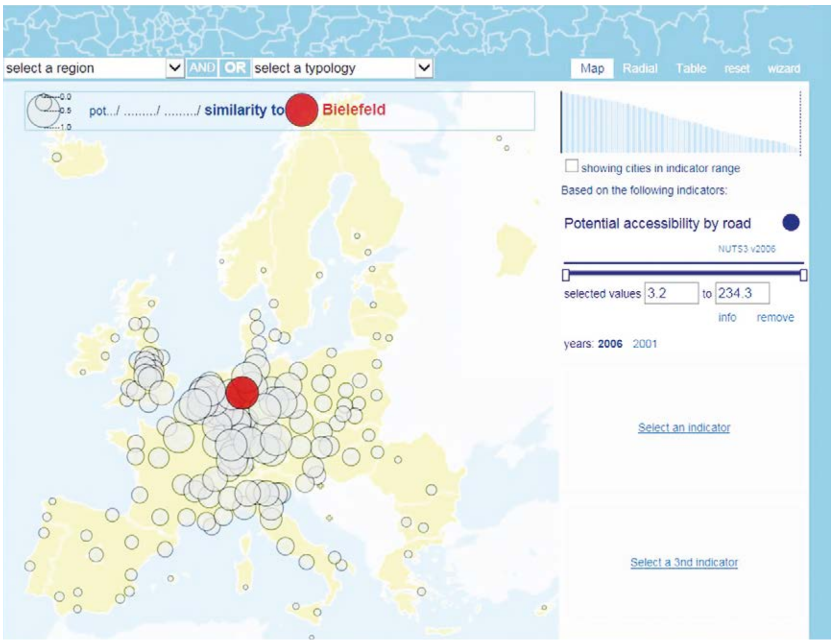
An example of representation and benchmarking of infrastructure characteristics is available from the ESPON CityBench project, where up to three indicators can be selected. A similar approach could be used for walking and cycling infrastructure e.g. select a city of a certain size (indicator 1 = population), population density (indicator 2 = population density), and compare the surface of pedestrianised areas (indicator 3 = surface of pedestrianised areas).

FIGURE 32
TEMS – THE EPOMM MODAL SPLIT TOOL



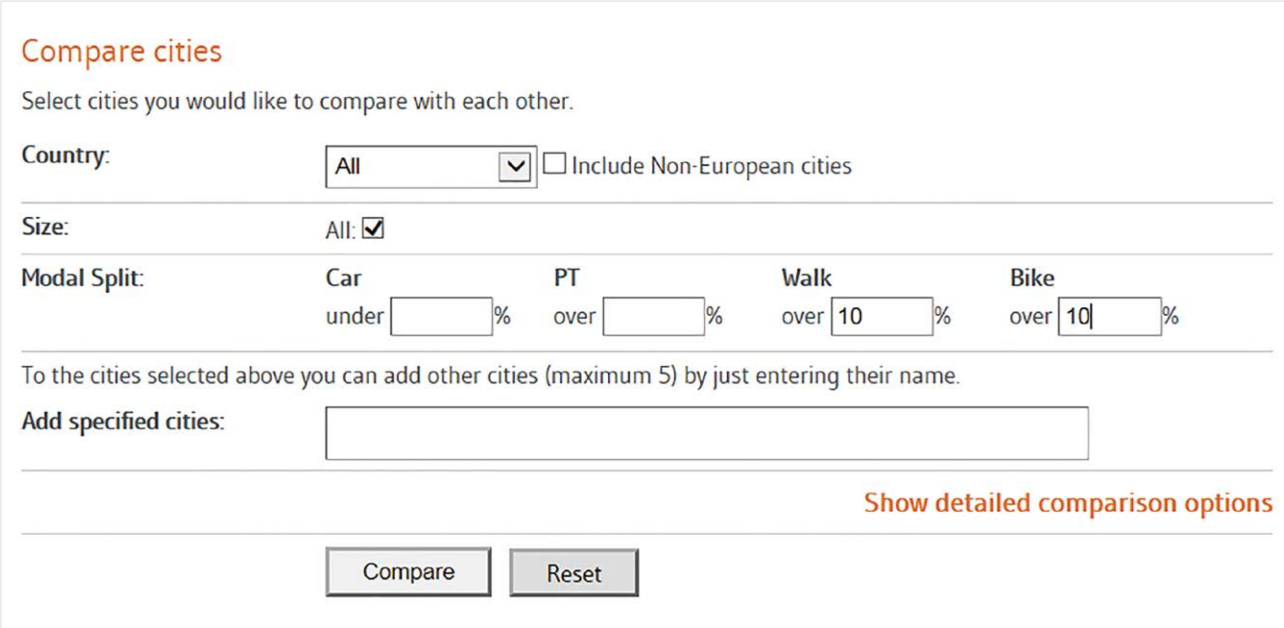
SOURCE
EPOMM, http://www.epomm.eu/tems/index.phtml?Main_ID=2928

FIGURE 33
ESPON – CITYBENCH TOOL

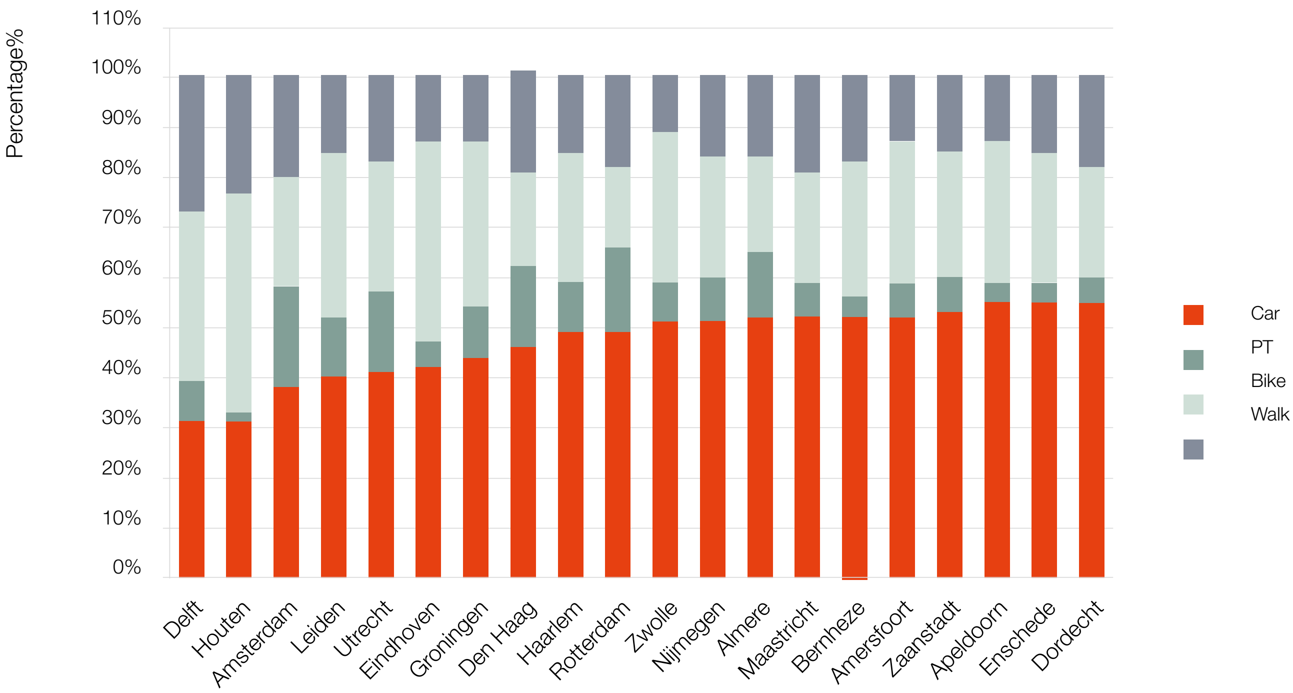


SOURCE
https://www.espon.eu/main/Menu_ToolsandMaps/CityBench/

FIGURE 34
TEMS – COMPARE CITIES TOOL



MODAL SPLIT CHART



SOURCE
EPOMM, http://www.epomm.eu/tems/index.phtml?Main_ID=2928

APPENDIX B

CONTRIBUTORS TO THE STUDY

Contributors to the study (presented in Table 22) include: the national contact points, the experts interviewed in Task 1, and those providing information about the Big Data case studies. Only contributors who gave authorisation to be mentioned in the report are included in the list.

TABLE 22
CONTRIBUTORS TO THE STUDY

COUNTRY	NAME ORGANISATION/INSTITUTION	TYPE ORGANISATION	CONTACT PERSON
Bulgaria	Bike Evolution Association	NGO/Think-Tank	Radostina Petrova
Croatia	University of Zagreb	University	Davor Brčić
Croatia	City of Zagreb	City Authority	Matija Vuger
Croatia	ODRAZ-Odrzivi razvoj zajednice (Sustainable Community Development)	NGO/Think-Tank	Lidija Pavic-Rogošic
Cyprus	Statistical Service of Cyprus (CYSTAT)	Ministry	Pantelis Protopapas
Denmark	Københavns Kommune	City Authority	Åse Boss Henrichsen
Denmark	Cykelplanen Reg hovedstaden	City Authority	Helen Lundgaard
Denmark	DTU Transport	Consultancy/Consultant	Hjalmer Christiansen
Denmark	COWI	Enterprise	Jonas Olesen
Estonia	Statistics office	Ministry	Heidy Roosimagi
Finland	Motiva Oy	Consultancy/Consultant	Sara Lukkarinen
France	CEREMA (Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement)	Ministry	Anne-Gaelle Jaillet
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Germany	Karlsruhe Institute of Technology, Institute for Transport Studies	University	Christine Weiss
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Greece	Attiko Metro, Athens	Other	Alexandros Deloukas
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Hungary	Hungarian Transport Administration	Ministry	Miklós Berencsi
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Italy	ISFORT	Ministry	Eleonora Pieralice
Israel	4 sight/SARTRE 4 survey	NGO/Think-Tank	David Zeidel
Latvia	Statistical Office Latvia	Ministry	Ms Edite Miezite/ Dita Zemite
Malta	Ministry for Transport and Infrastructure	Ministry	Camilleri Stephen J
Netherlands	Statistics Netherlands (CBS)	Ministry	Carine Zwaneveld

COUNTRY	NAME ORGANISATION/INSTITUTION	TYPE ORGANISATION	CONTACT PERSON
Netherlands	SWOV Road Safety Institute	NGO/Think-Tank	Rob Methorst
Netherlands	Fietsersbond	NGO/Think-Tank	Jaap Kamminga
Netherlands	City of Amsterdam	City Authority	Remco van Lom
Norway	Oslo Kommune	City Authority	Siv Linette Grann
Slovenia	University of Maribor	University	Beno Mesarec
Slovenia	Ministry of Infrastructure	Ministry	Gregor Steklačič
Slovenia	Development agency Sinergija	Other	Katja Karba
Slovenia	Municipality of Ljubljana	City Authority	Matic Sopotnik
Slovenia	Jozef Stefan Institute	Institute	Matjaž Česen
Slovenia	Ministry of Infrastructure	Ministry	Tadej Žaucer
Slovenia	Republic of Slovenia Statistical Office	Ministry	Alenka Skafar
Slovenia	Urban Planning Institute of the Republic of Slovenia (UIRS)	Institute	Aljaz Plevnik
Spain	City of Madrid	City Authority	Elisa Barahoma Nieto
Sweden	Municipality of Stockholm	City Authority	Tobias Johansson
Sweden	Trafa	NGO/Think-Tank	Andreas Holmström
Sweden	Lunds Tekniska Högskola	University	Gabriella Nilsson
Switzerland	Federal Roads Office	Ministry	Urs Walter
Switzerland	Federal Roads Office	Ministry	Robert Dorbritz
Switzerland	Measuring walking	University	Daniel Sauter
UK	Walk 21	NGO/Think-Tank	Jim Walker
UK	University of Leeds	University (ICTCT community)	Eva Heinen
UK	Google	Enterprise	Marlo McGriff

APPENDIX C

APPENDIX C COUNTRY REPORTS [PRESENTED AS SEPARATE DOCUMENT]

C.1 Austria
C.2 Belgium
C.3 Bulgaria
C.4 Croatia
C.5 Cyprus
C.6 Czech Republic
C.7 Denmark
C.8 Estonia
C.9 Finland
C.10 France
C.11 Germany
C.12 Greece
C.13 Hungary
C.14 Ireland
C.15 Italy
C.16 Latvia
C.17 Lithuania
C.18 Luxembourg
C.19 Malta
C.20 Netherlands
C.21 Norway
C.22 Poland
C.23 Portugal
C.24 Romania
C.25 Slovakia
C.26 Slovenia
C.27 Spain
C.28 Sweden
C.29 Switzerland
C.30 United Kingdom

APPENDIX D

APPENDIX D INITIAL E-MAIL TEMPLATE, QUESTIONNAIRE AND GUIDANCE NOTE

PRESENTED AS SEPARATE DOCUMENT	
D1	Initial email template
D2	Country Questionnaire
D3	City Questionnaire
D4	Guidance Note

APPENDIX E

DATA COLLECTION AND AVAILABILITY INFORMATION

The following tables present the summary of the response obtained in the countries consultation, and discussed in the report section 3.2.
When data for a capital was not available, data for other city in the country was used instead.

E.1 RATING OF THE FRIENDLINESS FOR WALKING AND CYCLING IN THE COUNTRY/CITY

Scale: 0–10, being "0" bad and "10" Excellent

TABLE 23
RATING OF THE FRIENDLINESS FOR WALKING AND CYCLING IN THE COUNTRY/CITY

COUNTRY	RATING WALKING	RATING CYCLING
CH	8	5
DE	7	5
EE	8	7-8
EL	1	2
ES		6
FR	7	5
HR	6-7-6-8	4-4-6-4
HU	6	7
IT	8	3
LT	7	4
LU	6	5
LV	7	5
NL	7	7
PL		5
PT	4	4
SE	7	7
SI	7-9-7-7	4-6-6
SK	5	3
UK	8	6

SOURCE
Own elaboration based on the countries consultation

E.2 DIFFICULTIES ENCOUNTERED WHEN COLLECTING STATISTICS ON WALKING AND CYCLING

Country level:

- Lack of information for other transport modes, small budget, working with volunteers (BG)
- No systematic data collection on either walking or cycling at national level. Statistics are being collected in connection with specific projects and building new infrastructures. Traffic counts are done in cities (mainly Prague), in a number of national parks, and in some regions. Statistics exist on the number of bikes owned by households (CZ)
- Short walking trips (including feeder stages) are likely to be forgotten and not reported. Walking distances are likely to be overestimated. Reporting and participation biases in the survey (socio-demographics), selectivity. (DE)
- People's memory regarding short walking and cycling trips is often short, and the different stages of a trip are also often forgotten, meaning that there is a lack of information and that the reported distance for walking and cycling probably is shorter than it is. Bikes can be used in many ways in combination with public transport. Geocoding the roads - when walking there is no proper walking-system (system) to connect data with. The statistics are not as exact as the counting methods on motorized traffic, since there are fewer

stations. The weather has a great influence on the number of cyclists. (DK)

- Lack of tradition, technical difficulties due to randomness in walking. (EE)
- Various working methods; various working areas (FR).
- Lack of practice counting the traffic of pedestrians and cyclists. There is no continuous / regular counter and data collection. For now there is only one count for cyclists. Lack of consistent data. Cycling network is not connected, a lot of physical barriers, focus on motorised traffic in planning phase etc. (HR)
- Insufficient supporting system, no monitoring, lack of relevant questions in household surveys and national census, data collection is not mandatory, no conception for data collection. (HU)
- In LT there are only statistics about cycling infrastructure. Difficulties - no national method of data gathering. Data is not reliable and inaccurate. Municipalities provide data about their region on bicycle path length. There is a room for improvement and development, but in general it is positive regarding the infrastructure. (LT)
- No stats on walking. Good permanent counters for cycling. (LU)
- The infrastructure for walking is successfully developed in central parts of urban areas where pedestrians have full priority, however, outside central parts and also outside urban areas usually there is no appropriate infrastructure. If we talk about cyclists the infrastructure for cycling until now has been mostly developed at the expense of pedestrian infrastructure, namely, by dividing the sidewalks into two parts. This is not right. It is possible to improve interrelation between pedestrians and cyclists by providing separate spaces for each. This is gradually developed, for example, by introducing cycling lanes or recommended cycling lanes in the centres of urban areas where the housing is dense. (LV)
- Underreporting; respondents tend to forget reporting short distances (to bus station, etc.). (NL)
- In the RVU we do not measure trips that do not have a clear purpose/destination. E.g. taking a walk in the neighbourhood in the afternoon, or cycling in the forest without any destination. There are also problems related to measuring walking/cycling (especially the distance and time) when combined with other modes of transport on a trip. In general, there is a problem in the RVU with measuring the distance with different means of transport – this is due to errors in the precision of the start/end location of a trip (given by the respondents and then registered by the interviewer) and errors in respondents' self-evaluation of the distance of a trip. (NO)
- Refusal to fill in the questionnaire, lack of time to fill in the questionnaire, fears regarding anonymity, lack of answers to parts of the questionnaire or a specific question, verification of data. (PL)
- Only data related to walking has been collected via Census, while the travel by bike has not received attention due to the low level of usage of the transport mode and the lack of incentives of the mode. Data collection on the use of cycling has been done by some independent organizations since 2011. (PT)
- Different measurement methods are used: in municipalities, flow measurements are used, where the selection of measuring points is skewed; nationally, in travel surveys, the response rate is somewhat low and decreasing. (SE)
- Lack of systematic data collection on walking and cycling. Data are scattered among different authorities. (SI)
- The Statistical office does not have any data: neither on the extent of cycling and walking nor the existing infrastructure. There are insufficient counting devices and lack of interest at local level. There is no data on the extent of walking. For cycling some data is being collected by NGOs in different cities, but there is no information collected for the entire population. In some cities there the NGOs use of traffic counts to monitor the extent of cycling. Traffic counts are often introduced when new bike lanes are built (recently e.g. in Presov). It is difficult to evaluate the quality and the comparability of the data collected. In the national census there may be a question on how many bicycles there are in each household. However, there is no way of knowing for which purpose and how often bikes are used. Most people use them for recreational purposes. (SK)
- Perhaps the most difficult problem of collecting data is that we are not able to directly measure walking and cycling behaviour. Our two main ways of indirectly measuring behaviour is through the National Travel Survey and Active People Survey, and both methodologies have their own strengths and drawbacks. For example, the Active People Survey asks how many days the respondent has walked/cycled in the last month which is advantageous as this can capture any walking/cycling behaviour (as opposed to other methodologies which only capture on-road travel behaviour for example) but it means data accuracy are limited to memory recall accuracy. The National Travel Survey asks respondents to keep a diary which can be more (but not completely) accurate but is also costlier and so has a smaller sample size.
- Whilst these methodologies may not be able to capture walking and cycling prevalence with perfect accuracy, it is generally considered to be reliable enough and just as importantly is able to capture what the long term trends of walking/cycling behaviours are. (UK)
- A trial in the 2011 National Travel Survey attempted to directly measure travelling behaviour by providing respondents with a device which tracked their travelling patterns via GPS although this encountered its own problems and much further development is required before pursuing this route.

Capital level:

- No data collection at regional level, data from NTS are limited and available data are rare. (Brussels)
- Nothing really challenging, we collect enough data in this field. (Zürich)
- On walking there are limited statistics on the number of people crossing the streets at a series of central locations in Prague, but no statistics on the distance walked. For cycling there is statistical data available from traffic counts and the travel survey (2012). (Prague)

- Walking and cycling figures at city level in Berlin are collected through a subsample of the national travel survey (MiD). (Berlin)
- Little investment on this issue and lack of unified criteria. (Madrid)
- Lack of methodology in collecting data. Lack of data. Statistics have been collected only on cycling. (Zagreb)
- Limits in the financial and resource management. Road management has been outsourced this year (problems in the organisation structure). (Budapest)
- Problem in quality of statistical data. (Vilnius)
- In Oslo, there are two main ways of collecting statistics on walking and cycling. The first is travel surveys, and the second is automatic counts located at specific sites throughout the city. The automatic counts in Oslo are primarily linked to passing cyclists, but there are a couple of places where also the pedestrians are counted.
- One of the main issues with travel surveys is that the response rate is very low. Another problem is that people have a tendency to forget some of the short trips they make on foot or by bicycle, which reduces their apparent share of mode. Different methodologies can also be challenging – both when trying to make a comparative analysis based on different travel surveys, and when trying to communicate why some surveys show a different mode share than other surveys.
- The quality of the counting equipment can be problematic-not all cyclists that pass a counting site actually get counted. We've done a few tests in Oslo comparing manual and automatic counts. At some sites the automatic count only captures as little as 50 % of the cycle-traffic, at other sites they count up to 10 % more cyclists than actually pass the site. Another issue is that cyclists sometimes use the pavement instead of the cycle lane, or that they use the lane for cars, which means that they won't be counted, and that the overall number of cyclists will be (further) underestimated. However, combining manual counts at the counting sites reduces the significance of the problem through making it possible to calculate the approximate number of cyclists if that information is needed for a specific project, for instance. Another difficulty, again related to the quality of the equipment, is that the battery sometimes goes flat, or something else happens so it doesn't register the passing cyclists for some time. When looking at the monthly data (for instance), the numbers cannot necessarily be trusted (unless it's checked manually) that the counting equipment did indeed count cyclists every day of the month, and that the pattern throughout the month looks normal. This is a time-consuming task, and a better and more automatic way of checking out the quality of the data would be very welcome. Another issue concerning the automatic counts is how representative the growth in the automatic count sites is to the general growth of cycling. Oslo has a target goal of a 25 % modal share for cycling by 2025, which means that the average growth from 2013 needs to be 12 %. So far in 2016 (January through to May), the growth in the automatic count sites has been 16 %. Does this mean that we are on the right track, or is the growth higher here than other places in the city? (Oslo)
- Refusal to participate in the questionnaire (33% in case of direct approach, 43% in case of pre-selected household visits, problems with reaching the pre-selected households, or respondents not being present, expectance of gratification, returning of blank questionnaires even if initially accepted. (Warsaw)
- Seasonal and spatial variation in behaviour, response rates in surveys. (Stockholm)
- No periodic collecting, small samples, low responses on survey, underreporting of trips. More counters for daily collecting would be needed(Ljubljana).

E.3 COMPARISON OF COUNTRY/CAPITAL STATISTICS/PERFORMANCE ON WALKING AND CYCLING WITH OTHER REGIONS/CITIES AND DIFFICULTIES ENCOUNTERED

Country level:

- The Swiss statistics refer to trip stages in multi-modal trips. These are difficult to compare with statistics in other countries. (CH)
- The National Strategy for the development of cycling in 2013-2020 includes examples of data from other countries, but the data is not compared as such. (CZ)
- We compare statistical key figures (such as modal split) as part of overall cross-regional and cross-country analyses. As both modes, in particular walking, can be regarded as short-distance modes that are mainly relevant for local transport, detailed data is often collected at local level only and for quite specific purposes. Due to this specificity and the given spatial limitation, micro data are seldom suitable for comparative analyses focusing on larger regions or the whole country.
- Data for both modes are also collected at national level (e. g. National Travel Surveys MiD, MOP). Difficulties occur in terms of accuracy and completeness of collected information depending on the overall survey design including design of survey instruments, question wording, or the underlying trip definition. Under-coverage of walking and cycling usually results from respective design characteristics (e. g., short walking trips are disregarded due to a minimum trip distance if one applies; feeder stages such as short walks to a bus station may not be reported if trip details are not collected at stage level). (DE)
- There is no systematic benchmarking, but the data are very comprehensive so it would be possible to ask for data if there is a wish to make a comparison. (DK)
- Comparison can hardly be relevant. Although, many statistics are out at the local level, little information is provided at the national level. Because of the diversity of working methods, local statistics are not relevant to compare. At the national level, only similar data are being compared which lower the amount of available data. (FR)
- There is a consistent lack of comparable data and very little will to improve the situation A lot of bureaucracy, non-defined legislation on a national and local level, non-existing political will (HR)
- Comparisons have been made. There are differences between countries in how a trip is defined and measured

in the different national travel surveys (which again will have consequences for how walking/cycling is measured). (NO)

- We are trying to compare mostly to make an assessment of potential for improvement, since we prepare projections of energy use. The largest difficulty is a lack of data for Slovenia. It is also difficult to find data for other countries since data is not available in Eurostat. (SI)
- In the past (10 years ago) there were sporadic activities for different cities to register the number of cyclists per municipality. There was a competition among the Slovak cities as to who registers most cyclists. There is ambiguity in distinguishing between transport cycling paths and tourist cycling paths. (SK)

Capital level:

- Only in a limited way: mostly developments, data difficult to compare due to data quality and number of counting units. (Zürich)
- Comparisons are possible based on (1) Mobilität in Städten – SrV: survey in selected German cities focusing on everyday mobility of private households (https://tu-dresden.de/die_tu_dresden/fakultaeten/vkw/ivs/srv) and Mobilität in Deutschland (MiD): which includes sub-samples at 'Länder' level (i. e. for Berlin, Hamburg, Bremen) and for different spatial categories. (Berlin)
- We compare to some extent. The problem is the lack of statistics from other regions as well (Madrid)
- Comparisons are performed. The difficulty is that the methodology used in the Oslo travel survey, is somewhat different from the national travel survey. We use the numbers from the Oslo travel survey, but when comparing the modal share with that of other cities, we need to use the numbers from the national travel survey. This is not a problem per se, but it can be hard to communicate in a comprehensible manner. (Oslo)
- Mode shares are often hard to compare due to small sample sizes. (Stockholm)
- Comparison of results between cities of Ljubljana and Maribor will be done in near future (at the moment there is an ongoing survey in Maribor). (Ljubljana)
- All the cities mentioning that they don't compare the performance with other cities/regions, give the same reason: lack of comparable data.

E.4 NEED FOR EU ACTION ON COMPARABLE STATISTICS ON WALKING AND CYCLING

Country level:

- The PEP Partnership on Promotion of Cycling (UNECE) initiated the development by 2019 of a pan-European Master For the PEP Partnership on Promotion of Cycling (UNECE) preparation of the pan-European Master Plan for Cycling Promotion, supported by guidelines and tools to assist in the development of cycling promotion policies at the national level (PEP, 2016), Europe needs:
    - to define a minimum set of indicators necessary to monitor the status of cycling;
    - to provide an overview of existing data sources and methodologies used for collecting this data;
    - to provide an overview of the current values of these indicators;
    - recommendations to survey these indicators. (BE)
- In general not. It is too challenging in comparison to the potential gain (data quality, data amount). Though some standardization to enhance comparability would be useful, e.g. a consistent definition of the modal split. (CH)
- As walking and cycling are considered as relevant components in particular of urban mobility (see EU White Paper section 2.4), respective data are required in order to monitor progress. There are already attempts and related activities in terms of harmonising national travel data including walking and cycling (i. e. Eurostat Task Force on Passenger Mobility Statistics).
- Resulting recommendations with respect to survey methodology and underlying concepts and definitions address not only data collection as such, but also post-processing and analysis of micro data. Addressees of such recommendations should not only include newcomers (countries without any NTS history), but also countries with a long tradition of NTS. In particular, the latter tend to be reluctant to implement any changes in survey design in order to maintain long national time-series. (DE)
- It is important to be clear about what is compared so that you do not compare “apples and oranges”. It is probably more relevant/realistic making a good comparison about walking compared to cycling since the cycling-culture and possibilities for cycling varies greatly in different countries. (DK)
- Statistics on walking/cycling are necessary. Since there is no data, it is difficult to select priority actions. (EE)
- Yes, all cities should be forced to collect and publish data on walking and cycling periodically to evaluate their progress towards sustainable mobility. (EL)
- Same working method to collect data. (FR)
- There is an urgent need; all statistics that would help to build a plan for improving cycling and walking. Priority is to develop guidance on collecting data about cyclist and pedestrian movements. National authorities should be obliged to insist on introducing such a system. Define the methods, tools and responsible body. (HR)
- Initiative like CityChallenge (using GPS data), in addition need for more campaigns and standardized EU regulations, guidelines for household surveys. (HU)
- There may be a greater focus on trips for any reason, where normally only the trips to go to work or school are detected. (IT)
- A common methodology of data collecting. Statistic could be published in www.ec.europa.eu/eurostat website. (LT)
- The EU should provide a definition of metrics, so that the stats become comparable indeed. (LU)
- We would be interested in the statistics on cyclists in city centres and interrelation between the number of cyclists and the developed cycling infrastructure on bridges. (LV)
- Draft guidelines for defining which trips should be collected. (NL)
- Set a standard for how to measure a trip, how to measure distance and time when different modes of transport are

combined on a trip, and then also apply new technology for measuring use of different means of transport plus distance and time with different means of transport. Try to get more precision in the measures. (NO)

- Standards are needed to define harmonised concepts with regards to walking and cycling infrastructure across EU, as well as harmonised methodology for the data collection of active modes use, including definition of the periodicity for this data collection. (PT)
- There is a need for the EU to produce harmonised statistics on walking and cycling. Actions have already been taken, by granting financial support to Member States for implementing statistical surveys on passenger mobility at national level. A set of variables appropriately defined and a common methodological approach for the production of the mentioned variables would be helpful. (RO)
- Unify the specifications on how “cycling” and “share” should be measured, and where (urban, non-urban). (SE)
- Harmonised data should be the goal. Priority actions: Definition of common methodologies for collection of data, dissemination of experiences between member states, improvement of statics in member states. There will be no data at national level unless the EU demands it. For the European Structural & Investment Funds, funding of the urban mobility, appropriate statistical data should be collected. We also see a need for comparable statistics on walking and cycling in the light of energy and transport transformation needed to reach 2050 targets - low carbon society and circular economy. It would be adequate to perform the comparison between different city sizes. (SI)
- Comparable statistics would be useful. There could e.g. be a system that could collect data from the different municipalities and aggregate them at a central level. However, to implement something like this, there would need to be some motivation for the municipalities to do so. Yes, I see a big need for comparable statistics. Main actions could be a) a report that would present the actual state of cycling and walking data in EU countries, b) guidelines or recommendations on states (and the capital cities) which data need to be collected, using what methods...c) create a database of relevant data information on cycling and walking (separate section in Eurostat transport database). (SK)

Capital level:

- People’s opinion about transport mode.
- Various data : modal share, modal split, behaviour, etc. (FR)
- Safety (accident data). (HR, HU, LT, IT, NL, SI, SE, SK)
- Road safety, security from theft, viability of bike lanes, access to the road network, intermodal parking lots, opportunity to carry your bike on public transport. Unfortunately, there are no time lines for these data, only occasional statistics. (IT)
- Lithuanian Bureau of Statistics collects the data on length of bicycle paths in Lithuania. (LT)
- Some local governments in their territories carry out some counting activities but they are irregular and non-systematic. (LV)
- The Norwegian department of safety and environment is constantly trying out new methods to measure walking and cycling (from a traffic safety perspective, primarily). Use different mobile applications, and have also developed one themselves. (NO)
- Amount of bicycles in the household, frequency of bicycle usage, mains reasons to use the bicycle, number of people in a household using public bicycle systems. (PL)
- SURS is planning to carry out a survey on passenger mobility in 2017. This survey might provide data such as: the share of walking and cycling in the total passenger mobility. (SI)

E.6 USE OF BIG DATA AND AWARENESS OF POTENTIALLY AVAILABLE BIG DATA

- Routecoach app. (Flanders and Brussels). (BE)
- Only in a few specific projects. (Zürich)
- Use: no. Awareness: In general yes, but with respect to walking and cycling no precise idea, what kind of Big Data could be used. (DE)
- There is an awareness about big data, and especially Copenhagen is collecting the data. (DK)
- Mobile positioning has been used, but not by Road Administration. (EE)
- City of Tallinn has used Endomondo app for tracking cyclists - lup.lub.lu.se/student-papers/record/4697089/file/4697138.pdf. (Tallinn)
- Big data are not currently used for now, but we expect to get them soon. (Madrid)
- The recently bike-sharing systems, don’t provide output yet but they can potentially be the basis of big data sources. (HU)
- App De Fiets! (NL)
- Work is going on, but it hasn’t been implemented yet. (NO)
- Participation in the European SPOT 2 project. But data are not yet used to produce walking and cycling statistics. (SE)

APPENDIX F

OVERVIEW OF DATA COLLECTIONS

The following tables present the summary of the response obtained in the countries consultation, and discussed in the report section 3.3.

F.1 OVERVIEW OF DATA COLLECTIONS AT COUNTRY LEVEL

TABLE 24
OVERVIEW OF DATA COLLECTIONS AT COUNTRY LEVEL

COUNTRY	COLLECTION METHOD	COLLECTION NAME	COLLECTION YEAR	COLLECTION PERIODICITY
AT	Other	Various sources		
BE	Survey	Survey on the mobility of the Belgian population (BELDAM)	2010	10 years
BE	National Census	National Census	2011	10 years
BE	Survey	Diagnostiek woon-werkverkeer	2014	3 years
BG	Survey	European Health Interview Survey (EHIS)	2014	5 years
CH	Survey	Microcensus on Travel Behaviour	2010	5 years
CY	Survey	Short Distance Passenger Mobility Survey (Cyprus Statistical Authority)	2009	irregular
CZ	National Census	National Census	2011	10 years
DE	Survey	Mobilität in Deutschland - MiD	2008	irregular
DE	Survey	German Mobility Panel	2015	yearly
DK	National Census	The Danish National Travel Survey	2014	yearly
EE	Survey	Estonian Labour Force Survey	2015-2016	quarterly
EL	Survey	Time Use Survey (Hellenic Statistical Authority)	2013-2014	none
ES	Survey	Barometro de la Bicicleta en Espana (La Red de Ciudades por la Bicicleta)	2015	irregular
ES	National Census	National Census	2011	10 years
FI	Survey	Finish National Travel Survey	2010-2011	5 years
FR	Traffic counts	Plateforme Nationale des Fréquentations	real time	real time
FR	National Census	National Census	2012	yearly
FR	Survey	French national travel survey	2008	10 to 15 years
HR	National Census	National Census	2011	10 years
HU	Traffic counts	Országos Közúti Keresztmetszeti Forgalomszámlálás (OKKF)	2014	yearly
HU	National Census	National Census	2011	10 years
HU	Survey	National Cycling Survey	2015	once
IE	Survey	National Travel Survey	2014	5 years
IT	Survey	Survey on mobility behavior of Italian citizens (ISFORT)	2015-2016	yearly
LU	Survey	Sondage Mobilité Douce du MDDI	2014	3 years
LV	Survey	Mobility survey of Latvian population	2008	3 years
MT	Survey	National Household Travel Survey	2010	10 years approx.
MT	Traffic counts	National Bike Count	2015	1 to 2 years
MT	Survey	Cyclists Consultation Conference	2016	none
NL	Survey	Onderzoek Verplaatsingen in Nederland (OViN)	2015	yearly

COUNTRY	COLLECTION METHOD	COLLECTION NAME	COLLECTION YEAR	COLLECTION PERIODICITY
NL	Big data	App de Fiets!	real time	real time
NL	Traffic counts	Annual bicycle count during one week in September	2015	yearly
NO	National Census	Den nasjonale reisevaneundersøkelsen	2013-2014	4 years
PL	Survey	Pilot study on transport behavior of the population in Poland	2015	10 years
PT	National Census	National Census	2011	10 years
SE	Survey	National Travel Survey (RVU)	2015	irregular
SI	Survey	Research on energy efficiency in households (REUS)	2015	irregular
SI	National Census	National Census	2002	none
SI	Other	Data estimation based on Central European Transport (CETRA) model.	2011	none
SK	Survey	Transport Mobility Survey	2015	irregular
SK	Traffic counts	National traffic counts	2015	5 years
SK	National Census	National Census	2011	10 years
UK_E	Survey	National Travel Survey	2014	yearly
UK_E	National Census	National Census	2011	10 years

SOURCE
Own elaboration based on the countries consultation

F.2 OVERVIEW OF DATA COLLECTIONS AT CITY LEVEL

TABLE 25
OVERVIEW OF DATA COLLECTIONS AT CITY LEVEL

COUNTRY	CITY	COLLECTION METHOD	COLLECTION NAME	COLLECTION YEAR	COLLECTION PERIODICITY
AT	Vienna	Survey	Omnitrend - mobility survey	2014	yearly
BG	Plovdic	Survey	Feasibility studies for structuring the Component "Design and construction of bike lanes"	2010	none
BG	Sofia	Traffic counts	Counting of cyclists's flows in Sofia-city, Bulgaria	2015	2-3 years
CH	Zürich	Survey	Ergebnisse des Mikrozensus Mobilität und Verkehr 2010	2010	5 years
CZ	Prague	Survey	GfK, Cyklistická doprava v Praze	2012	irregular
DE	Berlin	Survey	Mobilität in Deutschland - MiD	2008	irregular
DK	Copenhagen	Survey	The National Travel Survey + a survey answered by randomly selected Copenhageners	2014	
EE	Tallinn	Survey	Annual Tallinn Residents' Survey	2015	yearly
ES	Madrid	Traffic counts + Survey	Mobility Household Survey (Survey 2004 - yearly updates based on counts)	2014	yearly
FI	Helsinki	Survey	Helsinki Mobility Habits	2015	yearly
FI	Helsinki	Survey	National Travel Survey	2011	5 years
FR	Paris	Survey	Enquête Globale Transport (STIF-OMNIL-DRIEA)	2010	10 years

COUNTRY	CITY	COLLECTION METHOD	COLLECTION NAME	COLLECTION YEAR	COLLECTION PERIODICITY
HR	Zagreb	National census	National Census	2012	10 years
HR	Zagreb	Survey	EU Project Presto (survey with student population)	2011	none
HR	Zagreb	Traffic counts	Bike totem	2015	real time
HR	Zagreb	Survey	Zagreb Transport Master Plan	1998	none
HR	Zagreb	Traffic counts	CIVITAS Elan (manual cycling traffic counts)	2016	none
HU	Budapest	Survey	Budapest Household Survey (2004)	2001	yearly
HU	Budapest	Traffic counts + Survey	BKK Household survey and traffic counts (2014)	2014	none
HU	Budapest	National census	National Census (2011)	2011	10 years
HU	Budapest	Survey	TNS Hoffman (2015)	2015	yearly
IT	Rome	Survey	Mobility survey year 2013 Rome Municipality	2013	4 - 5 years
LT	Vilnius	Survey + Big data + Traffic counts	Vilnius city bicycle trails special plan	2014	6 years
LV	Riga	Survey	PTP - Cycle project in Riga	2015	irregular
NL	Amsterdam	Survey	Onderzoek Verplaatsingen in Nederland (OViN)	2015	yearly
NO	Oslo	Survey	Travel survey for Oslo (ORVU)	2013	4 years
NO	Oslo	Traffic counts	Automated and manual traffic counts		
PL	Warsaw	Traffic counts + Survey	Warsaw Traffic Study	2015	10 years
PL	Warsaw	Traffic counts + Survey	Warsaw Cycling Report	2015	yearly
PT	Lisbon	National census	National Census "XV Recenseamento Geral da População - Censos 2011"	2011	10 years
RO	Bucharest	Survey	Household survey for the Bucharest Urban Master Plan	2008	irregular
RO	Bucharest	Survey	Cycling on the rise	2009	none
SE	Stockholm	Survey	Resvanor i Stockhoms län 2015	2015	irregular
SI	Ljubljana	Survey	Statistical survey on travel behaviour in the Municipality of Ljubljana (MOL)	2013	10 years
SI	Ljubljana	Survey	Statistical survey on travel behaviour in the Ljubljana wider urban region (LUR)	2013	10 years
SK	Kosice	Survey	Cities for cyclist assessment	2014	irregular
UK	London	Survey	London Travel Demand Survey	2014	yearly

SOURCE
Own elaboration based on the countries consultation

APPENDIX G

NATIONAL CENSUS

The primary focus of a national census is to provide information on population and housing. In 2011, European legislation defined in detail a set of harmonised high-quality data from the population and housing censuses conducted in the EU Member States[38]. The database has mobility statistics at national and regional level, however, it does not systematically produce walking and cycling statistics. In order to assess the potential of producing comparable European active modes statistics based on national census data, three questions on active modes use were included in the country questionnaires:

- Which is the most recent year?
- What is reported in the Census with regards to walking and cycling?
- What percentage of the population cycles?

The following countries reported having walking and cycling statistics in the national census. In all cases, the information on walking and cycling refers to the modal split for daily commuting to work / school, however, the way it is recorded and reported, is not standardized:

- CZ: Modal split by number of trips over workdays (people who travel regularly to school and work). 2001-2011. Share of population that cycles: 3,1% (work and school), 7,3 % if school is excluded (most children do not cycle to school); Prague: 1,2%
- DK: 2014. Modal split for daily transport use in km and trips.
- ES: 2011. Mode of transport normally used to go to work (if more than one, select the two which cover the largest distance). Walking and cycling are separate options.
- FR: Information on walking and cycling to work or to school. 2013. Each year, a number of French cities are surveyed for the census. However, the statistics don't appear in the on-line results http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATTEF13627 (last consulted 29/07/2016).
- HR: 2011 Census collected data on "means of transport to work/school" and possible answers, among others, were: "bicycle" and "walking", so data available on walking/cycling are those on employed persons and pupils/students who walk or cycle to work/school. Employed that walk to work (2011 Census): City of Zagreb - 12.2%, County of Zagreb -9.8%. Pupils/students that walk to school (2011 Census): City of Zagreb- 43.4%; County of Zagreb- 33.6% Percentage of employed persons who cycle daily to work is 4,5%; 3.3% City of Zagreb; 2.4% County of Zagreb (2011 Census); Percentage of pupils/students who cycle daily to school is 3,0%; 1.6% City of Zagreb; 1.4% County of Zagreb (2011 Census).
- HU: 2011. Means of transport to work/school. 3.6% of the population cycles to work or school.
- IT: 2011. Means of transport to work/school. 1% of the population cycles to work or school.
- LU: 1997 (next one planned for 2017). Do you own a bike? Did you ride your bike/walk on a workday/Saturday/Sunday (in 1997). 1,4% of the population cycled on a typical day (in 1997).
- NO: 2014. Modal spit, trip length, bike ownership.
- PT: 2011. Commuting trips (main mode). 0.5% (cycling) + 16% (walking).
- SI: 2002. 2011 doesn't include travel anymore.
- SK: 2011. Along with an origin (a residence) and a destination (an occupation), the participants marked the transport mode they use most frequently in commuting. Data are not publicly accessible and are charged.
- UK: 2011. All UK, residents >16 working, reports on method of travel to work, distance travelled (This applies to the distance in km between a person's residential postcode and their workplace postcode, measured in a straight line.). 3.1% cycling / 11.7% walking.

This always refers to commuting trips and mostly main mode only. The comparability of the percentage of the population reported walking and cycling, needs to be further assessed, as well as compared to the outcome of travel surveys.

[38] http://ec.europa.eu/eurostat/web/population-and-housing-census. Last consulted 29/07/2016

APPENDIX H

WALKING AND CYCLING TRAFFIC COUNTS

Traffic counts can be used to indicate which routes are used most, and to calculate traffic volumes. To assess the use of walking and cycling counts to calculate and or validate active modes statistics, three questions were added to the country questionnaires:

- Which counting methods used? e.g. automatic, manual, video
- Are pedestrians and cyclists counted/extracted separately?
- What is the duration of the counts?
- Which are the locations of the traffic counting points?

The following table summarizes the responses.

TABLE 26
WALKING AND CYCLING TRAFFIC COUNTS

COUNTRY	NATIONAL WALKING / CYCLING TRAFFIC COUNTS	CAPITAL NATIONAL WALKING / CYCLING TRAFFIC COUNTS
AT	-	-
BE	-	Project based/not systematic
BG	-	Sofia: › systematic › cycling only › manual by volunteers.
CH	› systematic on ausgewählte Freizeitrouten (Schweiz Mobil) › cycling only › automatic	Zürich: › systematic › walking and cycling › automatic (passive infrared for pedestrians, inductive loops for bicycle counts), video (3D, standard) if appropriate, manual control counts
CY	-	-
CZ	-	Prague: › systematic › walking and cycling › automatic + manual
DE	-	Berlin: › systematic › walking an cycling › mostly manual
DK	› systematic (cykelbarometer) › cycling only › automatic	-
EE	-	-
EL	-	-
ES	-	Madrid: › systematic in core area › walking and cycling › Manual and GPS
FI	-	-

COUNTRY	NATIONAL WALKING / CYCLING TRAFFIC COUNTS	CAPITAL NATIONAL WALKING / CYCLING TRAFFIC COUNTS
FR	› Systematic, 500 counting points, mostly out of towns, but round 150 counters are in towns › cycling only › automatic	-
HR	-	Zagreb: › systematic on main cycle path in the city centre › cycling only › automatic (Bike totem)+ manual
HU	-	Budapest: › systematic › walking and cycling › automatic fixed and mobile + manual
IE	-	
IT	-	Rome: › systematic › walking and cycling › automatic
LT	-	Vilnius: › systematic in city center › walking and cycling › automatic (video detectors, GPS) + manual
LU	› systematic › cycling only › automatic counters in the cycle lane on strategic points	
LV	-	Riga: › systematic on bridge permanently, at intersections when appropriate › cycling. Pedestrians are counted separately if needed for street construction works. › automatic + manual
MT	› systematic, morning rush hour › cycling only › manual (4 points)	
NL	› systematic › cycling only At national level, there is an annual bicycle count during one week in September, together with Flanders (Belgium). During this count manual and automatic counting methods are used. There is also an app that cyclists can download on their smartphone, and which is used to track cycle trips and calculate statistics. Data are available from the NL Cycling association	Amsterdam: › systematic on intersections and key cycle path segments › cycling only

COUNTRY	NATIONAL WALKING / CYCLING TRAFFIC COUNTS	CAPITAL NATIONAL WALKING / CYCLING TRAFFIC COUNTS
NO	-	Oslo: › systematic › walking and cycling › automatic + manual There are about 35 places with fixed, automatic counting of cyclists today, and the number will increase to more than 40 within this year (2016) There are three places with automatic counting of pedestrians. One of these is done by video-recording, and it also counts cyclists and cars. There are also some automatic counts that are made on a shorter basis, usually as part of a simple before-after analysis when building new infrastructure for cyclists. At one of the automatic count sites, pedestrians are counted separately. At one place both pedestrians and cyclists are counted, and at another place pedestrians, cyclists and cars are counted.
PL	-	Warsaw: › systematic in various locations (over 200 points) › cycling only › manual
RO	-	-
SE	-	Stockholm: › systematic › walking and cycling › automatic (pneumatic tubes, video, loops) + manual
SI	-	Ljubljana: › systematic › cycling only › automatic (10 fixed cycling counters)
SK	› Systematic (every 5 y). › Cycling only National traffic counts in 2015 in connection with E-Road Traffic Census. The methodology was manual traffic count in combination with the data from permanent automatic traffic counts	Kosice: › systematic on cycling routes, in city centre and pedestrian zone › cycling only › manual
UK	-	-

SOURCE
Own elaboration based on the countries consultation

APPENDIX I

THE GEODATABASE

The comparative overview of walking and cycling use was produced based on the response of P2 – Use of Active modes – statistics in the questionnaire. The tables per country were further processed into a summary table in the country reports. These summary tables give an overview of all the available statistics found on: average daily distance walked and cycled (in pkm/day), number of walking and cycling trips (in trips/day/person), percentage of the population cycling, and statistics on walking and cycling infrastructure. An example is presented in Figure 35. While the summary tables can contain more than one number for the same indicator, for example one based on NTS, another from census, the comparative overview is based on a geodatabase which cannot contain more than one number for the same indicator. A selection was made, preferably the most recent and the most representative statistic of the mobile population (e.g. not limited to commuter related trips), but also by interpretation of which numbers are the most credible based on the available description in the country report. This implied a blunder of apparent outliers, in some cases minor calculations (e.g. pkm/week instead of pkm/day), and eventually clarification from the country researchers. The selected statistics for the geodatabase are highlighted in the summary tables. When needed, footnotes explain the choice.

The geodatabase was developed in ArcGIS and compiled from the selected statistics from MOVE5-24_CITY_City Name_XX and MOVE5-24_COUNTRY_XX, as represented in Figure 37. The 5 geodatabase tables were compiled by combining the statistics of the country and city summary tables in 5 themes.

In the following sections, only the data from the geodatabase used to produce a first comparative overview on walking and cycling in 30 European countries and their capital, is presented. In some cities, the walking or cycling statistics provided don't refer to exactly the same area; in those case a different city code is given. For example, SI001C1 refers to the Municipality of Ljubljana, while SI001K1 refers to Ljubljana wider urban region.

[39] MOVE5-24_CITY_City Name_XX and MOVE5-24_COUNTRY_XX, compiled by the country researchers based on the consultation of national contacts in task 2

FIGURE 35
SUMMARY TABLE, TEMPLATE

NATIONAL SURVEYS

	Survey name	*Year*

CITY-LEVEL SURVEYS

	Survey name	*Year*

Walking: average daily distance travelled per person

	Distance	Unit	Population	Year
Country				
City				

Walking: average number of trips per day

	Number	Unit	Population	Year
Country				
City				

Cycling: average daily distance travelled per person

	Distance	Unit	Population	Year
Country				
City				

Cycling: average number of trips per day

	Number	Unit	Population	Year
Country				
City				

Statistics on cycling infrastructure (km), by the type of infrastructure

	Country	City
Cycle track		
Cycle street		
Bus and cycle lane		
Contraflow cycling		
Cycle lane		
Advisory cycle lane		
Total		

Reasons for (not) using data in the comparisons and maps:

FIGURE 36
THE LINK BETWEEN THE QUESTIONNAIRE AND THE GEODATABASE TABLES

P2. USE OF ACTIVE MODES – STATISTICS

2.1 Walking

2.1.2 Please provide us with the **most recent data on Walking**

	Average daily distance travelled per person			Average number of trips per day		
	Distance	Unit	Year	Number	Unit	Year
2.1.2.1		pkm/day			trips/day	
2.1.2.2		other?			other?	
2.1.2.3						
2.1.2.4						
2.1.2.5						
2.1.2.6						

2.2 Cycling

2.2.3 Please provide us with the **most recent data on Cycling**

	Average daily distance travelled per person			Average number of trips per day		
	Distance	Unit	Year	Number	Unit	Year
2.2.2.1		pkm/day			trips/day	
2.2.2.2		other?			other?	
2.2.2.3						
2.2.2.4						
2.2.2.5						
2.2.2.6						

2.2.4 Whats is the percentage of the population Cycling in the country?

GEODATABASE TABLES

AM_walking_pkm
Average km per person per day

AM_walking_tips
Average number of trips per person per day

AM_cycling_pkm
Average km per person per day

AM_cycling_tips
Average number of trips per person per day

AM_cycling_population
What is the cycling population?

For each theme, a map was produced (Table 27):

TABLE 27
OVERVIEW OF THE GEODATABASE TABLES AND MAPS OF THE COMPARATIVE OVERVIEW OF WALKING AND CYCLING

GEO-DATABASE TABLE	MAP
AM_walking_pkm (Figure 37)	Walking in the city/country (pkm/day) (Table 7, Table 8) and the map representing the average pkm/day walking (Figure 11), show that normal walking behaviour in Europe ranges between 0.5 kilometres per day (in Cyprus and Ireland) and more than 2 kilometres per day (in Italy, Latvia, Norway and Switzerland). The differences may reflect different walking behaviour (due to culture, urbanisation,), yet they may also be due to different data collection methods, such as including walking for professional purpose (i.e. mail delivery, tourist guides), or including leisure activities such as hiking. In most countries people tend to walk more in cities. There are exceptions where the opposite is the case: for example, Rome vs. the average for Italy, Oslo vs. the average of Norway. In Switzerland recreational walking is included in the statistics. This may explain the high values. In Belgium and the Netherlands this could be related to the importance of cycling in cities: people use the bicycle for short trips instead of walking.
AM_walking_tips (Figure 38)	Walking in the city/country (trips/day) - The reported average numbers of walking trips/day are quite similar across Europe, mostly less than 1, meaning people don't walk every day, except for Slovakia and Italy (Figure 12). The data indicate that people take more walking trips per day in cities. However, because many countries have the trip data only at country or at city level, the European map of average number of walking trips/day is not suited for statistical comparisons.
AM_cycling_pkm (Figure 39)	Cycling in the city/country (pkm/day)
AM_ cycling _tips (Figure 40)	Cycling in the city/country (trips/day)
AM_cycling_ population (Figure 41)	Cycling population in the city/country (%)

SOURCE
Own elaboration based on the countries consultation

The legend classes in the maps are manually defined. The symbols use a logarithmic scale to accentuate the differences between countries. City and country statistics have a different colour, the smallest symbol is placed on top of the largest.

FIGURE 37
THE LINK BETWEEN THE GEODATABASE AND THE MAP WALKING IN THE CITY/COUNTRY

WALKING IN THE CITY / COUNTRY: PKM/DAY

P2. USE OF ACTIVE MODES – STATISTICS
2.1 Walking
2.1.2 Please provide us with
the **most recent data on Walking**

COUNTRY

	Average daily distance travelled per person		
	Distance	Unit	Year
2.1.2.1		pkm/day	
2.1.2.2		other?	
2.1.2.3			
2.1.2.4			
2.1.2.5			
2.1.2.6			

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

P2. USE OF ACTIVE MODES – STATISTICS
2.1 Walking
2.1.2 Please provide us with
the **most recent data on Walking**

CITY

	Average daily distance travelled per person		
	Distance	Unit	Year
2.1.2.1		pkm/day	
2.1.2.2		other?	
2.1.2.3			
2.1.2.4			
2.1.2.5			
2.1.2.6			

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

GEODATABASE TABLES

AM_walking_pkm
Average km pp per day

CNTR_ID
country_average
country_unit
country_population
country_year
city_average
city_unit
city_population
city_year

MAP LAYERS

AVERAGE DISTANCE (KM) PER PERSON PER DAY (COUNTRY LEVEL)
country_average

- 0.558–1.000
- 1.001–1.500
- 1.501–2.000
- 2.001–2.500
- 2.501–3.000
- 3.001–3.500
- 3.501–4.000

AVERAGE DISTANCE (KM) PER PERSON PER DAY (CITY LEVEL)
AM_walking_pkm.city_average

- 0.266–0.500
- 0.501–1.000
- 1.001–1.500
- 1.501–2.000
- 2.001–2.500
- 2.501–3.000
- 3.001–3.500
- 3.501–4.000

FIGURE 38
THE LINK BETWEEN THE GEODATABASE AND THE MAP WALKING IN THE CITY/COUNTRY (TRIPS/DAY)

WALKING IN THE CITY / COUNTRY: TRIPS/DAY

P2. USE OF ACTIVE MODES – STATISTICS
2.1 Walking
2.1.2 Please provide us with
the **most recent data on Walking**

COUNTRY

	Average number of trips per day		
	Number	Unit	Year
2.1.2.1		trips/day	
2.1.2.2		other?	
2.1.2.3			
2.1.2.4			
2.1.2.5			
2.1.2.6			

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

P2. USE OF ACTIVE MODES – STATISTICS
2.1 Walking
2.1.2 Please provide us with
the **most recent data on Walking**

CITY

	Average number of trips per day		
	Number	Unit	Year
2.1.2.1		trips/day	
2.1.2.2		other?	
2.1.2.3			
2.1.2.4			
2.1.2.5			
2.1.2.6			

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

GEODATABASE TABLES

AM_walking_trips
Average # trips pp per day

CNTR_ID
country_average
country_unit
country_population
country_year
city_average
city_unit
city_population
city_year

MAP LAYERS

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (COUNTRY LEVEL)
country_average

- 0.240–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2001–3.000

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (CITY LEVEL)
city_average

- 0.360–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2.001–3.000
- 3.001–4.000

FIGURE 39
THE LINK BETWEEN THE GEODATABASE AND THE MAP CYCLING IN THE CITY/COUNTRY (PKM/DAY)

CYCLING IN THE CITY / COUNTRY: PKM/DAY

P2. USE OF ACTIVE MODES – STATISTICS
2.2 Cycling
2.2.3 Please provide us with
the **most recent data on Cycling**

COUNTRY

	Average daily distance travelled per person		
	Distance	Unit	Year
2.2.2.1	0.0	pkm/day	
2.2.2.2	0.0	other?	
2.2.2.3	0.0		
2.2.2.4	0.0		
2.2.2.5	0.0		
2.2.2.6	0.0		

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

P2. USE OF ACTIVE MODES – STATISTICS
2.2 Cycling
2.2.3 Please provide us with
the **most recent data on Cycling**

CITY

	Average daily distance travelled per person		
	Distance	Unit	Year
2.2.2.1	0.0	pkm/day	
2.2.2.2	0.0	other?	
2.2.2.3	0.0		
2.2.2.4	0.0		
2.2.2.5	0.0		
2.2.2.6	0.0		

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

GEODATABASE TABLES

AM_cycling_pkm
Average km pp per day

CNTR_ID
country_average
country_unit
country_population
country_year
city_average
city_unit
city_population
city_year

MAP LAYERS

AVERAGE DISTANCE (KM) PER PERSON PER DAY (COUNTRY LEVEL)
AM_cycling_pkm.country_average

- 0.032–1.000
- 1.001–2.000
- 2.001–3.000
- 3.001–4.000
- 4.001–5.000
- 5.001–6.000

AVERAGE DISTANCE (KM) PER PERSON PER DAY (CITY LEVEL)
AM_cycling_pkm.city_average

- 0.300–1.000
- 1.001–2.000
- 2.001–3.000
- 3.001–4.000
- 4.001–5.000

FIGURE 40
THE LINK BETWEEN THE GEODATABASE AND THE MAP CYCLING IN THE CITY/COUNTRY (TRIPS/DAY)

CYCLING IN THE CITY / COUNTRY: TRIPS/DAY

P2. USE OF ACTIVE MODES – STATISTICS
2.2 Cycling
2.2.3 Please provide us with
the **most recent data on Cycling**

COUNTRY

	Average number of trips per day		
	Number	Unit	Year
2.2.2.1	0.0	trips/day	
2.2.2.2	0.0	other?	
2.2.2.3	0.0		
2.2.2.4	0.0		
2.2.2.5	0.0		
2.2.2.6	0.0		

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

P2. USE OF ACTIVE MODES – STATISTICS
2.2 Cycling
2.2.3 Please provide us with
the **most recent data on Cycling**

CITY

	Average number of trips per day		
	Number	Unit	Year
2.2.2.1	0.0	trips/day	
2.2.2.2	0.0	other?	
2.2.2.3	0.0		
2.2.2.4	0.0		
2.2.2.5	0.0		
2.2.2.6	0.0		

P.3 TARGET POPULATION
3.5 What is the **population included** in the **sampling**?
Please select the correct answer

total population
mobile population

GEODATABASE TABLES

AM_cycling_trips
Average # trips pp per day

CNTR_ID
country_average
country_unit
country_population
country_year
city_average
city_unit
city_population
city_year

MAP LAYERS

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (COUNTRY LEVEL)
country_average

- 0.020–0.250
- 0.251–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2.001–3.000

AVERAGE NUMBER OF TRIPS PER PERSON PER DAY (CITY LEVEL)
city_average

- 0.100–0.250
- 0.251–0.500
- 0.501–0.750
- 0.751–1.000
- 1.001–2.000
- 2.001–3.000

FIGURE 41
THE LINK BETWEEN THE GEODATABASE AND THE MAP OF THE CYCLING POPULATION IN THE CITY/COUNTRY

CYCLING POPULATION IN THE CITY / COUNTRY

P2. USE OF ACTIVE MODES – STATISTICS
2.2 Cycling
2.2.4 **What is the percentage of the population Cycling in the city?**

CITY

P2. USE OF ACTIVE MODES – STATISTICS
2.2 Cycling
2.2.4 **What is the percentage of the population Cycling in the country?**

COUNTRY

GEODATABASE TABLES

AM_cycling_population
What is the cyclingg population?

CNTR_ID
city_cyclingPop
city_cyclingPopDef
country_cyclingPop
country_cyclingPopDef

MAP LAYERS

CYCLING POPULATION IN THE COUNTRY (%)
AM_cycling_population.country_cyclingPop

- 0%–20%
- 21%–40%
- 41%–60%
- 61%–80%
- 81%–100%

CYCLING POPULATION IN THE CITY (%)
AM_cycling_population.city_cyclingPop

- 0%–20%
- 21%–40%
- 41%–60%
- 61%–80%
- 81%–100%

APPENDIX J

CYCLING INFRASTRUCTURE STATISTICS AND OPENCYCLEMAP ASSESSMENT

A general introduction to the OpenCycleMap, is presented in section 2.4. The extraction of cycling infrastructure data, requires an understanding of the coding of map features. The OSM map style rules have evolved over the years and are currently being developed in CartoCSS. Tags are applied to features of map elements and changesets. A tag consists of two items, a key and a value: key = value. The key is used to describe a topic, category, or type of feature (e.g. highway or name), the value details the specific form of the key in: free form text (e.g. highway = street name), one of a set of distinct values (e.g. highway = residential to indicate a street in a residential area), a number (e.g. maxspeed = 50). A changeset consists of a group of changes made by a single user over a short period of time include the additions of new elements to OSM, the addition of new tags to existing elements, changes to tag values of elements, deletion of tags and also deletion of elements. Edits can only be added to a changeset as long as it is still open; a changeset can either be closed explicitly, or it closes itself if no edits are added to it for a period of inactivity (e.g. one hour). Conventions are agreed on the meaning and use of tags, and are captured on the wiki.

To produce the city maps, the tags ‘cycle tracks’ and ‘cycle lanes’ were used, as well as values e.g. cycle path indicated in free form text.

FIGURE 42
VIENNA (1,222 KM) - MANY CYCLING TRACKS IN THE ENTIRE CITY

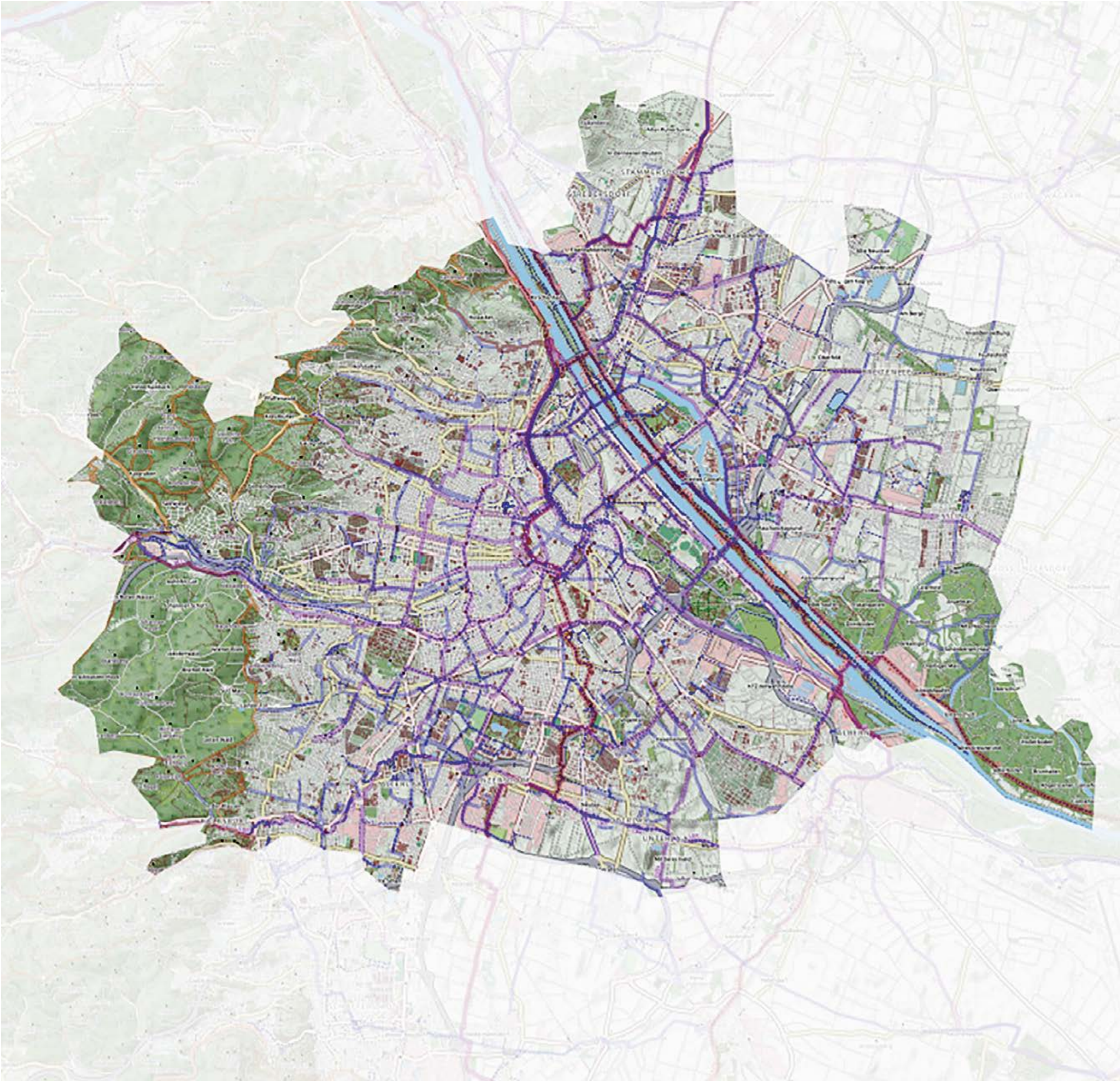


FIGURE 43
BRUSSELS (598 KM) - MANY CYCLING TRACKS IN THE ENTIRE CITY

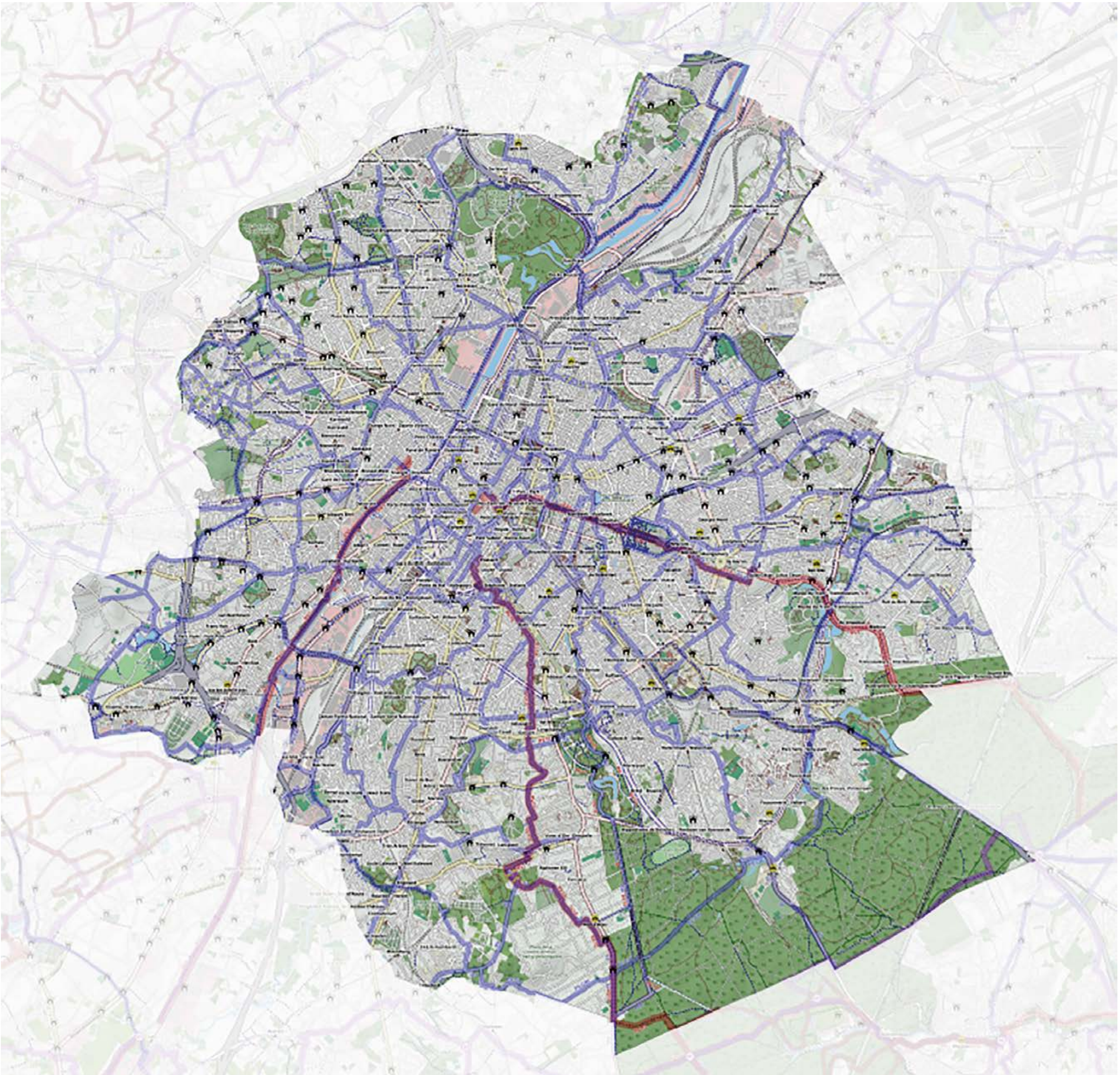


FIGURE 44
SOFIA (60 KM) – LIMITED NUMBER OF CYCLING TRACKS, SPREAD OVER THE ENTIRE CITY

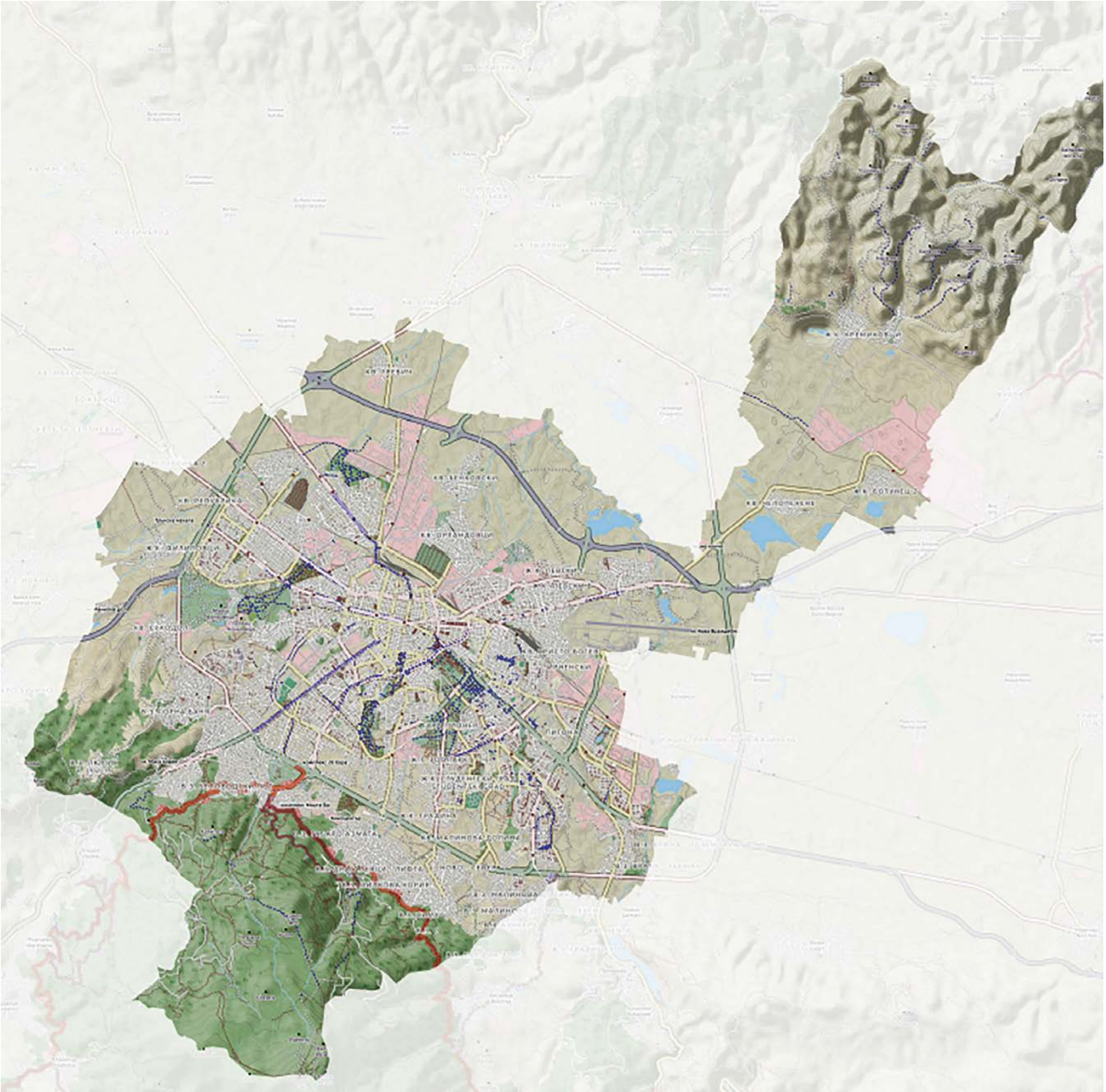


FIGURE 45
ZAGREB (250 KM) - CYCLING TRACKS MOSTLY IN THE CITY CENTRE

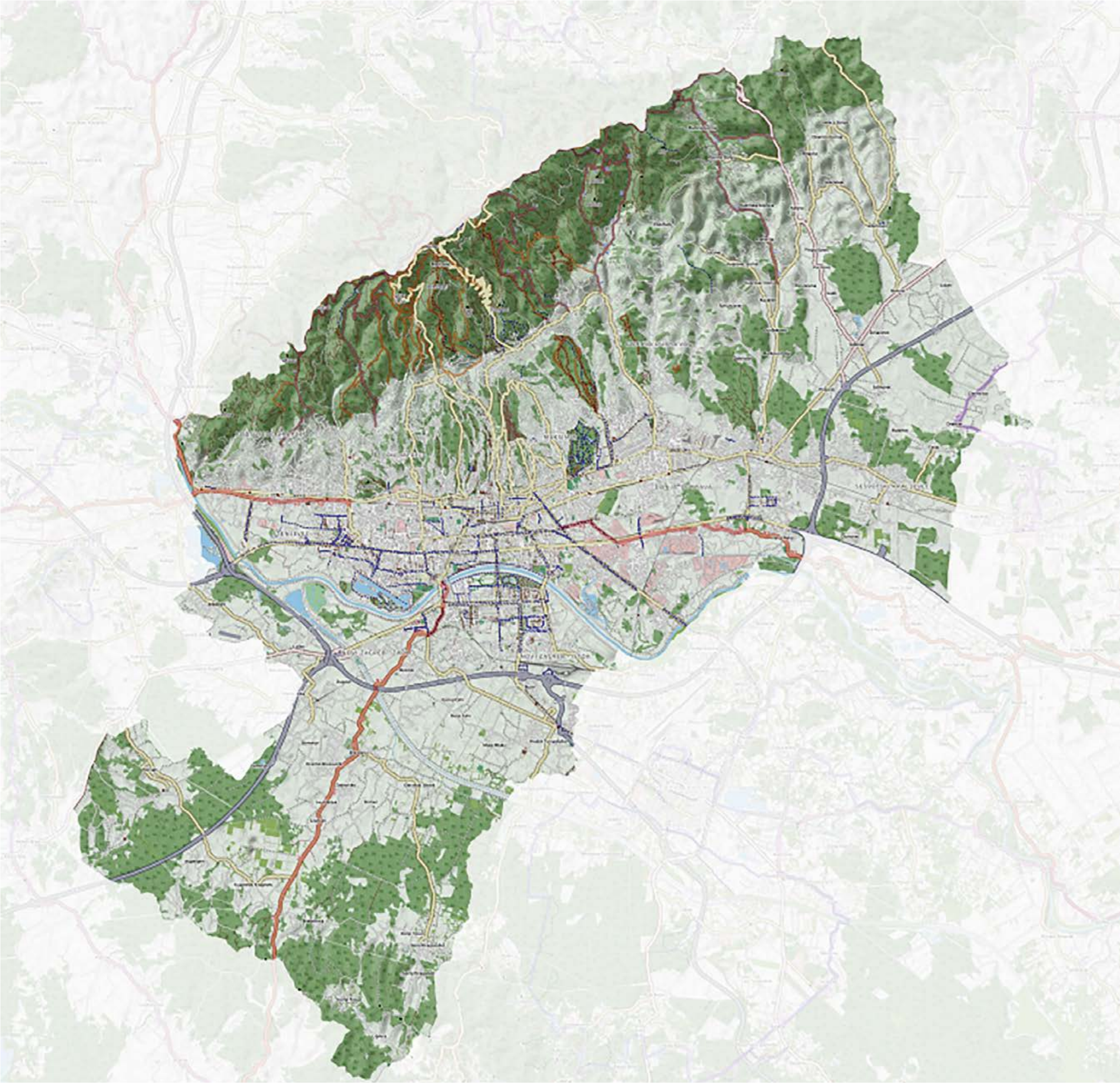


FIGURE 46
PRAGUE (454 KM) - MANY CYCLING TRACKS IN THE ENTIRE CITY

FIGURE 47
TALLINN (212 KM) - CYCLING TRACKS IN THE ENTIRE CITY

FIGURE 48
HELSINKI (1,200 KM) - MANY CYCLING TRACKS IN THE ENTIRE CITY

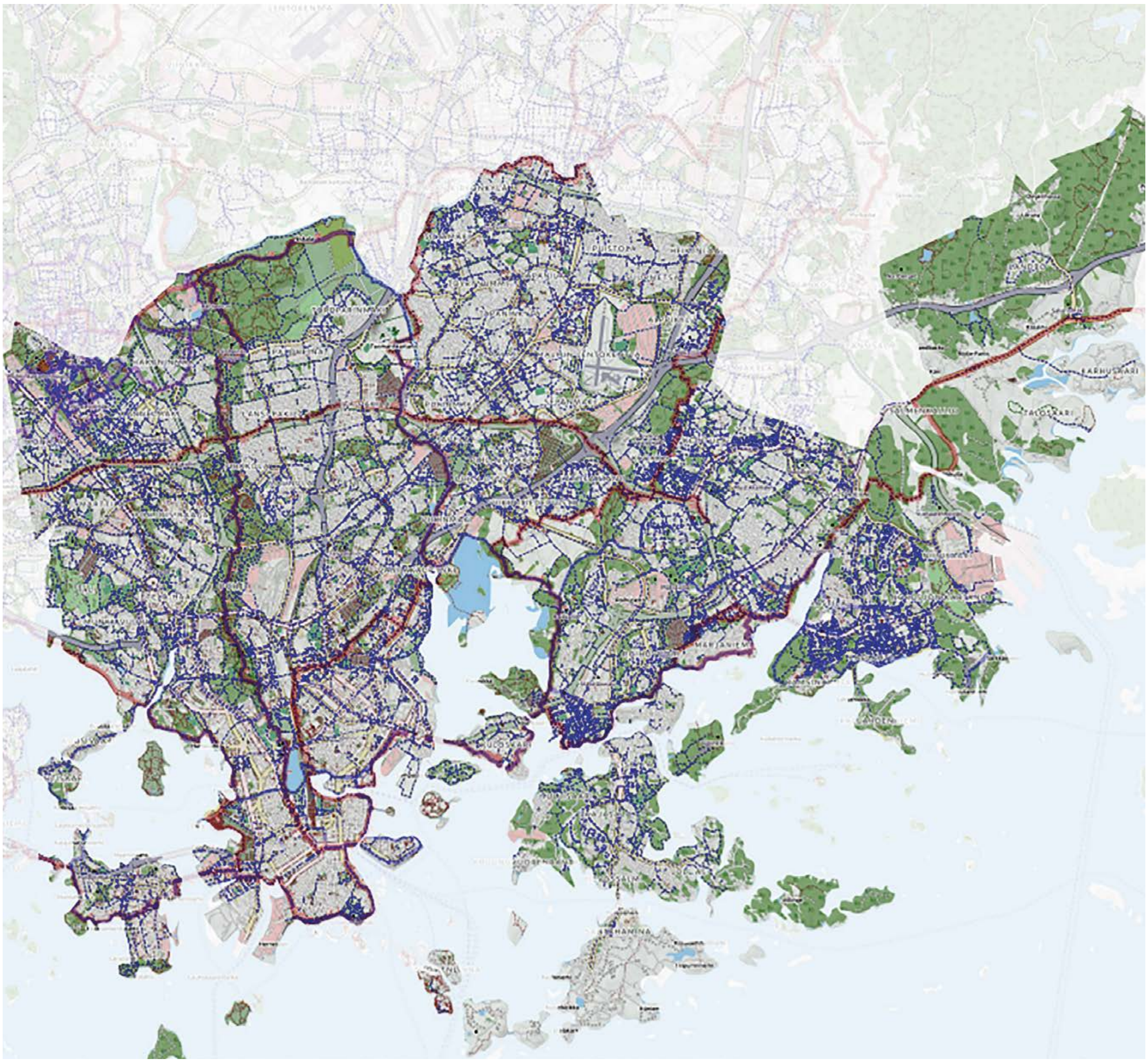


FIGURE 49
BERLIN (1,433 KM) - MANY CYCLING TRACKS IN THE ENTIRE CITY

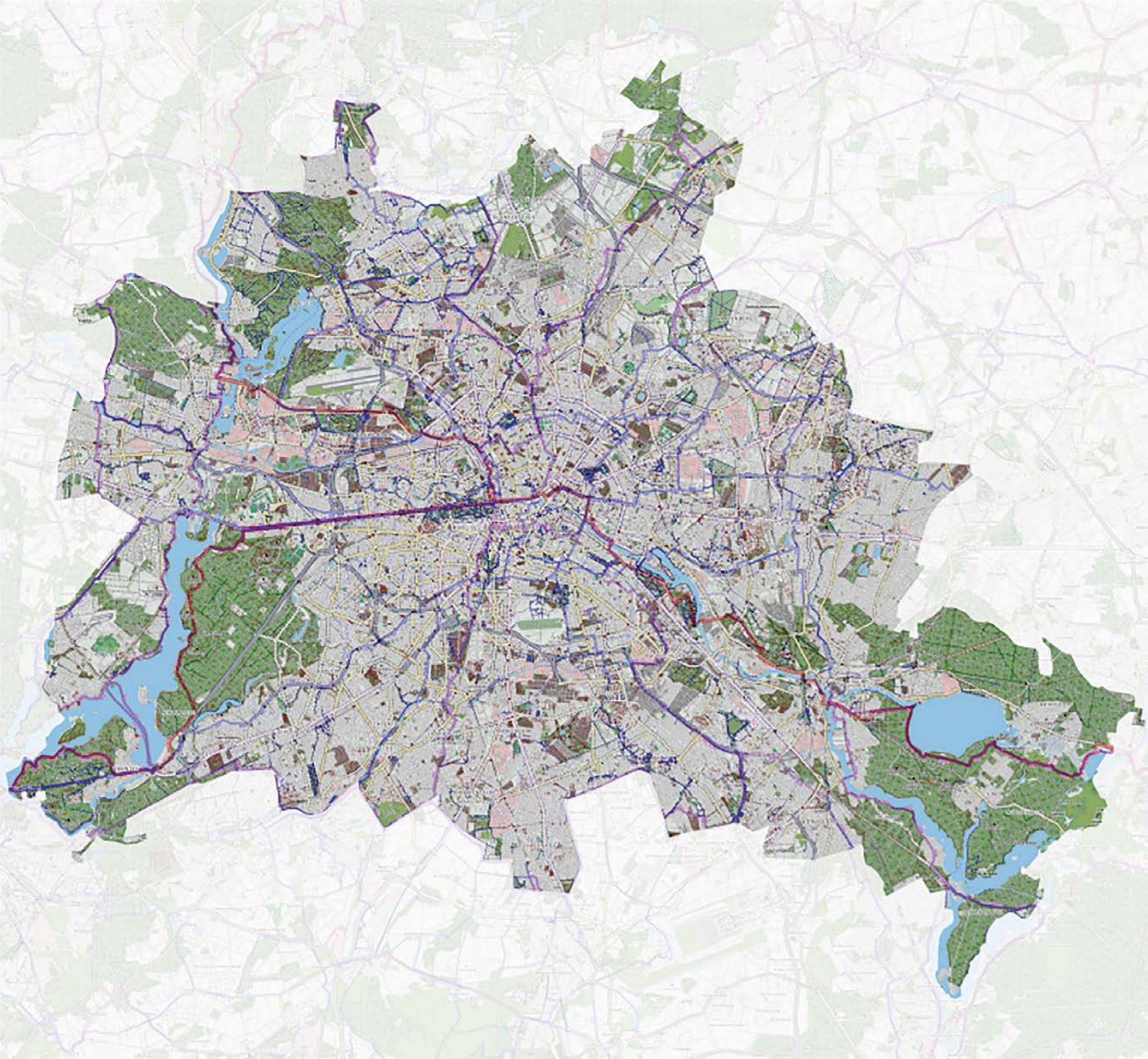


FIGURE 50

ATHENS (83 KM) –LIMITED NUMBER OF CYCLING TRACKS, SPREAD OVER THE ENTIRE CITY. THE KM PRODUCED IN THE COUNTRY REPORT WERE DERIVED FROM OSM AND PROVIDED BY OUR CONTACT POINT IN THE COUNTRY

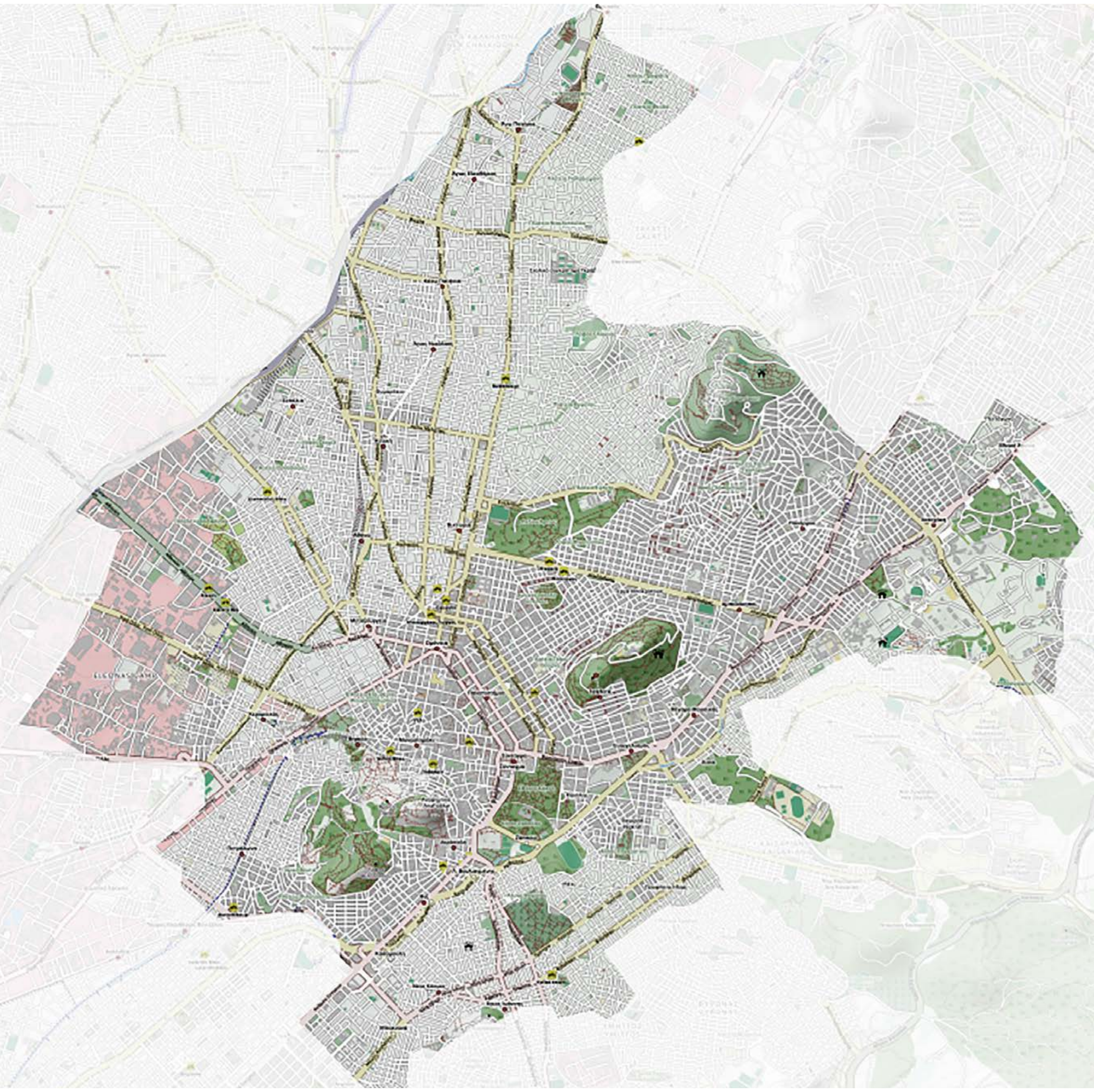


FIGURE 51
DUBLIN (170 KM) - LIMITED NUMBER OF CYCLING TRACKS, SPREAD OVER THE ENTIRE CITY, MOSTLY ALONG MAIN ROADS, IN PARKS AND ON RIVERSIDE

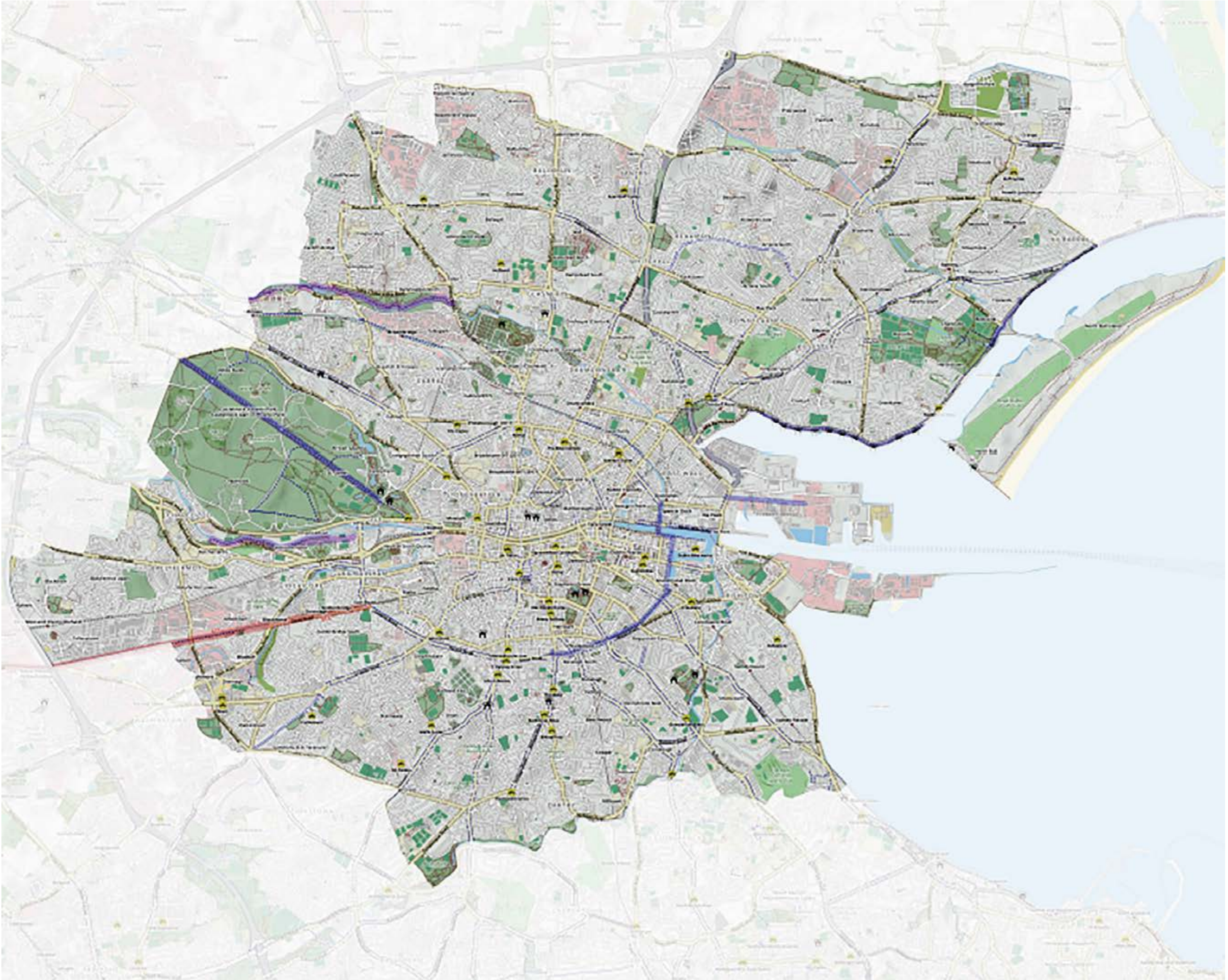


FIGURE 52
ROME (120 KM) - LIMITED NUMBER OF CYCLING TRACKS, MOSTLY ON RIVERSIDE AND CONCENTRATIONS OF FRAGMENTS IN SOME NEIGHBOURHOODS

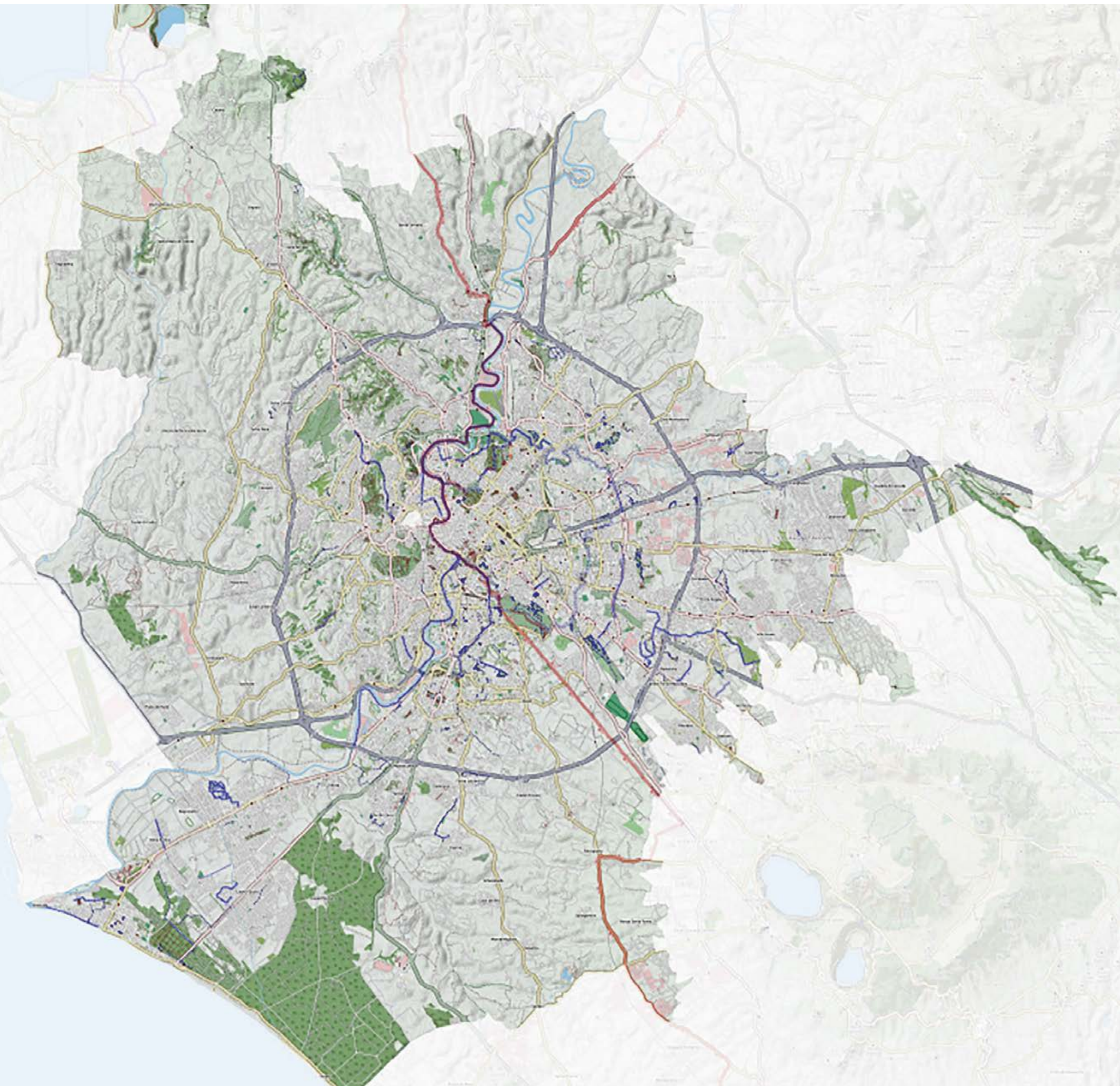


FIGURE 53
VILNIUS (139 KM) - CYCLING TRACKS IN THE ENTIRE CITY

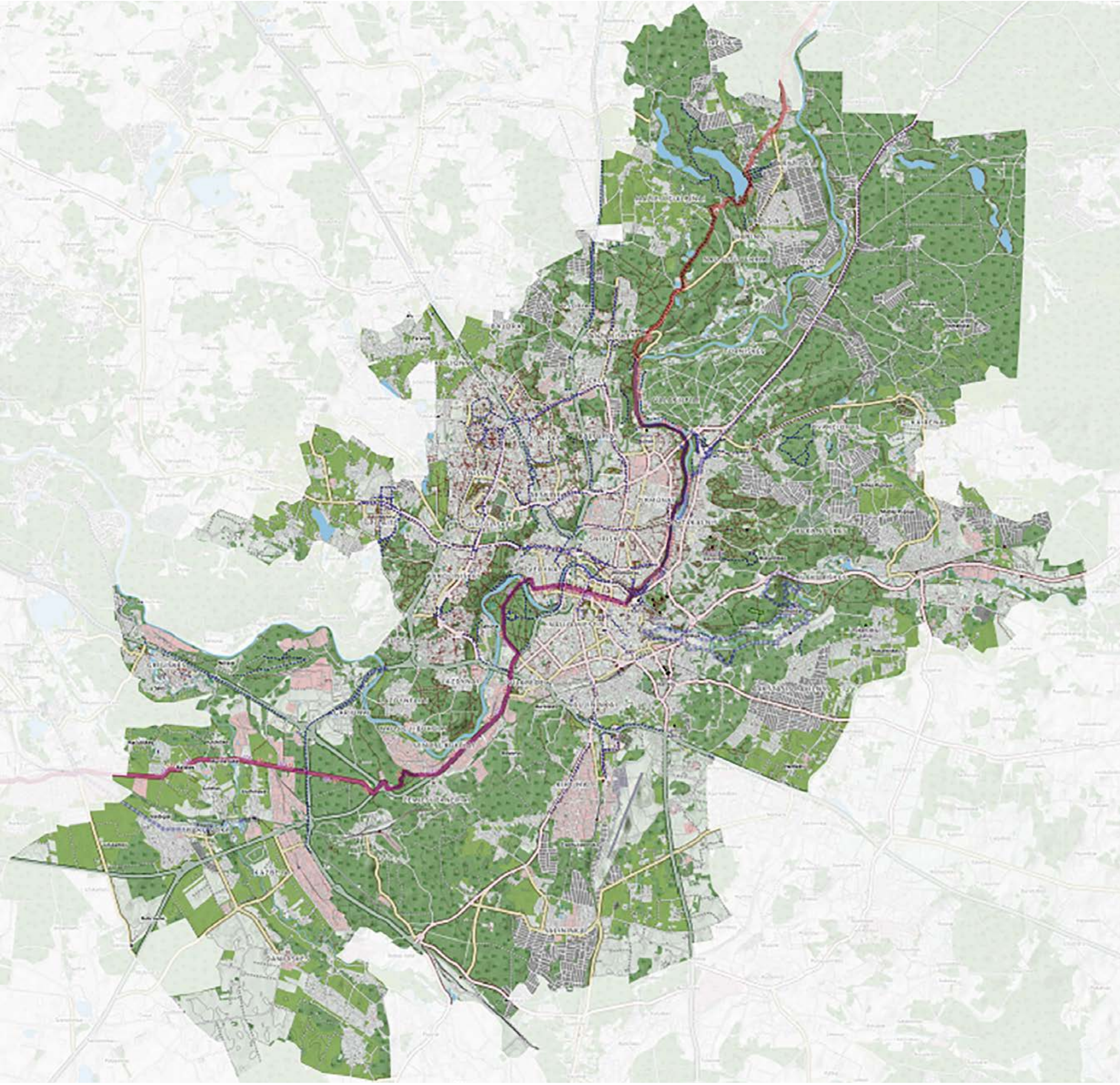


FIGURE 54
AMSTERDAM (579 KM) – MANY CYCLING TRACKS IN THE ENTIRE CITY

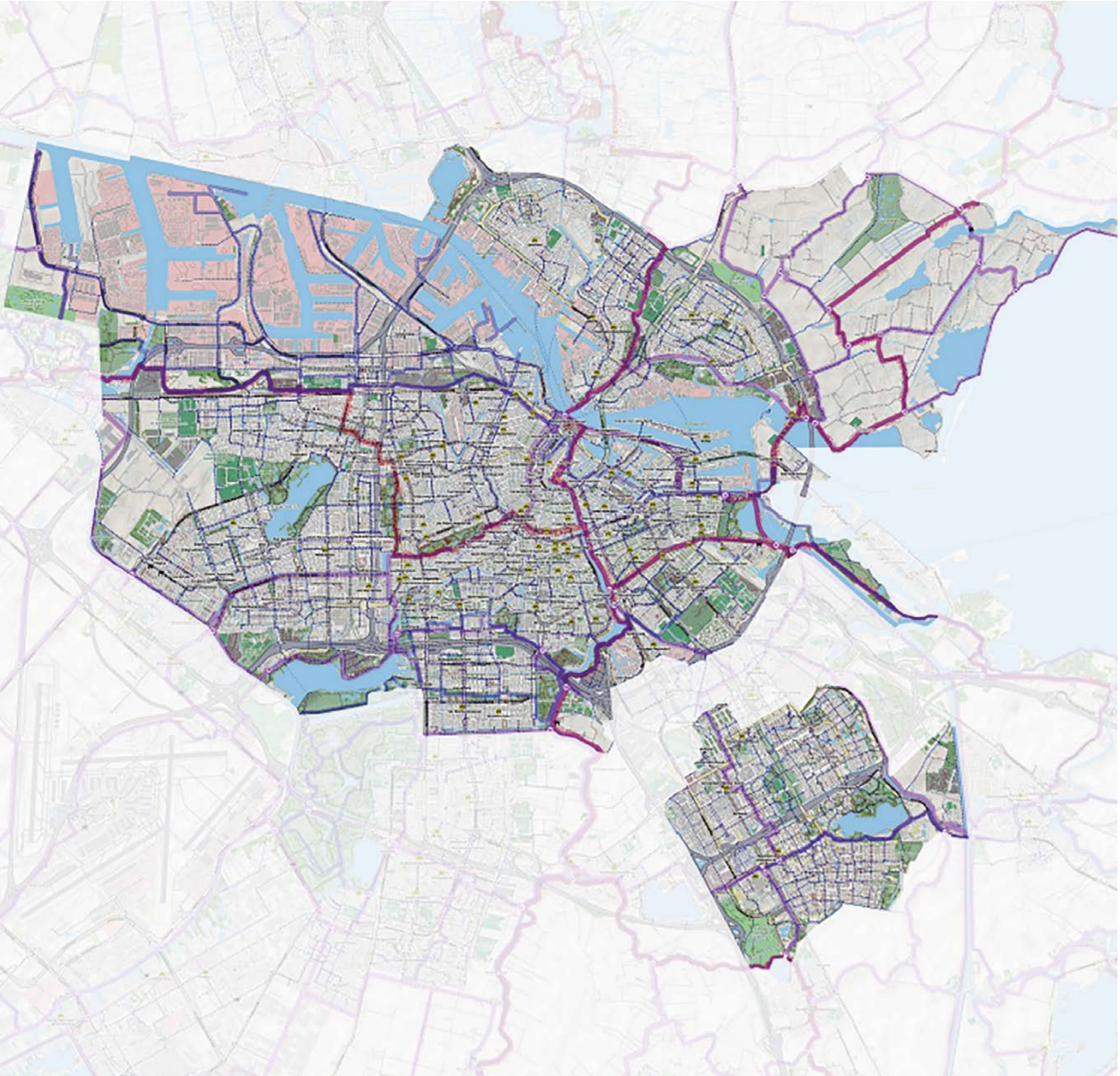


FIGURE 55
OSLO (190 KM) - CYCLING TRACKS IN THE ENTIRE CITY

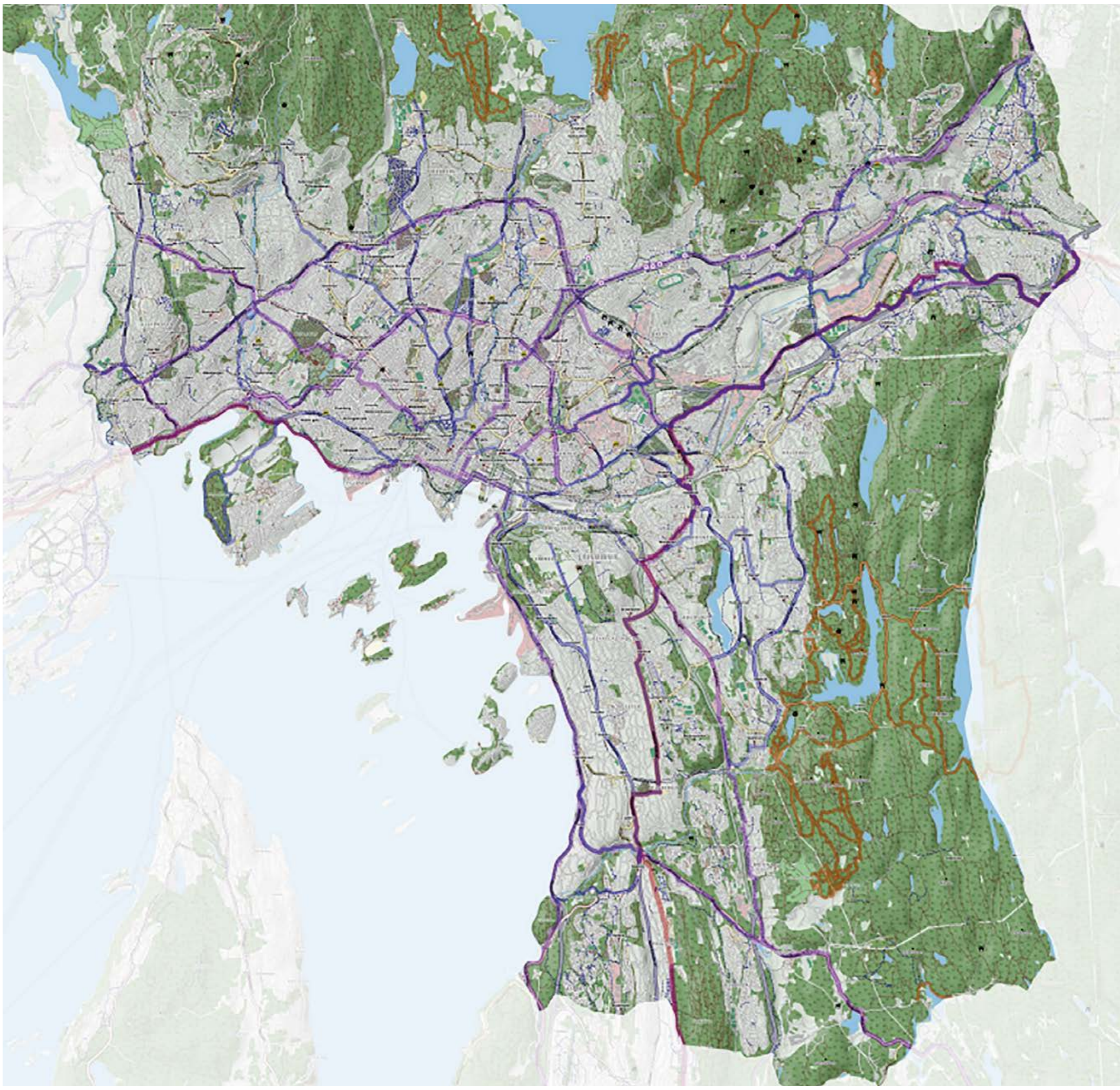


FIGURE 56
BUCHAREST (6 KM) - LIMITED NUMBER OF CYCLING TRACKS, CYCLING SERVICE POINTS ARE NOT ON STREETS WITH CYCLING TRACKS

FIGURE 57
KOSICE (23 KM) – MANY CYCLING TRACKS IN GREEN AREAS OUTSIDE THE CITY CENTRE

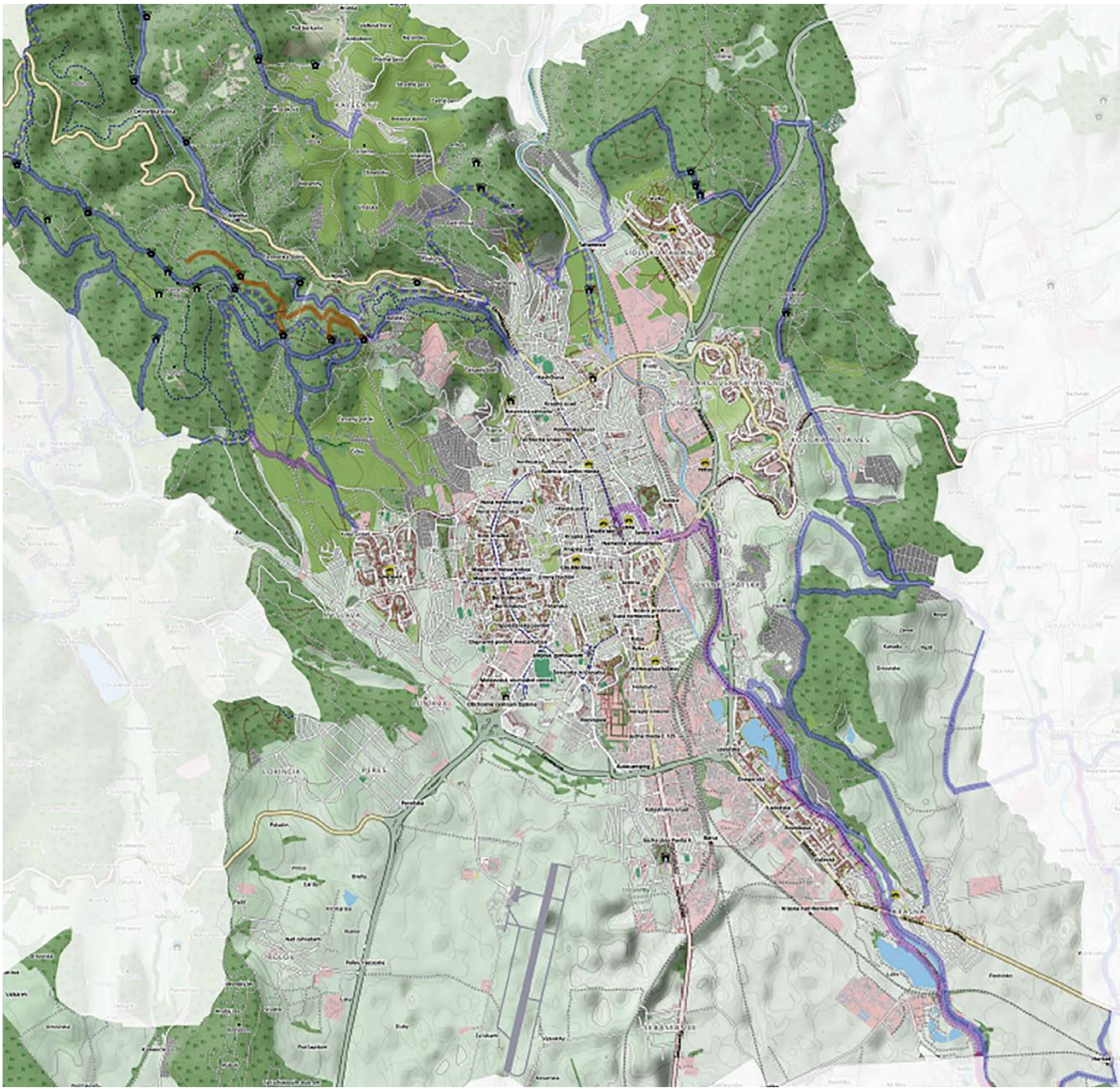


FIGURE 58
LJUBLJANA (225 KM) - CYCLING TRACKS IN THE ENTIRE CITY

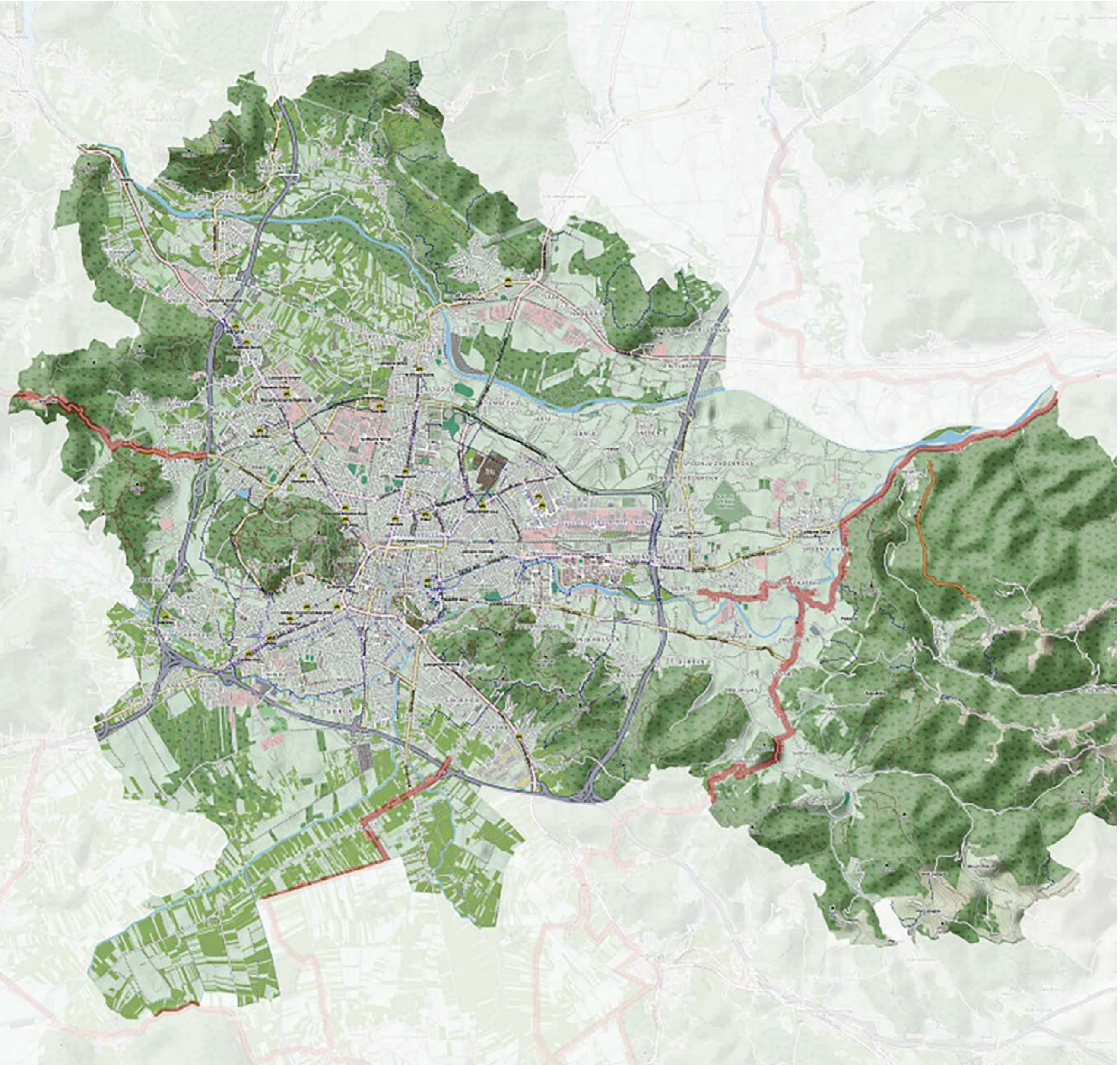


FIGURE 59
MADRID (447 KM) - CYCLING TRACKS IN THE ENTIRE CITY

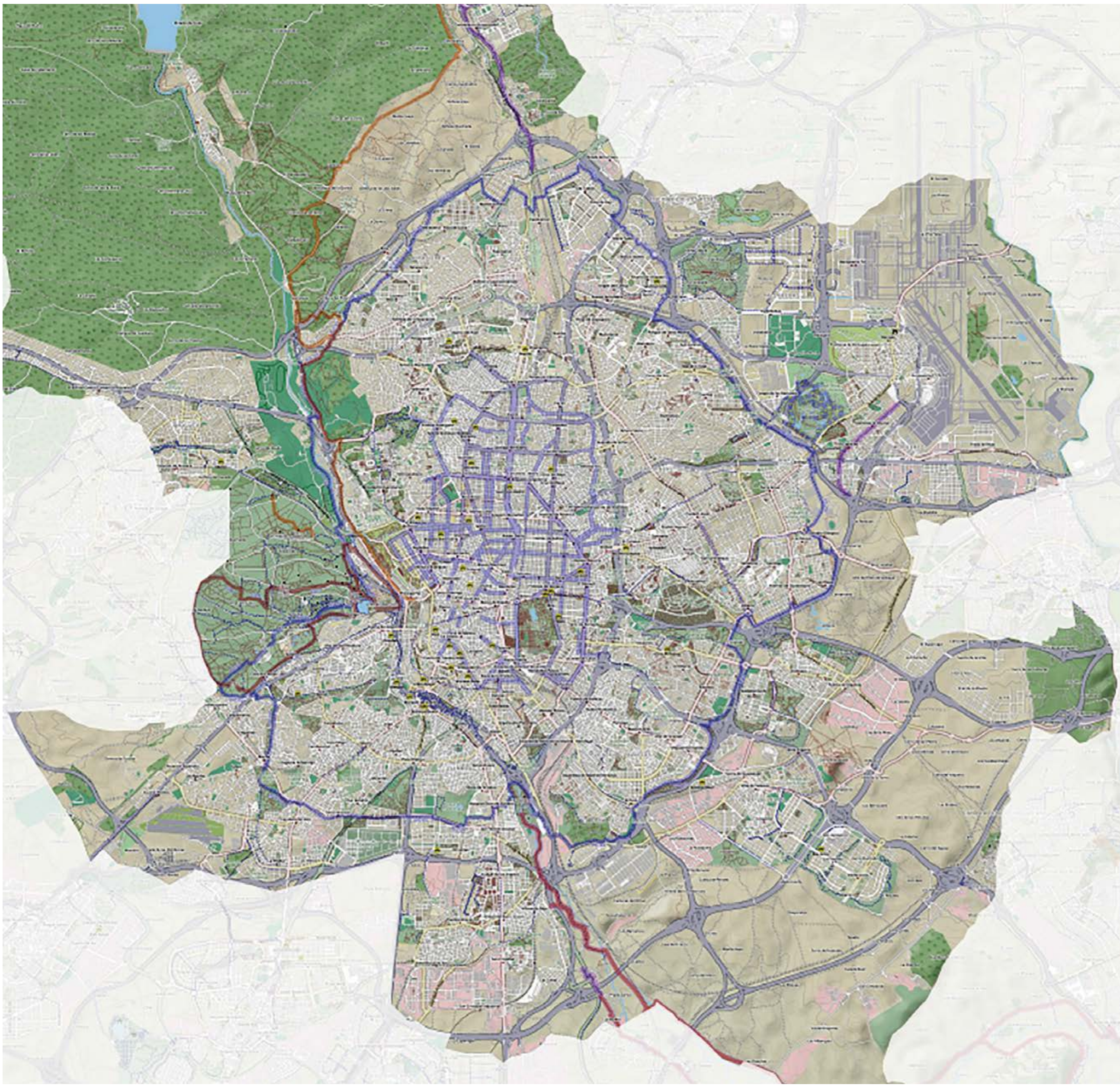


FIGURE 60
STOCKHOLM (965 KM) - MANY CYCLING TRACKS IN THE ENTIRE CITY

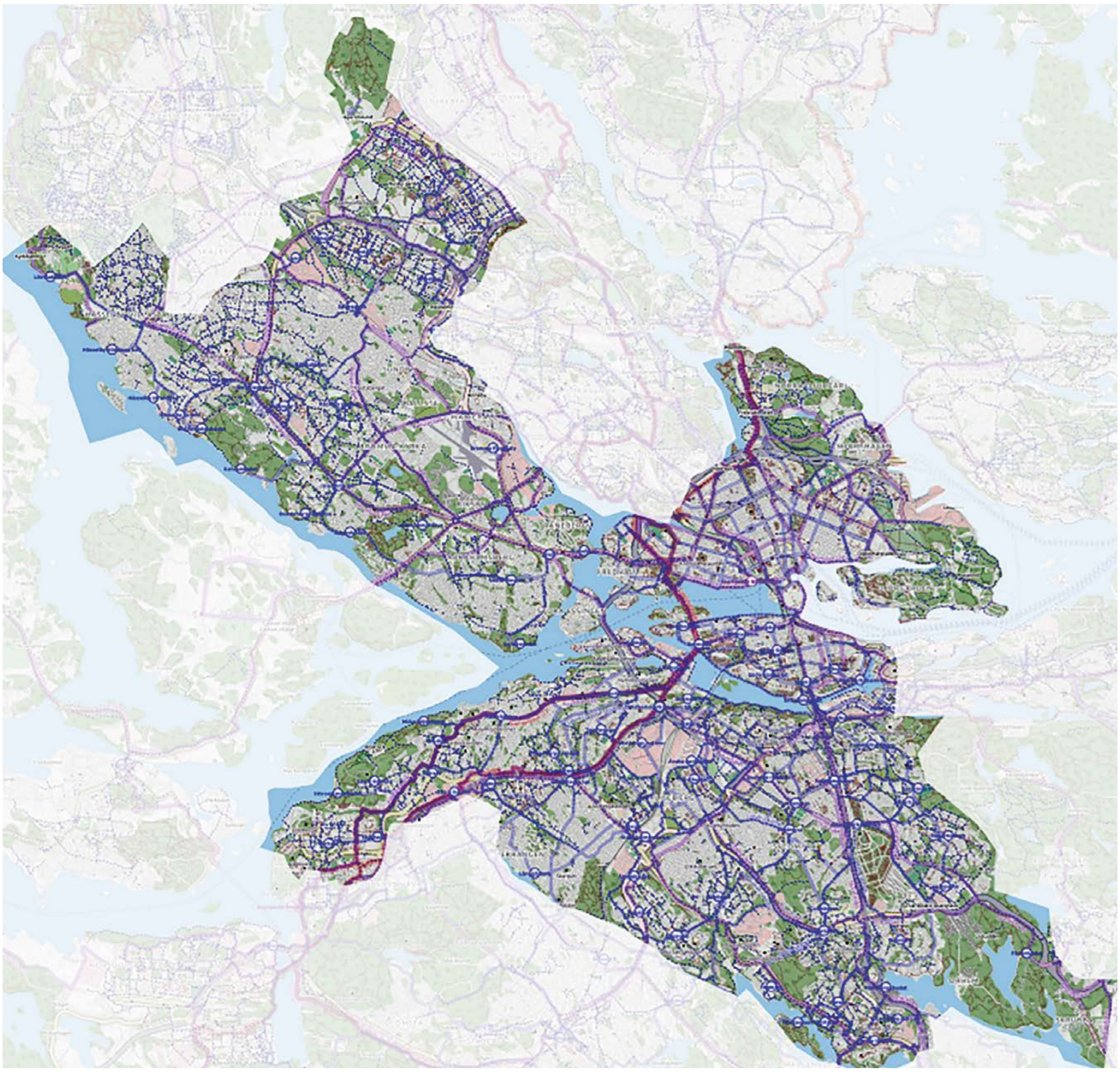


FIGURE 61
ZURICH (881 KM) - CYCLING TRACKS IN THE ENTIRE CITY

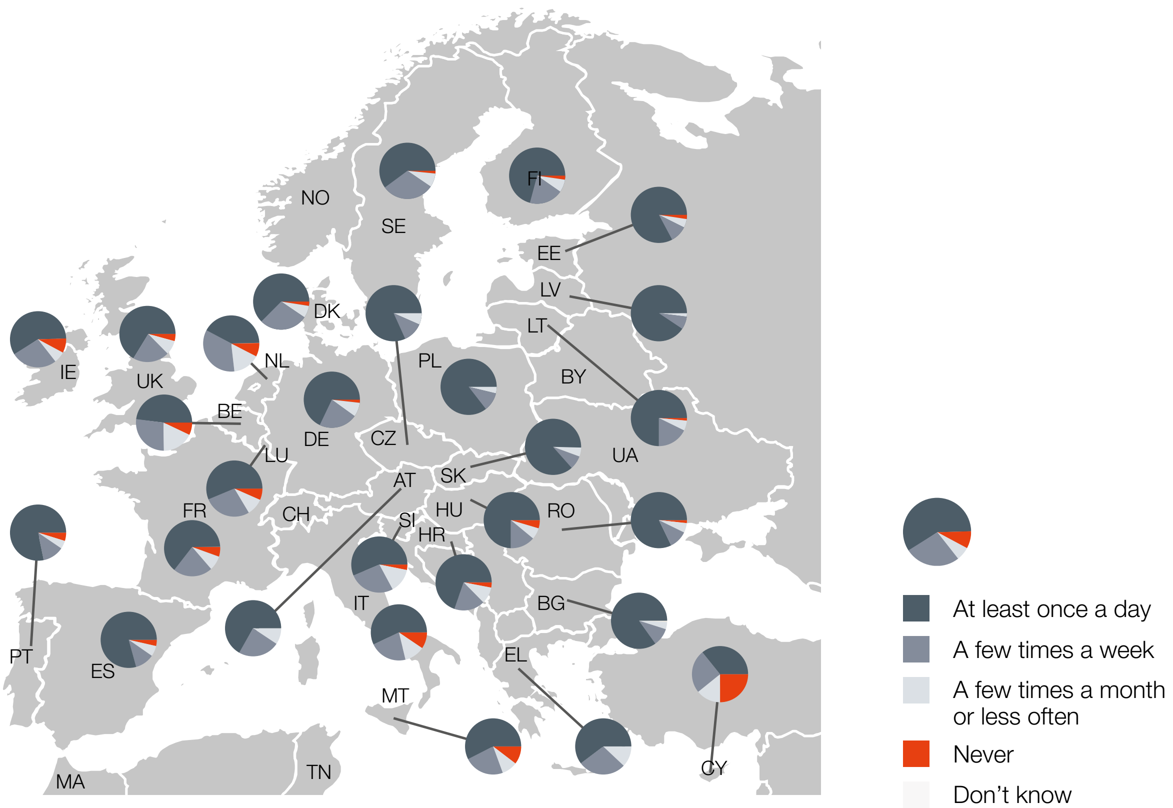
APPENDIX K

ACTIVE MODES PUBLISHED IN THE EUROBAROMETER 406, EHIS AND FLASH EUROBAROMETER 419

The active modes tables of Eurobarometer 406 and EHIS and Flash Eurobarometer 419 were used to produce a comparative overview of walking and cycling frequencies, and of walking and cycling as main modes of transport. Eurobarometer 406 and EHIS were added to the geodatabase to produce maps of the frequencies in the 30 countries involved. For the Flash Eurobarometer 419 the statistics of urban mobility at country level are presented without a map, because reference cities were different.

K.1 EUROBAROMETER 406

FIGURE 62
EUROBAROMETER 2013: WALKING FREQUENCY IN THE EU28 COUNTRIES



SOURCE
Eurobarometer 406, 2013

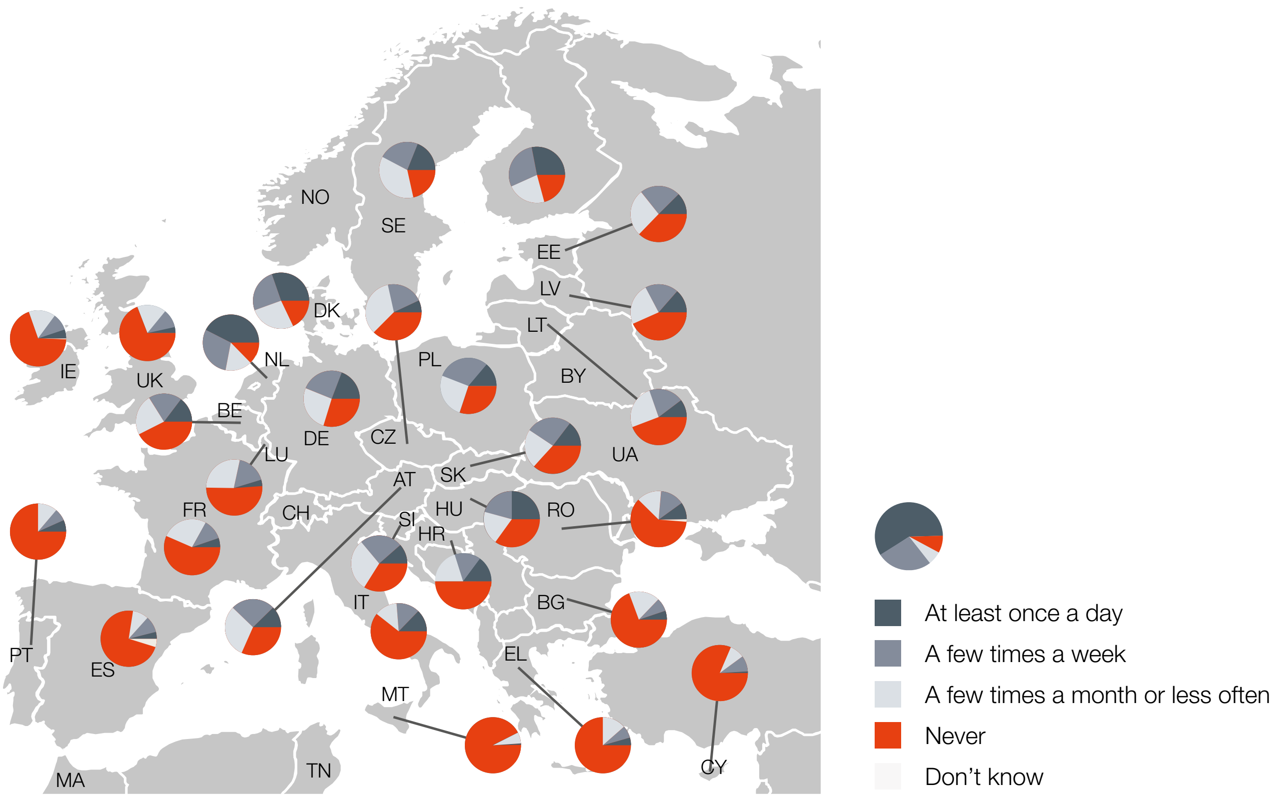
TABLE 28
WALKING FREQUENCY IN THE EU28 COUNTRIES

COUNTRY	SAMPLE SIZE	AT LEAST ONCE A DAY (%)	A FEW TIMES A WEEK (%)	A FEW TIMES A MONTH OR LESS OFTEN (%)	NEVER (%)	DON'T KNOW (%)
EU28	27,680	68	19	9	4	0
AT	1,034	66	24	9	1	0
BE	1,006	48	27	18	7	0
BG	1,025	84	10	4	1	1
CY	506	35	25	15	25	0
CZ	1,026	82	12	6	0	0
DE	1,505	68	21	8	2	1
DK	1,010	61	29	7	2	1
EE	1,008	83	10	5	2	0
EL	1,002	60	28	12	0	0
ES	1,008	78	12	5	4	1
FI	1,003	71	21	6	2	0
FR	1,053	64	22	9	5	0
HR	1,000	69	18	10	3	0
HU	1,033	74	15	7	4	0
IE	1,001	59	27	6	8	0
IT	1,025	56	22	12	9	1
LT	1,023	75	18	5	2	0
LU	502	56	27	11	6	0
LV	1,018	90	7	2	1	0
MT	500	57	23	10	10	0
NL	1,013	42	35	16	7	0
PL	1,000	85	11	3	1	0
PT	1,007	78	13	5	4	0
RO	1,053	81	11	5	2	1
SE	1,000	60	31	8	1	0
SI	1,005	56	27	14	3	0
SK	1,000	86	8	5	1	0
UK	1,314	67	21	8	4	0

SOURCE
Eurobarometer 406, 2013

FIGURE 63

EUROBAROMETER 2013: CYCLING FREQUENCY IN THE EU28 COUNTRIES



SOURCE

Eurobarometer 406, 2013

TABLE 29
CYCLING FREQUENCY IN THE EU28 COUNTRIES

COUNTRY	SAMPLE SIZE	AT LEAST ONCE A DAY (%)	A FEW TIMES A WEEK (%)	A FEW TIMES A MONTH OR LESS OFTEN (%)	NEVER (%)	DON'T KNOW (%)
EU28	27,680	12	17	20	50	1
AT	1,034	13	25	30	32	0
BE	1,006	15	19	23	43	0
BG	1,025	5	7	18	69	1
CY	506	2	8	8	82	0
CZ	1,026	7	21	35	37	0
DE	1,505	19	25	26	30	0
DK	1,010	30	26	26	18	0
EE	1,008	12	23	27	37	1
EL	1,002	5	7	13	75	0
ES	1,008	4	10	9	73	4
FI	1,003	28	29	22	21	0
FR	1,053	5	13	26	56	0
HR	1,000	15	14	20	51	0
HU	1,033	25	20	20	35	0
IE	1,001	5	10	15	68	2
IT	1,025	13	13	14	60	0
LT	1,023	10	20	25	45	0
LU	502	4	17	29	50	0
LV	1,018	14	19	23	44	0
MT	500	1	2	4	93	0
NL	1,013	43	28	16	13	0
PL	1,000	14	29	26	30	1
PT	1,007	7	8	10	75	0
RO	1,053	10	13	14	61	2
SE	1,000	19	24	35	22	0
SI	1,005	12	24	30	34	0
SK	1,000	15	25	23	37	0
UK	1,314	4	10	17	69	0

SOURCE
Eurobarometer 406, 2013

K.2 EHIS

TABLE 30

PERCENTAGE DISTRIBUTION OF PERSONS AGED 15 OR OVER ACCORDING TO THE NUMBER OF DAYS SPENT WALKING TO GET TO AND FROM PLACES

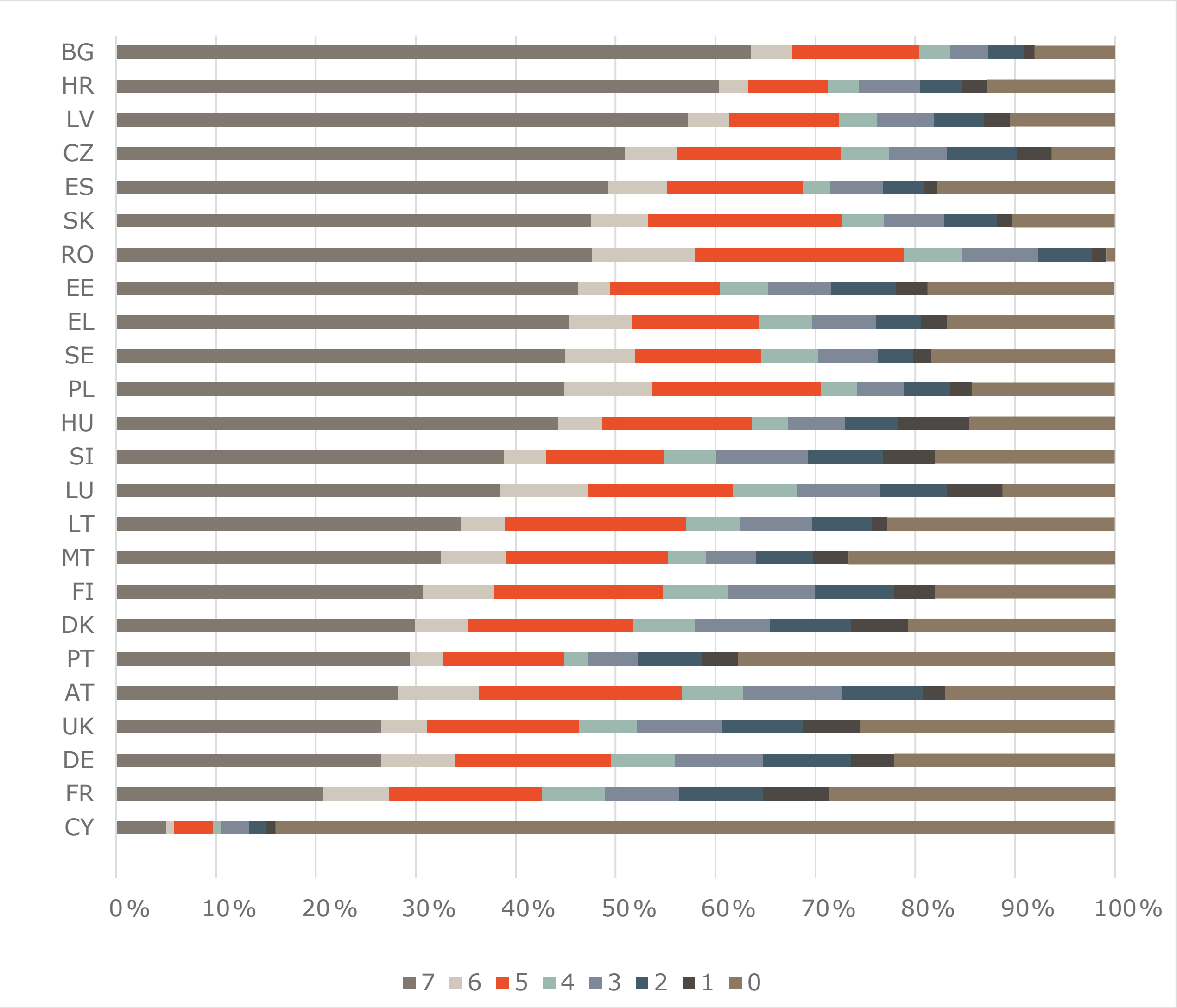
COUNTRY	0	1	2	3	4	5	6	7	1-7
AT	17.0	2.2	8.1	9.9	6.1	20.3	8.1	28.2	83.0
BG	8.1	1.1	3.6	3.9	3.1	12.7	4.2	63.5	91.9
CY	84.0	1.0	1.6	2.8	0.9	3.8	0.8	5.1	16.0
CZ	6.4	3.5	7.0	5.8	4.9	16.4	5.3	50.9	93.7
DE	22.1	4.4	8.8	8.8	6.4	15.6	7.4	26.6	77.9
DK	20.8	5.7	8.2	7.4	6.2	16.6	5.3	29.9	79.3
EE	18.7	3.1	6.5	6.3	4.8	11.0	3.2	46.2	81.2
EL	16.8	2.6	4.5	6.4	5.3	12.8	6.2	45.4	83.2
ES	17.8	1.3	4.1	5.3	2.8	13.6	5.9	49.3	82.2
FI	18.1	4.0	8.0	8.6	6.6	16.9	7.2	30.7	81.9
FR	28.7	6.6	8.4	7.5	6.3	15.3	6.7	20.7	71.4
HR	12.9	2.5	4.2	6.1	3.2	8.0	2.9	60.4	87.1
HU	14.6	7.2	5.2	5.7	3.6	15.0	4.4	44.3	85.4
LT	22.8	1.5	6.0	7.3	5.3	18.2	4.4	34.5	77.2
LU	11.3	5.5	6.7	8.3	6.4	14.4	8.8	38.5	88.7
LV	10.5	2.6	5.0	5.7	3.8	11.0	4.1	57.3	89.5
MT	26.7	3.5	5.8	5.0	3.9	16.1	6.6	32.5	73.3
PL	14.3	2.2	4.6	4.8	3.6	16.9	8.7	44.9	85.6
PT	37.8	3.5	6.5	5.0	2.4	12.1	3.3	29.4	62.2
RO	0.9	1.4	5.4	7.6	5.8	21.0	10.3	47.6	99.1
SE	18.4	1.8	3.5	6.0	5.7	12.6	7.0	45.0	81.6
SI	18.0	5.2	7.5	9.2	5.2	11.8	4.3	38.8	82.0
SK	10.3	1.5	5.3	6.0	4.1	19.5	5.6	47.6	89.7
UK	25.5	5.7	8.0	8.6	5.8	15.2	4.5	26.6	74.5

SOURCE

Eurobarometer 406, 2013

FIGURE 64

PERCENTAGE DISTRIBUTION OF PERSONS AGED 15 OR OVER ACCORDING TO THE NUMBER OF DAYS SPENT WALKING TO GET TO AND FROM PLACES



SOURCE

European Health Interview Surveys, 2014

TABLE 31

PERCENTAGE DISTRIBUTION OF PERSONS AGED 15 OR OVER ACCORDING TO THE NUMBER OF DAYS SPENT ON CYCLING TO GET TO AND FROM PLACES

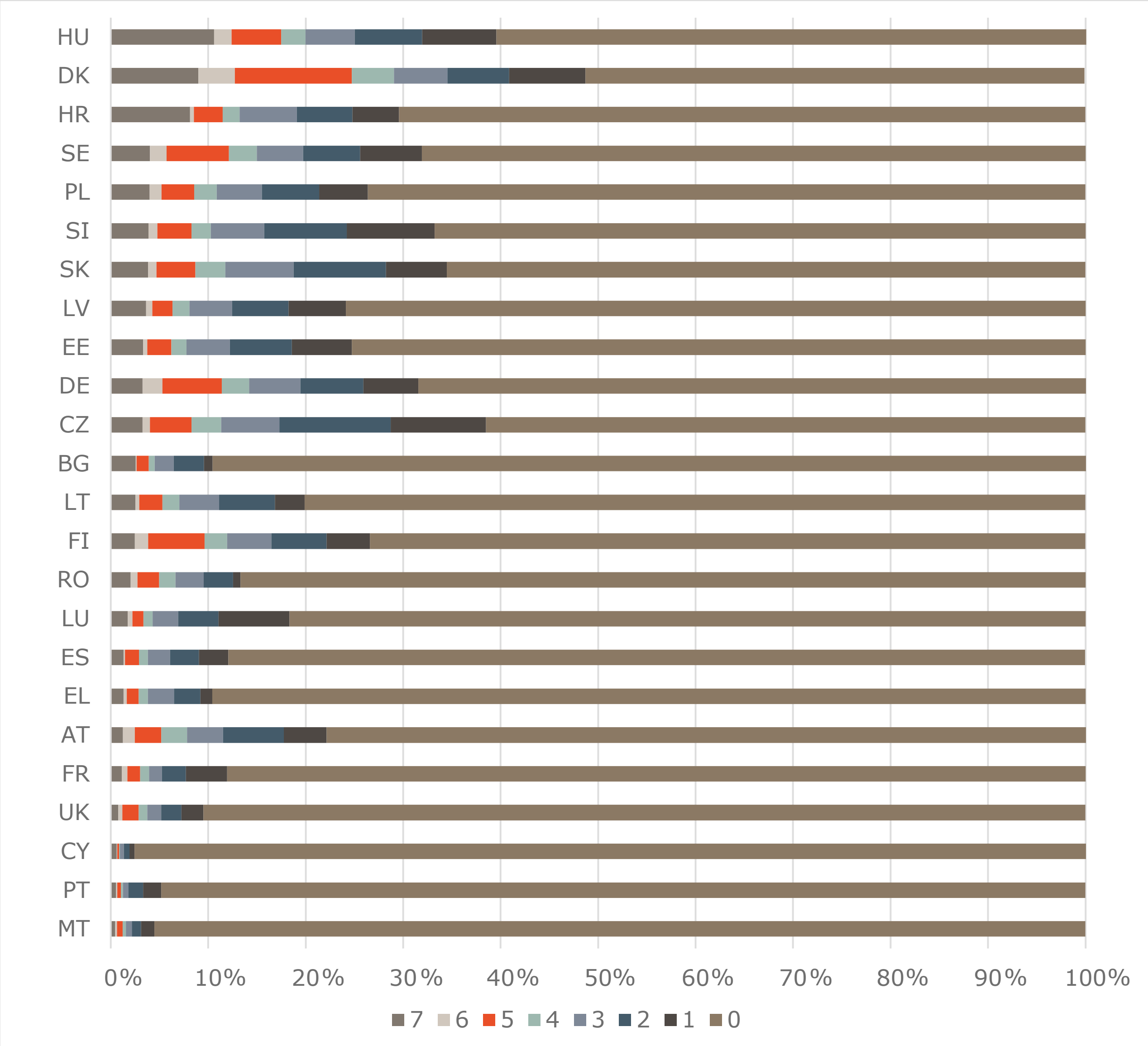
COUNTRY	0	1	2	3	4	5	6	7	1-7
AT	77.9	4.4	6.2	3.7	2.6	2.7	1.2	1.3	22.2
BG	89.6	0.9	3.1	1.9	0.6	1.2	0.1	2.6	10.5
CY	97.6	0.5	0.6	0.4	0.1	0.2	0.1	0.6	2.4
CZ	61.5	9.8	11.4	6.0	3.1	4.3	0.8	3.3	38.5
DE	68.5	5.6	6.5	5.3	2.8	6.1	2.0	3.3	31.5
DK	51.2	7.8	6.3	5.5	4.3	12.0	3.7	9.0	48.7
EE	75.3	6.2	6.4	4.5	1.5	2.5	0.4	3.3	24.7
EL	89.6	1.2	2.7	2.7	1.0	1.2	0.3	1.3	10.4
ES	87.9	3.0	3.0	2.3	0.9	1.5	0.1	1.3	12.1
FI	73.4	4.5	5.7	4.5	2.3	5.8	1.4	2.5	26.6
FR	88.1	4.2	2.5	1.3	0.9	1.3	0.6	1.1	11.9
HR	70.4	4.8	5.7	5.9	1.8	2.9	0.4	8.1	29.6
HU	60.5	7.6	6.9	5.1	2.5	5.1	1.8	10.6	39.6
LT	80.1	3.1	5.7	4.1	1.7	2.4	0.4	2.5	19.9
LU	81.7	7.3	4.1	2.6	0.9	1.1	0.5	1.7	18.3
LV	75.9	5.9	5.8	4.4	1.7	2.1	0.7	3.6	24.1
MT	95.5	1.4	1.0	0.6	0.3	0.6	0.2	0.5	4.5
PL	73.6	5.0	5.9	4.6	2.3	3.4	1.2	4.0	26.4
PT	94.8	1.8	1.5	0.5	0.2	0.4	0.1	0.6	5.2
RO	86.7	0.8	3.0	2.9	1.7	2.2	0.7	2.0	13.3
SE	68.1	6.3	5.9	4.8	2.9	6.4	1.7	4.0	31.9
SI	66.8	9.0	8.5	5.5	2.0	3.5	0.9	3.9	33.2
SK	65.5	6.3	9.5	7.0	3.1	4.0	0.9	3.8	34.5
UK	90.5	2.2	2.1	1.4	0.9	1.7	0.4	0.8	9.5

SOURCE

European Health Interview Surveys, 2014

FIGURE 65

PERCENTAGE DISTRIBUTION OF PERSONS AGED 15 OR OVER ACCORDING TO THE NUMBER OF DAYS SPENT ON CYCLING TO GET TO AND FROM PLACES

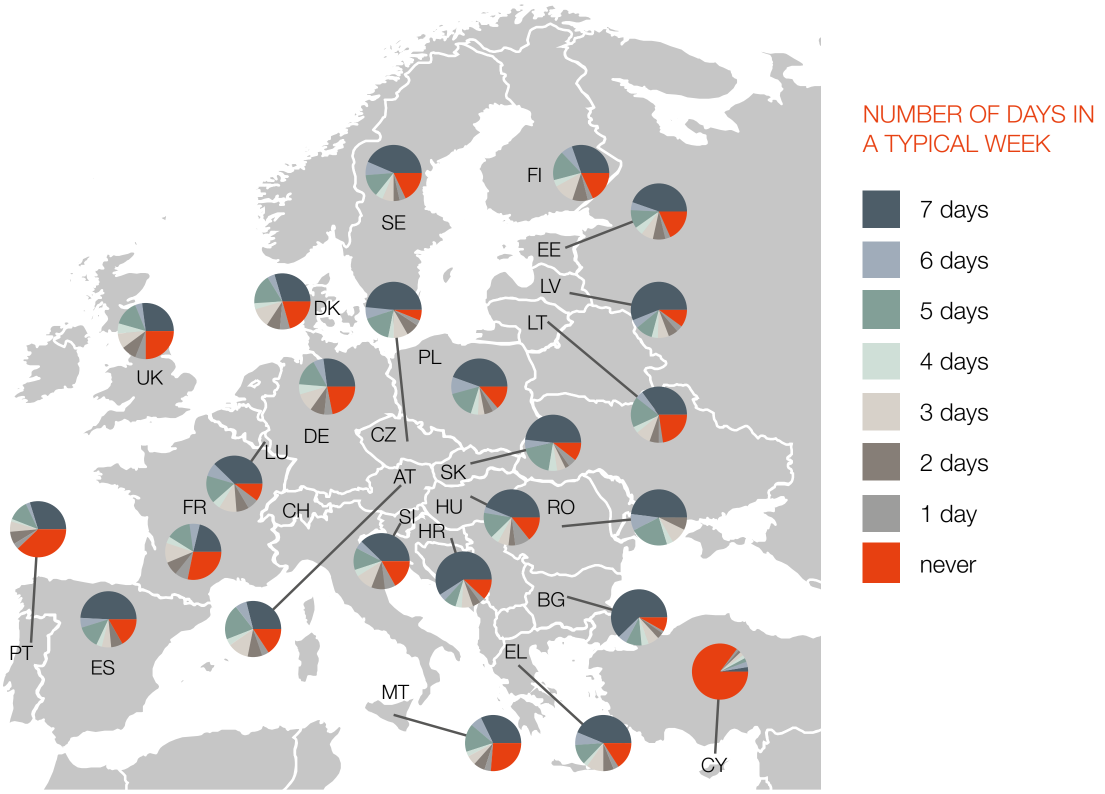


SOURCE

European Health Interview Surveys, 2014

FIGURE 66

EHIS 2014: DISTRIBUTION OF PERSONS (AGED 15+) ACCORDING TO THE NUMBER OF DAYS WALKING PER WEEK IN EU COUNTRIES

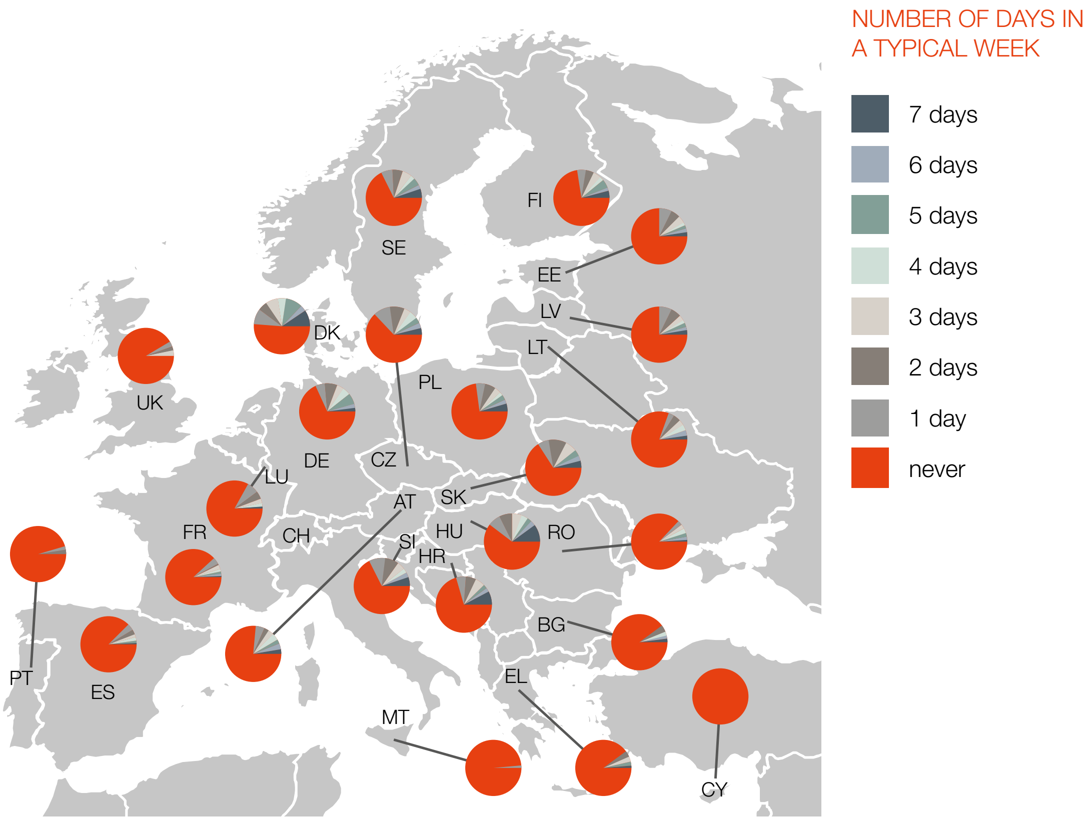


SOURCE

European Health Interview Surveys, 2014

FIGURE 67

EHIS 2014: DISTRIBUTION OF PERSONS (AGED 15+) ACCORDING TO NUMBER OF DAYS CYCLING PER WEEK IN EU COUNTRIES



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