



TOWARDS SMART ZERO CO₂ CITIES ACROSS EUROPE
VITORIA-GASTEIZ + TARTU + SØNDERBORG

Deliverable 3.1: Vitoria-Gasteiz Diagnosis and Baseline

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¹ PU = Public

PP = Restricted to other programme participants (including the Commission Services)

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Abbreviations and Acronyms

Abbreviation/Acronym	Description
3G	Third Generation of wireless mobile telecommunications technology
4G	Fourth Generation of wireless mobile telecommunications technology
APN	Access Point Names
CAPV	Basque Country Autonomous Community (<i>Comunidad Autónoma del País Vasco</i>)
CIF	Tax Identification Code (<i>Código de Identificación Fiscal</i>)
CIOP	City Information Open Platform
D	Deliverable
DHW	Domestic Hot Water
DMP	Data Management Plan
DoA	Description of Action
ECM	Energy Conservation Measure
EPC	Energy Performance Certificate
ESCO	Energy Service Company
GAV	Gross Added Value
GDP	Gross Domestic Product
GIS	Geographical Information Systems
GPRS	General Packet Radio Services
GWP	Global Warming Potential
ICT	Information and Communication Technologies
ID	Identity Document
IDAE	Energy Saving and Diversification Institute (<i>Instituto para la Diversificación y Ahorro de la Energía</i>)
INE	Statistics National Institute (<i>Instituto Nacional de Estadística</i>)
IPMVP	International Performance Measurement and Verification Protocol

ISO	International Organization for Standardization
ITU	International Telecommunication Union
KET	Key Enabling Technologies
KPI	Key Performance Indicator
LCA	Life Cycle Analysis
LH	Light House
LUDA	Large Urban Distressed Areas
M	Month
M&V	Measurement and Verification
NGO	Non-Governmental Organization
SmartEnCity	Towards Smart Zero CO2 Cities across Europe
SUMP	Sustainable Urban Mobility Plan
SWOT	Strengths, Weaknesses, Opportunities and Threats
T	Task
VPN	Virtual Private Network
W3C	World Wide Web Consortium
WP	Work Package

Table 1: Abbreviations and Acronyms

0 Publishable Summary

The overall objective of WP3 “Vitoria-Gasteiz Lighthouse Deployment” is to develop the detailed planning and coordination, to set up the management structures and procedures, and to implement demonstration works in the Vitoria-Gasteiz demo site according to the initial process layout.

This deliverable develops an in-depth evaluation of Vitoria-Gasteiz at a city level, making use of the indicators system provided in WP7. The main outputs of this deliverable are a comprehensive diagnosis of Vitoria-Gasteiz and the area of Coronación, and the baseline evaluation framework to be used in the intervention. This diagnosis phase, including baseline calculation and city needs identification and prioritization should be the first step of any intervention process.

This deliverable has been divided in four parts describing main aspects of Vitoria-Gasteiz diagnosis and baseline definition.

Chapter 4 delves on the diagnosis process definition, regarding activities, phases, agents, methods and tools, among others factors.

Chapter 5 relies on indicators to describe and characterize Vitoria-Gasteiz performance regarding local conditions, energy supply and consumption, building stock and retrofitting needs, urban mobility, ICTs infrastructures and services, and citizen engagement.

Chapter 6 identifies and prioritizes city needs through SWOT analysis, defining the intervention area. This analysis will set the ground for the intervention baseline definition, which framework is presented on chapter 7.

Finally, last chapters draw main outputs of D3.1 to be used in other WPs as well as an Annex with the indicators system developed for this diagnosis.

1 Introduction

1.1 Purpose and target group

The aim of this deliverable is an **in-depth evaluation of the situation of Vitoria-Gasteiz at a city level**, making use of the indicators system developed in WP7 (in a further step, those indicators were selected by the LH cities in D2.4). The main outputs of this deliverable are a comprehensive diagnosis of the area of Coronación and the baseline framework definition to be used in the intervention. In a wider sense, D3.1 can be useful for any European city willing to identify and prioritise its needs before any urban regeneration process.

Concerning other deliverables, D3.1 diagnosis and baseline becomes the stepping stone for remaining WP3 deliverables, shaping the ground of Vitoria-Gasteiz LH intervention. In addition, D3.1 provides valuable inputs for both designing the citizen engagement strategies of D2.6 and the integrated and systemic SmartEnCity urban regeneration strategy of D2.7 and D2.8. Furthermore, this city diagnosis will be taken into account as baseline in the evaluation process of impacts in D7.13, as well as for Integrated Urban Plans of WP8 (D8.6).

Project stakeholders are also a target group of D3.1, helping them to visualize a comprehensive scenario for setting goals, further development and assistance for decision making in down-the-line integrated planning.

1.2 Contributions of partners

Table 2 depicts the main contributions from participant partners in the development of this deliverable.

Participant short name	Contributions
TEC	General structure and coordination, Chapters 1, 2, 3, 6 <i>City needs definition and prioritization</i> , and 8. Internal review of all sections.
CEA	Section 5.1 <i>Local Conditions</i> and Section 5.6 <i>Citizen and stakeholders engagement</i> ; contributions to section 5.4 and 6.1; data provision for Chapters 4, 5 (indicators selection) and 6
ACC	Chapter 4 <i>Defining the process as a whole</i> ; contribution to section 6.2
VIS	Sections 5.2 <i>Energy supply and consuming patterns</i> and 5.3 <i>Building stock and retrofitting needs</i> . Review of consolidated draft
CAR	Chapter 7 <i>SmartEnCity Evaluation Framework for Intervention Baseline</i> ; Section 5.4 <i>Urban Mobility</i> ; annex 1 <i>List of indicators for City Diagnosis</i> ; contributions to Chapter 4. Contribution to Chapter 9. Review of consolidated draft
GIS	Section 5.5 <i>ICT Infrastructures and Services</i>
CEE	Data provision for chapter 4; review of section 5.6

Table 2: Contribution of partners



1.3 Relation to other activities in the project

Table 3 depicts the main relationship of this deliverable to other activities (or deliverables) developed within the SmartEnCity project and that should be considered along with this document for further understanding of its contents.

Deliverable Number	Contributions
D7.1	D7.1 provides a first proposal of city characterization indicators that has been filtered by LH cities to define the definitive list of common and optional indicators included in D2.4 and applied in D3.1, D4.1 and D5.1.
D2.1, D2.2, D2.3	D2.1, D2.2, D2.3 give input on specific topics (Policy & Regulation, Standards, Business environment) for diagnosis and baseline definition of LH cities on D3.1, D4.1 and D5.1.
D2.4	D2.4 describes the overall method and process, as well as the template to be applied in diagnosis and baseline definition of D3.1, D4.1 and D5.1
D2.6	D3.1 provides valuable information for designing the Citizen Engagement Strategy of D2.6.
D2.7	D3.1 also provides inputs for the integrated methodology strategy of SmartEnCity to be defined on D2.7.
D4.1, D5.1	D3.1, D4.1 and D5.1 are aligned providing a diagnosis and baseline definition for each LH city, following a parallel process described in D2.4.
WP3	Diagnosis and baseline definition of D3.1 sets the common ground for the remaining WP3 deliverables
WP7, D7.13	City diagnosis will be the starting point for the city impact evaluation to be done at WP7 (D7.13, <i>Assessment of the overall performance</i>)
WP8, D8.6	D3.1 becomes a relevant output for defining Integrated Urban Plans.

Table 3: Relation to other activities in the project

2 Objectives and expected impact

2.1 Objective

The overall objective of WP3 “Vitoria-Gasteiz Lighthouse Deployment” is to develop the detailed planning and coordination, to set up the management structures and procedures, and to implement demonstration works in the Vitoria-Gasteiz demo site according to the initial process layout.

Task 3.1 is closely linked to this deliverable. The main objective of this task is to provide an in-depth evaluation of the situation in Vitoria-Gasteiz at a city level and in the demonstration area of Coronación, making use of the indicators system developed in WP7 and the methodology developed in WP2. Furthermore, this task intends to allow stakeholders to visualize a comprehensive scenario for setting goals, further development and assistance for decision making in down-the-line integrated planning, as well as to work as valuable input for citizen-engagement processes.

This D3.1 accomplishes these goals through the evaluation of Vitoria-Gasteiz at a city level and provides a comprehensive framework to identify the needs and priorities of the city and the area of Coronación, having an accurate approach to define the intervention baseline.

2.2 Expected impact

D3.1 diagnosis and baseline definition becomes the stepping stone for remaining WP3 deliverables, shaping the base of Vitoria-Gasteiz LH intervention. Furthermore, D3.1 provides valuable inputs for both designing the citizen engagement strategies of D2.6 and the integrated and systemic SmartEnCity urban regeneration strategy of D2.7 and D2.8. In a wider sense, D3.1 can be useful for any European city willing to identify and prioritize its needs before defining any urban regeneration process.

3 Overall Approach

Task 3.1 focused on diagnosis and baseline framework definition of Vitoria-Gasteiz LH intervention requires inputs from previous SmartEnCity tasks. Firstly, D3.1 makes use of the indicators system developed in WP7 (D7.1), transforming city performance into numbers in order to quantify the intervention baseline. Secondly, D3.1 is steered by the methodology described in WP2 (D2.4). According to this methodology, this deliverable has been divided in four parts, describing main aspects of Vitoria-Gasteiz diagnosis and baseline definition.

Chapter 4 delves on the intervention process definition, regarding activities, phases, agents, methods and tools, among others factors. Here, ACC describes this process, with the contribution of CAR as coordinator of indicators definition for the three LH cities of SmartEnCity.

Chapter 5 relies on indicators to describe and characterize Vitoria-Gasteiz performance regarding local conditions (CEA), energy supply and consumption (VIS), building stock and retrofitting needs (VIS), urban mobility (CAR, with CEA contribution), ICTs infrastructures and services (GIS), and citizen engagement (CEA). Due to its central role in Vitoria-Gasteiz, CEA was the partner mainly involved in obtaining and selecting indicators process.

As main reference of characterization chapter, Annex 1 includes a detailed table of indicators provided by CAR, where all indicators are explained, providing common units and framework for the three LH interventions of SmartEnCity.

Chapter 6 identifies city needs through SWOT analysis, defining the intervention area. Here TEC makes an analysis of provided data by the previous chapter and additional sources, narrowing down to the case of Coronación district. This chapter includes a contribution of ACC for the specific spatial analysis. This analysis sets the ground for the intervention baseline framework definition, presented on chapter 7, developed by CAR.

Finally, last chapters draw main outputs of D3.1 to be used in other WPs as well as an Annex with the indicators system developed for this diagnosis.

This deliverable has been coordinated with deliverables D4.1 and D5.1 in order to harmonise diagnosis processes in all three LH cities. PLAN, TREA, TEC and CAR have participated in this parallel process

4 Defining the process as a whole

SmartEnCity project aims to contribute to create Smart Zero CO₂ Cities across Europe through urban regeneration strategies, integrated urban plans and district integrated interventions. This process needs to be well defined and coordinated using a specific methodology that permits developing such a task.

In Vitoria-Gasteiz's case, the first thing to take into account is the long history of the city regarding sustainability issues. This is not such a new business for local authorities and citizens, being this a key factor in order to facilitate the governance and management of the numerous stakeholders involved in this LH project. A methodology of governance should be established in order to organize the diverse activities that must be carried out.

As part of that methodology, knowledge domains must be analysed in order to focus efforts effectively. Furthermore, interests of local authorities and citizens should be taken in account, without forgetting the compromises acquired with H2020 EU program. Those knowledge domains must be analysed using the adequate planning tools and techniques such as indicators thoroughly selected. In order to achieve those objectives, procedures for data collection must be defined as well as possible solutions to data management barriers.

This section delves in all these questions, crucial issues to succeed in a diagnosis process² and, accordingly, in the final LH intervention in Vitoria-Gasteiz.

4.1 Process in Vitoria-Gasteiz

Vitoria-Gasteiz is a city in which sustainability has been an issue for last thirty years. During all this time, several initiatives have already been implemented by the Municipality, pursuing sustainability goals.

4.1.1 Previous activities in Vitoria-Gasteiz's Municipality

The following lines describe the sustainability activities developed in the city of Vitoria-Gasteiz, which have finally derived in the SmartEnCity project participation.

- The **Sustainable Urban Mobility Plan**, undoubtedly one of the most effective actions. This plan is changing the way people move around Vitoria-Gasteiz; it is a true “green revolution” that arouses interest in the most prestigious environmental forums. The increased use of public transport and cycling is one of the greatest success stories. The city is recovering urban space for citizens; space hitherto occupied by private vehicles.
- **Covenant of Mayors**³, the local contribution against climate change, with the goal of reducing the emission of harmful gases by at least 20% by 2020.
- **Green Ring of Vitoria-Gasteiz**⁴, highlighted by the European Commission as example of Green Infrastructure because of its improvement of ecosystem services in

² SmartEnCity Consortium (2016) “City needs and baseline definition. Process and methods” Deliverable 2.4

³ Covenant of Mayors http://www.covenantofmayors.eu/about/signatories_en.html?city_id=186&seap

⁴ Vitoria-Gasteiz Municipality webpage <http://www.vitoria-gasteiz.org/>

urban limits. This project has been complemented with green zones achieving a rate of 20m²/inhabitant.

- **European Green Capital 2012⁵**. Core issues for this award were urban mobility, city compactness, water and waste closing cycles, biodiversity, green infrastructures, energy and green economy. This appointment seeks coping with common challenges of European cities in terms of sustainability, as well as fostering job-sharing and knowledge networks, citizen involvement, innovation and differentiation of cities, raising enthusiasm and ambitions of communities.
- **Action Plan Against Climate Change 2010-2020⁶**, which main goal is achieving an emission reduction of at least 20% by 2020, compared to 2006 results. This plan expects these results due to actions of efficiency and energy production. Energy Sustainability Action Plan is integrated on it.
- **Local Agenda 21 Action Plan** incorporates not only environmental dimension but also economic, cultural and social aspects. Each year a bulletin informs citizens about situation and evolution of environmental, social and economic aspects through a series of indicators of sustainability and the most relevant interventions carried out in Vitoria-Gasteiz Municipality.
- **Citizen engagement actions**. High consciousness of inhabitants concerning green issues, including diverse initiatives carried out in this sense.
- **Green projects**. Some examples: Central Superblock, Bizing, Ecological agricultural park, Olárizu botanical Gardens, Restoration of Medieval District, the Green Belt, the Solar Ring, Recovery of waste fuel, New Town Development Plan Zero growth, and community centres and squares that promote social cohesion.
- **Indicators for sustainability in Vitoria-Gasteiz**. This indicator system developed for the city consists of 50 Indicators used to evaluate the current situation of Vitoria-Gasteiz (2009) and two clear-cut scenarios, located at 2020 (stage 01) and 2050 (stage 02), considering an overall population increase.
- **Smart Green City**, namely Vitoria-Gasteiz's Smart City Strategy. This strategy includes smart irrigation initiatives (IRRIGESTLIFE), a public energy efficiency lighting strategic plan, mobility initiatives (ICT4EVEU, MOVESMART and Naviki), technological modernization and administrative transparency, including a citizen's mailbox and electronic administration.
- **Dubai International Award for Best Practices to Improve Living Environments 2011⁷**. Award granted in collaboration between UN-HABITAT and Dubai Municipality. Awarded to successful initiatives which have a demonstrable and tangible impact on improving people's quality of life. These initiatives are the result of effective partnerships between the public, private and civic sectors of society, being socially, culturally, economically and environmentally sustainable.
- **Spanish Capital of Biodiversity in 2010**. Award granted by Fundación Biodiversidad⁸, taking into account measures and projects implemented by municipalities to protect biodiversity. Special attention was paid to green areas, planning instruments for biodiversity protection, biodiversity in agriculture, forests and

⁵ Vitoria-Gasteiz Municipality (2012) "Vitoria-Gasteiz European Green Capital 2012" p 24

⁶ Vitoria-Gasteiz Municipality (2010). Action Plan Against Climate Change 2010-2020

⁷ UN-HABITAT webpage <http://unhabitat.org/dubai-international-award-for-best-practices-to-improve-the-living-environment/>

⁸ Biodiversidad Foundation webpage <http://www.fundacion-biodiversidad.es/capitaldelabiodiversidad/>



continental water bodies, municipal organization, monitoring indicators and actions related to participation and social awareness.

- **CIVITAS Award 2010⁹** recognises outstanding cities in the implementation of ambitious transport policies or activities in order to achieve clean urban transport. It is framed within CIVITAS initiative.
- Several initiatives regarding nature, biodiversity, water management, air quality and waste management.



Figure 1: Vitoria-Gasteiz European Green Capital 2012. www.ec.europa.eu

Partly due to this significant career in sustainability issues, Vitoria-Gasteiz has been selected as suitable site for implementing a demonstrator in SmartEnCity project.

4.2 Governance

As already mentioned, a methodology of governance should be established in order to organize the diverse activities that must be carried out with a successful result. Good communication and understanding between partners is a priority in the process. All consortium partners should be coordinated in order to avoid duplicities in contents or skills. For a good work organisation, activities and responsibilities should be assigned to each stakeholder. In the case of Vitoria–Gasteiz’s, the core team is meeting periodically every 15 days since February 2016. Seven partners are participating on those periodic meetings:

- VIS
- TEC (also representing ACC until the month of October, when they joined periodic meetings).
- AVG/CEA
- TEC / European Union Horizon 2020
- MON representing (ETIC, LKS, MTEL, MU, FED)
- GIR
- CEE/H-ENEA

Visesa leads the meeting in collaboration with Vitoria-Gasteiz Municipality and Tecnalia as project coordinator. All above mentioned stakeholders analyse, discuss and decide on

⁹ CIVITAS webpage <http://www.civitas.eu/past-awards-full>

alternatives to be presented to the General Management Board. Finally, definitive decisions are validated by both the General Management Board of Visesa and the General Manager of Urbanism Department of Vitoria-Gasteiz Municipality. At a time, Tecnalía is in charge of safeguarding the compromises acquired with the European Commission and to offer solutions and bridges for enabling action due to its role as Project Manager.

In Smart City projects, interdisciplinary cooperation becomes crucial on daily workflow. There is a need of understanding between the different disciplines involved: edification, urbanism, ICTs, energy, mobility, citizen engagement, etc. In SmartEnCity case, and more precisely in Vitoria-Gasteiz's Lighthouse Project, the profile of the participating agents in the Management Board is multidisciplinary, with a clear predomination of engineers and architects.

Community involvement and citizen engagement is especially relevant in this kind of projects due to the nature of building retrofitting interventions. The interventions are held mostly in housing and, depending on property structures, resident's opinion and implication might be decisive. In the case of Spain, if the residents of the building do not mostly agree with the intervention, this might be an insurmountable barrier for the action.

In the case of Coronación district there is no housing association for the refurbishment management. Accordingly, the agents involved in the first phase are: *Errota Zaharra* and *Bizilagun* neighbours associations, *Aparejua!*, *Nagusilan*, *Ekologistak Martxan* and *Gaden* associations, Coronación church, Coronación mosque, Health Centre, Elderly People Sociocultural Centre, foreign people collectives, and *SEA Catering* and *Gasteiz On* commercial associations. This degree of involvement shows that citizens are in the foundation of the project. They have been integrated in the definition process and will be integrated in Co-creation workshops to approach them to co-create the neighbourhood intervention, adapting them to new deployable technologies.

Some citizen engagement activities are planned and will take place during Vitoria LH project deployment. First of all, a flyer was distributed between the neighbours during the month of February (2016) and a municipal website has been enabled in order to make accessible the main information to all Vitoria-Gasteiz's inhabitants interested in the project.

A global strategy for the intervention is being developed in parallel to citizen engagement strategies (T2.1)¹⁰, including several presentations done in the municipality during the month of April (2016); one of them to the municipal political groups and collectives and another one to the residents. Furthermore, a review of the communication plan for 2016 has been developed, as well as workshops and other awareness actions, especially during the Mobility Week in September 2016. Finally, an office has been opened on-site to inform all the people interested, working as the communication hub between neighbours and the project consortium.

The first phase of this strategy ended in April (2016), based in an Information Strategy. A new phase was designed during April and May, working over an Information and Consultation Strategy where citizens are consulted about different alternatives related to district renovation and mobility. This consultation process took place during September (2016). Next steps of Citizen Engagement process are currently being designed and

¹⁰ SmartEnCity Consortium (2016-2017) "Citizen engagement Strategy and deployment plan" Deliverable 2.6

discussed. The process will continue during the following months and further steps will be discussed and decided between partners involved when necessary.

4.3 Methods

Once stakeholders are organised and governance procedures established, other methodological issues should be addressed, such as the selection of relevant knowledge domains for the project. It is crucial to gather basic information for the intervention in order to evaluate it and identify which results are interesting for the partners involved. When having main knowledge domains selected, relevant indicators should be identified in order to be able to calculate and evaluate relevant information of those domains.

Some problems might appear when carrying out this process. Accordingly, data management should be planned thoroughly in advance.

4.3.1 Knowledge domains

As already analyzed in D2.4, the Aalborg Commitments defined a set of domains in which could be divided the actions carried out towards sustainable urban development. Also the Leipzig Charter and LC-FACIL URBACT II defined later on a reference framework for sustainable cities with 30 objectives and 5 dimensions. All these actions are related to the city scale, while district level is much more undeveloped. At district level, there are several certification tools which deal with common aspects (environmental, social and economic issues). However, other aspects vary depending on the certification tool (mobility and governance are the most extended ones while energy is the most popular).

After going through all this information, D2.4 established a proposal of knowledge domains that should be taken into account in SmartEnCity project.

Domain	Subdomain
City characterization	Key features of the city Land use characterization Socio-economic features of the city Environmental features of the city
Energy supply network	City energy profile Potential local energy resources in the city Environmental impacts in the city due to energy consumption
Transport and mobility	Mobility City profile City statistics for mobility Environmental impact of the mobility
Urban infrastructures	Available infrastructures in the city for managing transport, waste, water and environment Existing transport utilities Existing environment monitoring infrastructure

	Existing city monitoring infrastructure Communication infrastructure in the city
City plans & regulation and governance	City plans and strategies Public procurement procedures & regulations and normative Governance
Citizens	Existing actions for citizen engagement Channels for citizen engagement Current scenarios of citizen engagement

Table 4: City characterization indicators: domains and subdomains – D2.4

4.3.2 Data management

Data is a central component of any diagnosis. It should be defined the way in which data is collected and processed in diagnosis phase, how it will be used in the subsequent stages of the project, and how it will be communicated.

The complexity of any urban regeneration project implies the use of a wide variety of data from several sources, so a **Data Management Plan** (DMP) that anticipates these problems is always highly recommendable. This DMP should cover the handling of data during and after the intervention project, what data will be collected, processed or generated, what methodology will be applied, which data will be shared or communicated (to other partners, to the public), and how data will be curated and preserved (EC, 2016b).

Regarding communication, data should be managed in several situations: on internal technical work, on sectorial working groups, on transversal meetings and in public participation, communication & awareness.

As happens in several aspects in this project, the 3 LH cities have different problems regarding data management but there are also some common issues as the ones attending confidentiality or privacy issues, spatial disaggregation of data and comparative analysis of different levels.

In the case of Vitoria-Gasteiz there are also some specific gaps and barriers identified in data management field:

- It is not very common to get data at building scale because of its confidentiality. The data gathered at this scale could not be gathered without public bodies' commitment and support. These data (at building scale) serves for the internal analysis and decision making but most of it would not be possible to be included in the diagnosis deliverable due to its confidentiality. Some data was impossible to gather, like: number of dwellings in which residents are also owners, population who lives alone or has reduced mobility, population without employment, income level of dwelling's owners, etc. Other data, especially those related to building characteristics, were not available and had to be obtained through a specific field work campaign.
- Data sources depending on private companies (for example: energy consumption per building) were not possible to access due to privacy issues.

- In any diagnosis using GIS, there is a common difficulty in the integration of data, due to the different levels and formats of information.

Some of these information barriers might be slightly overcome by consulting diagnosis documents already published like *CAPV Diagnosis of intervention necessities in the renovation of building stock*¹¹ or similar ones. In other cases it is not possible to achieve the targeted information.

4.3.3 Procedure for the selection of indicators

In the framework of the project, indicators have been selected as potential tool to be employed for any city which intends to be transformed into a Smart Zero CO₂ City. In deliverables D3.1, D4.1 and D5.1 this selection of indicators is used to characterise and diagnose the three lighthouse cities in a comparable form. The indicators are found in several fact boxes in Chapter 5 of this document as well as in the Annex 1, where definitions have been included for a better understanding of the document.

Through a city diagnosis based on these key indicators for different application areas (named as domains), city planners can know the potential features and adverse conditions of urban areas as well as identify their main needs which lead to define the objectives and strategies to be implemented in the cities, making decisions for the most suitable interventions. Consequently, once the city demand is known, strategic plans and actions can be launched within the roadmap of the city in order to overcome detected barriers. These plans help to promote those technologies, necessary to reach the city objectives. Finally, specific plans can be developed for the implementation of these technologies.

Taking into account this premise, main partners in charge of the deployment of the evaluation framework in SmartEnCity project (CAR and TEC) defined application areas as well as a set of indicators to be proposed to the cities involved in SmartEnCity (lighthouse cities and follower cities). These areas (*Domains* in table 4 above) and indicators will assist them in the general process of developing smart and sustainable urban plans for their city (D7.1).

These indicators were selected after a review of the available sources, focused on the measurement of the city in terms of sustainability, since there is not an only source which satisfies all the application areas previously identified. Finally, chosen indicators (template in Annex 1) came from shared working documents, agreeing an indicator system among a wide sample of stakeholders.

These well-accepted documents were:

- ISO 37120¹². It is the only standard already developed for city indicators. Although it is not focused on indicators for smart cities, it delves on city services and quality of life.
- SCIS and CITYKEYS¹³, which integrate the existing results from previous smart city initiatives.
- PLEEC and STEEP projects, where the selection of indicators were done by city representatives.

¹¹ Tecnalia and Basque Government (2011). Diagnosis of intervention necessities in the renovation of building stock in the Basque Country Autonomous Community

¹² ISO website: <http://www.iso.org/iso/home.html>

¹³ CITYKEYS Project website: <http://www.citykeys-project.eu/>



- ITU¹⁴ as main source for indicators in ICT issues.

Criteria for this first selection of indicators were:

- **Relevance.** Each indicator has a significant importance for the evaluation process and for the goals of the project.
- **Completeness.** The set of indicators consider all aspects of the planning and implementation of smart city projects, covering all the pillars of the project: interventions (building, mobility, ICT), actions (engagement), impacts (energy, economy, social, environment) and non-technical barriers (governance, people and finance).
- **Reliability.** The definitions of the indicators tried to be clear and not open for different interpretations. This holds for the definition itself and for the calculation methods behind the indicator.
- **Measurability.** The identified indicators were accompanied by units (for quantitative data available in data sources) and with a Likert scale (for qualitative information linked with own criteria of respondent).
- **Non-redundancy.** Indicators within a system/framework should not measure the same aspect of a subtheme.
- **Independence.** Small changes in the measurements of an indicator should not impact preferences assigned to other indicators in the evaluation.

In a further stage, partners involved directly with LH cities (CEA from Vitoria-Gasteiz; TREA from Tartu; PLAN, SONF, ZERO, and VG from Sonderborg) participated in the selection of most suitable indicators for their cities taking into account the below set of criteria. This process was done in D2.6.

- **Relevance.** Each indicator has a significant importance for the evaluation process and for the goals of the project in the city.
- **Availability.** Data for the indicators seem to be easily available.
- **Familiarity.** The indicators were easy to understand by the users.

This process finished with the question: *Would you like this indicator to be included in the template for **city** diagnosis?*

A posterior analysis of the answers received from the three cities established two types of indicators for this process of city diagnosis:

- **Mandatory** indicators correspond to those indicators selected by the three cities.
- **Optional** indicators correspond to those indicators not selected by the three cities.

The reached agreement consisted of the search of mandatory indicators for the three cities in order to make a comparable analysis of the three lighthouse cities. The indicators are found in several fact boxes in Chapter 5 of this document, being mandatory indicators marked in green for a better identification. In additional, optional indicators could be searched by the cities, complementing the characterisation of the cities.

The whole list of indicators can be found in Annex 1.

¹⁴ ITU website: <http://www.itu.int/>

Procedure for the search of indicators

A template was provided to the cities with the aim to include the value found by each indicator, the data source and some comments related to the difficulty to gather some data, the non-reliability of found data or other obstacles to be mentioned (template in Annex 1)¹⁵. This search and analysis of available information is done by each LH city in D3.1, D4.1 and D5.1, being a valuable input for the regeneration strategy to be deployed in the framework of the SmartEnCity project (D2.7).

In the case of Vitoria-Gasteiz, the gathering process has been developed by CEA, closely linked to the different departments of Vitoria-Gasteiz Municipality. The gathering process has been hard for different reasons, and a few indicators were finally inaccessible, as it can be noted in the city characterization chapter of this D3.1 (Chapter 5).

The city diagnosis process had several difficulties in the city of *Vitoria-Gasteiz* to find information from selected domains. Main difficulties concerned data management (identification of the source of the information, achieving the collaboration of the depository, requirement of interaction between different sources to obtain specific data), quantification of data (fixed scale units with little flexibility, existence of aggregate data which is not collected regularly and even lack of data), and timing (very tight deadlines for data collection).

Despite the mentioned difficulties, interesting information has already been achieved by consulting the Municipality of Vitoria-Gasteiz's website and other previous reports as "Local Agenda 21" (further explained in the continuation of this document) because this data has been verified and is 100% reliable.

Unfortunately, the most interesting data is not previously collected in the mentioned reports and it is very difficult to generate it in the tight deadlines given.

As brief reflexion about indicators obtainment process, it should be said that is a work which huge dimension requires coordination of much people, departments and institutions holding the diverse information, would require more time than the period that is given and maybe the indicator list is too ambitious taking that in account.

Preexisting indicator initiatives in Vitoria-Gasteiz

Despite the indicators selected in this project, Vitoria-Gasteiz has its own system of indicators, which was developed by BCNecología¹⁶. The objective of this system is to give a description and evaluation of the current sustainability situation and tendencies in Vitoria-Gasteiz. This system is an instrument that responds to a more sustainable vision of the city, with the intention of evaluating quantitatively and qualitatively the urbanization process of Vitoria-Gasteiz from an integrated and systemic point of view, incorporating sustainability criteria.

The document which explains the system is structured in two parts. First one consists of conceptual reflections about sustainable city models and stability logics in city ecosystems. Second part delves on practical application of indicators and posterior analysis of its accommodation degree to the integrated and systemic model, already exposed on the conceptual framework.

¹⁵ SmartEnCity Consortium (2016) "Procedure for selecting KPIs" Work package 7

¹⁶ Barcelona Urban Ecology Agency (2010) "Plan de indicadores de sostenibilidad urbana de Vitoria-Gasteiz" p 7-10



All indicators were selected including key aspects for the definition and accommodation of Vitoria-Gasteiz to a more sustainable urban model. In this case, indicators respond to a double vision: performance and prediction of current and future situations. Four basic criteria were considered for the selection: relevance for sustainable city models, evaluation of progress towards goals, potential comparison between territories and urban fabrics, and viability regarding information of base.

The complete list includes 50 indicators divided in eight thematic categories as follows: soil occupation, public space and habitability, mobility and services, urban complexity, urban metabolism, green spaces and urban biodiversity, social cohesion, and sustainability guide function. In order to calculate all indicators 3 scenarios and 4 scales are considered: years 2009, 2020 and 2050; municipality, city, district and *supercityblock*¹⁷.

Besides this system of indicators, Vitoria-Gasteiz has also its own indicators defined in the Agenda 21 report, as well as a compilation of applicable indicators developed by Studies and Statistics Cabinet¹⁸. This compilation is divided in several domains: population movement, population structure, family, education, health, activity situation, economic situation, social protection, free time, society of information, public function, soil uses, dwellings, economic fabric and associative movements. The application area is also specified.

Concerning Agenda 21, it has recently extended its number of indicators for city diagnosis from 21 to 35 in 2016¹⁹. They are divided in different topics: urban contamination, transport and traffic, water, energy, industry, waste, town planning and territory, biodiversity and nature, health and environmental risks, information, education and citizen engagement, and socioeconomic environment. These indicators have been used to do a sectorial diagnosis of the city.

Besides new indicators defined for SmartEnCity project, there were several already existing initiatives which had already defined suitable indicators for measuring Vitoria-Gasteiz's sustainability. For this reason, this kind of method might already be familiar for implied authorities and stakeholders.

¹⁷ Concept defined by Salvador Rueda in mobility strategy for Barcelona on his publication "Ecologic Urbanism".

¹⁸ Gabinete de estudios y estadísticas "Un sistema de indicadores urbanos" (2016) <http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/29/23/32923.pdf>

¹⁹ Ayuntamiento de Vitoria-Gasteiz / Vitoria-Gasteizko Udala (2016) "Agenda 21. Boletín 2016. Vitoria-Gasteiz hacia un desarrollo sostenible"

<http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/69/13/66913.pdf>



5 City characterization: Vitoria-Gasteiz

This chapter develops a thorough analysis of Vitoria-Gasteiz's current situation, deepening on relevant aspects that can affect the design and implementation of LH project intervention. For this purpose, Chapter 5 makes use of a common framework based on a set of appropriate indicators designed for the evaluation of the city (D7.1). This indicators set for pre-intervention data collection has required the view of those partners involved in LH districts diagnosis as well as cities' opinion in order to define a familiar set of indicators ready to be used.

As a result, Vitoria-Gasteiz's characterization is divided in six sections, which are in line with both the indicators defined in WP7 and the necessary data to develop a comprehensive diagnosis of the city, presented in Chapter 6. These sections are:

- Local conditions
- Energy supply and consuming patterns
- Building stock and retrofitting needs
- Urban mobility
- ICT infrastructure and services
- Citizen and stakeholders engagement

5.1 Local conditions

5.1.1 Vitoria-Gasteiz

King Sancho VI of Navarre founded “Nueva Victoria” in 1181 as a walled defensive outpost, on top of a hamlet named “Gasteiz” on the hill around which the city was built. The well-preserved medieval district was declared a monumental site in 1987.

Nowadays, Vitoria-Gasteiz is the capital of the autonomous community of the Basque Country (northern Spain). It has a population of ~246,000 inhabitants gathered in a compact city, though the entire municipality covers an area of 276.81 km².

Population has steadily increased from 50.000 inhabitants in year 1950 to 220.000 in year 2000 and around 246,000 now. Current annual increase rate is of 1%. However, population is aging, and today 20% of the people is over 65 years old.

Vitoria-Gasteiz offers 42m² of green space per person. In this regard, the restoration of a Green Belt surrounding the city has received international appraisal and it has become an icon and a source of pride (and awareness) for the citizenships. These features and Vitoria-Gasteiz’s long commitment to progressive environmental policies were acknowledged by the city’s appointment as European Green Capital 2012²⁰.

Around 20% of the municipal area is urbanised, and the rest of the space comprises agricultural lands and natural forests. In the urban space, population density is around 4,500 people/km², so it is a rather compact city. There is not suburban sprawl, and the nearest cities are Agurain (5,000 inhabitants, 27km distance), Miranda de Ebro (40,000 inhabitants, 33km distance) and Arrasate (22,000 inhabitants, 34km distance).



Figure 2: Plaza Virgen Blanca, Vitoria-Gasteiz. www.euskoguide.com

²⁰ Vitoria-Gasteiz Municipality (2012) “Vitoria-Gasteiz European Green Capital 2012”

Economic facts

Economy in Vitoria-Gasteiz is mainly devoted to industry and services.

Regarding the services sector, the city hosts the main public administrative offices of the Basque Government and the autonomous administration. These public bodies, together with the city's local administration and the importance of the city as the main commercial hub for the surrounding region, they all shape a strong services sector. The weight of services is 67% of overall city economy.

22% of the jobs are related to industry, and specifically to car related manufacturing: the two main private companies are the Mercedes Benz factory (vans) and Michelin factory (tyres). Aeronautics is another big player, with Aernnova (airplane components) having a big impact in the city. All together, the industry sector accounts for 25% of total city's economy.

Concerning innovative industries related to energy, the city was home-town of Gamesa, one of the world's leaders in wind turbines fabrication.

Although in the first years of the 21st century Vitoria-Gasteiz was close to the full employment, due to the economic crisis dating back in 2008, unemployment rates suffered a steep increase reaching a maximum of around 18%. In July 2016, there are 113,000 employed and 18,000 unemployed people, so current unemployment rate is around 14%.

Comparing to the rest of Europe, the per capita income in Vitoria-Gasteiz is above the average. In year 2012, income per capita was 32,252 € in Vitoria-Gasteiz, whereas in Europe was 29,000€ in 2014, and 22,800€ in Spain.

Business & funding

There are ten industrial parks in the municipality (2,560 companies in total), most of them surrounding the city and devoted mainly to traditional industrial activities (automotive industry related, manufacturing, construction, etc.) with one of them dedicated to new technological industries and activities: the Technological Park of Alava.

Gross Added Value (GAV) is distributed among the main sectors as follows²¹: manufacturing (20%); construction (10%); commerce (9.5%); health & social services (8.5%); real estate (8%); public administration (7.5%). The main manufacturing sub-sectors are the plastic & rubber industry (mainly Michelin), metallurgy and metallic products, and transport materials (including aeronautics). The average company size is of 20 workers.

Education levels are pretty high in the population. 80 % of the people have got a secondary or professional degree, and among them 24 % have a University degree.

After the 2008 economic crisis, the local government is trying to improve the economic conditions to attract more companies to the city and to support local people who want to create new businesses.

In this regard, the municipality has a plan to promote entrepreneurship, which comprises training, advice & mentoring. There is a Centre for Companies in the Old Town, where these activities are being carried out. Periodical workshops, seminars and meetings are organised, for instance CoColab 2016, to promote collaborative economics, and Urban Commerce.

²¹ Statistics Basque Institute Eustat website: <http://www.eustat.eus/>

On the other hand, Vitoria-Gasteiz gives economic aids to companies that want to hire new workers, to promote low carbon economy, to create new small companies, to modernise the hospitality industry, shops and small businesses, and to promote local products. Overall, green economy is one of the main sectors the municipality wants to impulse.

On the negative side, last years have seen a reduction in the number of companies working in the construction, finances, communications, industry, energy and commerce. However, other sectors like computing are increasing their weight regarding GAV.

Environment

The European Green Capital nomination in year 2012²² acknowledged the importance of the environmental features of Vitoria-Gasteiz. Among the most prominent elements of the environmental strategy of the city, it is worth mentioning the green infrastructure aspects and the mobility solutions.

One of the most successful environmental projects in the past decade was the Green Belt of Vitoria-Gasteiz, a chain of green spaces around the city, which serve as a contention wall to keep the city within its limits. This belt was created recovering deteriorated periurban spaces, occupying nowadays around 800 hectares.

With the rise of the “green infrastructure” concept, now the Green Belt is integrated within the whole green infrastructure of the municipality, which includes all green spaces of the urban fabric, as well as surrounding agricultural and natural spaces. The agricultural land (approximately 12,000 hectares) is being reinforced at the local level by means of a new Agricultural & Food Strategy that will impulse the production and consumption of local and organic food, closing the primary sector circle. The natural spaces, located at the mountainous edges of the municipality, are also protected with political tools (natural reserves, Natura 2000 sites, etc.). Likewise, the Urban Green Infrastructure project is updating the inner city green spots using more ecosystem service oriented approaches.

Mobility is another hot topic in the local environmental agenda. The Local Mobility and Public Space Plan²³ is rapidly changing how local people understand their mobility needs. In ten years, bicycle modal share jumped from 3 % to 13 %, while motorised vehicle use keeps at 24 %. Pedestrian mode is highly considered (55% of modal share). Construction of bike lanes (up to 145 km in 2015), reduction of car lanes and the recovery of public space for people to live and socialise, are some key elements of the city’s mobility plan.

Water management has been quite successful in the last years. Total water consumption has lowered to 216 litres/person/day in 2015 (45 litres less than in 2007), and residential consumption shows also good figures (106 litres/person/day).

The downsides are related mainly to soil consumption, energy and waste management. Due to the construction boom of the early 21st century, a lot of space has been used to create new neighbourhoods that are less dense than the existent ones. This urban sprawl has created some dysfunctions in the availability of basic services for people in the new hoods, and an increase of the mobility demand. Regarding energy, the city still hasn't found a way to create a sustainable energy model: consumption is increasing and the energy mix is not shifting to sustainable resources as fast as it would be desirable. Waste recycling isn't advancing as fast as it should, and the city is stuck at a 25 % of urban waste recycling rate.

²² Vitoria-Gasteiz Municipality (2012) “Vitoria-Gasteiz European Green Capital 2012”

²³ Vitoria-Gasteiz Municipality website <http://www.vitoria-gasteiz.org/>

Policies and regulations

The intricate power distribution of the Basque region results in five administrative levels, each one with its own responsibilities. Apart from the European and the Spanish levels, the city is regulated by laws created at the Basque regional level (with competences on natural resource management, train mobility, education, health and employment), the provincial level (roads, agriculture and tax collection) and the local level (urban planning, social services, urban mobility, local culture & sports and local environment).

Vitoria-Gasteiz has several local Plans and Strategies that give shape to the general objectives of the city.

- Urban General Plan
- Sustainable Urban Mobility Plan (including Public Space)
- Climate Change Plan
- Local Waste Management Plan
- Carbon Neutral City
- Biodiversity Conservation Strategy
- Local Agenda 21
- Several plans to support economic activities: companies' creation and consolidation
- Tourism Development Plan

Public procurement is regulated by the Spanish government, who has created a specific law, namely the Public Sector Procurement Law (Spanish: *Ley de Contratos del Sector Público*). It establishes how public works, public services and supplies must be contracted and regulated.

Local governance is made up of a Town Council with 27 representatives, and the local administration is organised in twelve departments, three local companies (bus transport, water management and land management) and three autonomous bodies (related to environment, dancing and music).

5.1.2 Fact box: Vitoria-Gasteiz in numbers

Area	Field	Indicators	Value	Units	Data source	Comments
City characterization	Key features of the city	Size	276.80	km ²	AVG	
		Population	246042	Inhabitant (inh)	AVG	January 1st 2016 data
		Population density	888.88	Inh./km ²	AVG	January 1st 2016 data
		Annual population change	0.41	%	AVG	Increase from the previous year (2015)
		Median population age	43.1	Years	AVG	January 1st 2016 data
		% of population > 75	9.55	%	AVG	January 1st 2016 data (≥ 75y)
		Land consumption	55/276.80	Km ² /Km ²	AVG	Source: Agenda 21 Local 2016 (2015 data): "Suelo artificializado": 19.87%
	Socio-economic features of the city (Current economic	GDP per capita	32,252	M€/inh	EUSTAT 2012	
		Median disposable income	26,765	€	INE	For the whole Basque



	performance of the city)				annual survey 2015	Country (data not available for just Vitoria-Gasteiz)
	Socio-economic features of the city (City prosperity)	Proportion of working age population with higher education	24.3	%	EUSTAT 2015	Data for >10 years old citizens (instead of the requested 18-65 range)
	Socio-economic features of the city (Equity)	City unemployment rate	13.8	%	LANBID E JULY 2016	
		Youth unemployment rate	28	%	LANBID E JULY 2016	<25 years old unemployment rate in Álava province for the second trimester of 2016 (but it was 49% in the first one)
		Percentage of the stock reserved for social housing	56	%	AVG	Data for Álava province in 2013 (515 out of 915)
	Environmental features of the city	Waste generated per capita	0.358	Ton/inh	AVG	2015 data (0.98 kg/inh/day)
		Nitrogen dioxide emissions	27	µg /m ³	AVG	Annual average concentration of NO ₂ (2015)
		Fine particulate matter emissions	9	µg /m ³	AVG	Annual average concentration of PM2.5 (2015) [PM10 one would be 20 µg /m ³ for 2015]
		Air quality index	NOT AVAILABLE	ppp or µg /m ³	AVG	However, annually, the Agenda 21 Local provides with the number of days with an air quality “moderate” “poor” or “very poor”. In 2015 these were 111, 2 and 0, respectively.
		Days PM10 > 50 µg/m3	13	days/year	AVG	2015
		Noise pollution	19	%	AVG	2013
		Green space	14,512/27,680	ha/ha	AVG	2015 data (52.43%)

Table 5: City characterization: common and optional indicators

Area	Field	Indicators	Value	Units	Data source	Comments
City plans and regulation & Governance	City plans and strategies	Existence of plans/programs to promote energy efficient buildings	YES	YES/NO	CEA	
		Existence of plans/programs to promote sustainable mobility	YES	YES/NO	CEA	
		Existence of local sustainability action plans	YES	YES/NO	CEA	
		Signature of Covenant of Mayors	YES	YES/NO	CEA	
		Existence of Smart Cities strategies	NO	YES/NO	CEA	Currently being prepared (published on 2017)
		Existence of public incentives to promote energy efficient districts	YES	YES/NO	CEA	
		Existence of public incentives to promote sustainable mobility	YES	YES/NO	CEA	
	Public procurement procedures & Regulations and normative	Existence of regulations for development of energy efficient districts	NO	YES/NO	CEA	
		Existence of regulations for development of sustainable mobility	NO	YES/NO	CEA	
		Existence of local/national Energy Performance Certificate (EPC)	YES	YES/NO	CEA	
	Governance	Involvement of the administration on smart city projects	Agree	Likert scale: Strongly/disagree Disagree Neither agree nor disagree Agree Strongly agree	CEA	

Table 6: Governance, city plans & regulation: common and optional indicators

5.2 Energy supply and consuming patterns

5.2.1 Energy system of Vitoria-Gasteiz

Vitoria-Gasteiz, as the rest of the Basque Country, relies almost completely (more than 90%) on the import of fossil fuels both for direct use (natural gas, petroleum products), and for electricity generation.

Energy sources and distribution infrastructures

Natural gas network is available throughout the city, and it is widely used in industry, residential, and service sectors. Cogeneration units are installed in few public buildings such as hospitals, and to a minor scale in some residential buildings. **Petroleum products** are the main fuel for transport. **Biomass** fuel is used in some public buildings and swimming pools, but its use remains very low in percentage.

Electricity distribution in Vitoria-Gasteiz is managed by Iberdrola, one of the five main electricity distribution companies in Spain. Connections to the grid from cogeneration plants or renewable energy installations have to be managed through this company. Recent regulatory changes in Spanish electricity market have made very difficult the economic viability of small electricity production systems connected to the grid, which has stopped many initiatives for their installation.

Consuming sectors

A detailed analysis of energy consumption carried out for the *Action Plan Against Climate Change 2010-2020*²⁴ included evaluation of the following sectors: residential, services, internal mobility/transport, primary, hydrologic cycle, municipal services and facilities and waste management.

Total consumption in 2006 was 2649.49 GWh, excluding the energy used by the industrial sector. The distribution of consumption by energy sources in 2006 showed that 44.7% were derived from petroleum, followed by a 26.8% natural gas and 25.9% of electricity. By sectors, the largest consumer was the residential, with 36.4%, followed by the mobility (34.3%) and the services sector (20.7%). The consumption of the primary sector (agriculture) accounted for 3.2%. Energy consumption corresponding to municipal services (hydrological cycle, waste management, urban cleaning and maintenance, public buildings) accounted for 5.3% of total consumption in 2006.

It must be noted that industrial sector is not considered in these ratios.

²⁴ Vitoria-Gasteiz Municipality. Vitoria-Gasteiz Action Plan Against Climate Change Plan 2010-2020. <http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/39/30/33930.pdf>

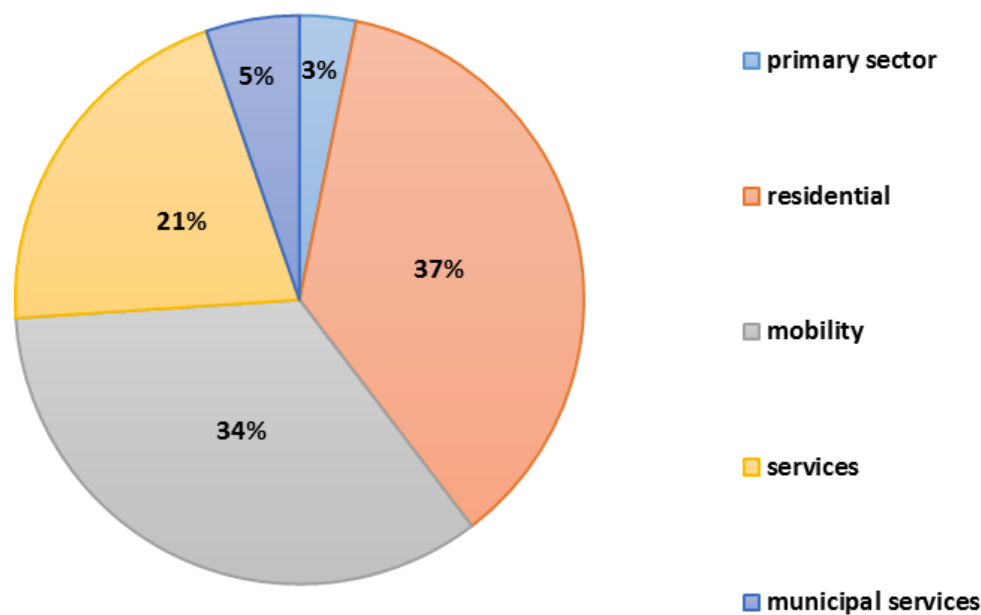


Figure 3: Share of energy-end uses, by sector (excluding industrial sector)²⁵

No major changes in these ratios have been registered in the last 10 years. In the projections for 2020, total energy consumption in the city increases by 16.3% from 2006, mainly due to an increase in population and the number of households

Climate Change Plan of Vitoria-Gasteiz

Vitoria-Gasteiz aims to reduce its energy consumption by rationalizing energy use and promoting the use of more efficient technologies such as district heating and micro-cogeneration, as well as greater energy efficiency in new and refurbished buildings. At the same time, the city aims to promote renewable energy sources such as solar power, geothermal systems, wind farms and biogas from urban waste.

In line with these objectives, the city council adopted a *Climate Change Prevention Strategy* in 2006, and agreed to cut emissions by 16% by 2012. In 2009, it signed up to the Covenant of Mayors and, in 2010, approved the *Action Plan Against Climate Change*, promising more ambitious reductions. The city's long-term objective is to become a carbon-neutral zone, with an interim goal of cutting emissions by half by 2050, through wide-ranging actions in different sectors and public education.

The key action lines for reduction of energy use and greenhouse gases in Vitoria-Gasteiz have been defined as follows in the climate action plan ([link²⁵](http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/39/30/33930.pdf): Spanish only):

- Rethinking the current system of mobility within the city, drastically reducing travel by private vehicle (over 70%) and promoting more efficient and environmentally friendly transport modes (public, bicycles, transition to electric and hybrid vehicles). This can reduce the consumption in this sector by 82%.
- Reduce energy demand of existing buildings by refurbishing the envelope, and by replacing consumer appliances, lighting, boilers, etc. with more efficient systems. This can achieve savings of over 40% from current values.

²⁵ Vitoria-Gasteiz Municipality. Action Plan Against Climate Change 2010-2020.
<http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/39/30/33930.pdf>

- Design and construct new buildings with maximum efficiency criteria (proper orientation, passive solar systems, daylight, under-floor heating, high efficiency equipment, etc.).
- Reducing energy consumption of public space, mainly replacing lighting systems and traffic lights with more efficient units, achieving a reduction in energy consumption of more than 40%.
- Minimising waste generation and implementing a management system that firstly fosters material recovery and secondly, energy recovery.
- Reduce water consumption by improving the efficiency of the network, the change in consumer habits, the installation of water saving components and boosting the use of unconventional water sources (rainwater, gray ...). These actions will make possible to achieve energy savings of 17% over the current value of water-related energy use.
- Reducing emissions of the primary sector and achieving self-sufficiency in food. This can be achieved by sustainable production of local products and promoting the consumption of these products in the municipality. This model, besides reducing related energy use, has advantages because it promotes local trade by establishing a network of local food producers.
- Exploiting renewable resources within the municipality. It is estimated that local renewable production could reach around 460 GWh/year, mainly from solar energy (thermal and photovoltaic).

Business model and funding

The public sector has various initiatives and promotes investments in energy efficiency or renewable energies at local level. In some cases, Energy Performance Contracting (EPC) is used, particularly for large commercial or service buildings (e.g. sport centres). Under these schemes, an energy service company (ESCO) and the customer come to a contractual arrangement to introduce energy efficiency improvement measures, where investments in those measures are recovered by means of the expected savings from the contractually agreed level of energy efficiency improvement.

Under an EPC, the ESCO examines the installation, assesses the level of energy savings that might be achieved and offers to implement the project, guaranteeing those savings during the agreed period. This scheme is also used in some cases by private companies, particularly in industry, health centers, or large service buildings.

There are specific grant programs for energy efficiency and renewable energy sources in the Basque Country, managed by EVE, the Basque Energy Agency. These programs are both oriented to increase efficiency on the industrial sector, transport, the tertiary sector, public authorities and to promote specific technologies for harnessing biomass, solar and geothermal energies.

5.2.2 Fact box: Energy system of Vitoria-Gasteiz in numbers

Area	Field	Indicators	Value	Units	Data source	Comments
Energy supply network	City energy profile	Primary Energy Consumption in the city per year	NOT AVAILABLE	MWh/year		Data not available as industrial consumption is not recorder
		Final Energy produced in the city per year	NOT AVAILABLE	MWh/year	AVG	The energy produced from renewable sources was available: 26,606 MWh/year in 2014
		Public lighting energy use per year	30,924,820	kWh/year	AVG	
		Primary Energy Consumption in the city per capita	NOT AVAILABLE	MWh/year per inhabitant		Data not available as industrial contribution is not recorded
		Final Energy produced in the city per capita	NOT AVAILABLE	MWh/year per inhabitant	AVG	The energy produced from renewable sources was available: 26,606 MWh/year in 2014 (population was 242,924)
		Public lighting energy use per capita	125.69	kWh/year per inhabitant	AVG	
	Potential local renewable energy resources	Percentage of total energy derived from renewable sources	NOT AVAILABLE	%		
		Energy use from District Heating	0	kWh/year	CEA	
		Energy use from Biomass	NOT AVAILABLE	kWh/year		
		Energy use from PV	NOT AVAILABLE	kWh/year		
		Energy use from Solar Thermal	NOT AVAILABLE	kWh/year		
		Energy use from Hydraulic	0	kWh/year	CEA	
		Energy use from Mini-Eolic	0	kWh/year	CEA	
		Energy use from Geothermal	NOT AVAILABLE	kWh/year		
		Budgets devoted to renewable energies and Energy Efficiency	NOT AVAILABLE	Euros / Persons	AVG	Some partial data available: e.g. 200,000 €/year for public lighting energy efficiency projects

	Environmental impacts of the energy consumption	Global Warming Potential (GWP) per capita	3.1*	Tn equi. CO ₂ / year capita	AVG	2013 *Data without considering the industrial sector (not available)
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Table 7: Energy supply network: common and optional indicators

5.3 Building stock and retrofitting needs

5.3.1 Building stock of Vitoria-Gasteiz

With regard to housing, the city has experienced a steady increase in the number of homes in the last 10 years. As shown in the graph, this growth has continued even during the crisis years.

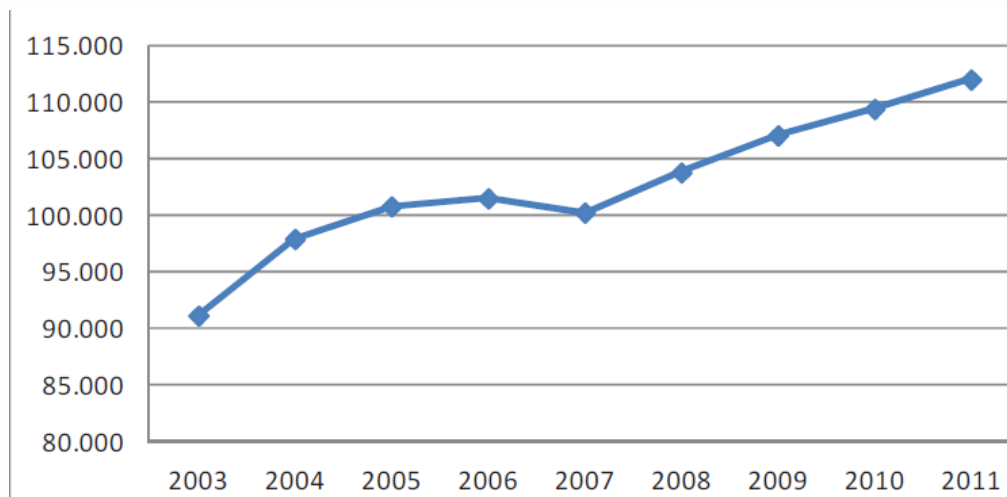


Figure 4: Number of dwellings in Vitoria-Gasteiz, by year. Strategy for Sustainable Integrated Urban Development²⁶

The city land-use General Plan proposed a very expansive growth of housing in 2003, with the planned construction of 36,296 new homes in both urban and developable lands. More than half of these homes have been materialised in 2016.

Construction period

Demand for housing has increased gradually, not only by population growth but also by reducing family sizes and the increased number of apartments occupied by just one person. In this sense, while the population has increased in the last two decades at a rate of 1% per year, households have increased at a rate of 3% annually. In fact, 50% of homes in Vitoria-Gasteiz have been constructed from the 80s; housing in the city is therefore relatively young, although its distribution is not uniform throughout the municipality.

As shows Figure 5 below, one third of the buildings were built in the 70s, where energy efficiency was still not even part of the building regulations, which means a significant part of the building stock has serious problems on thermal performance, as they have no insulation.

²⁶ Vitoria-Gasteiz Municipality (2016). Personal communication

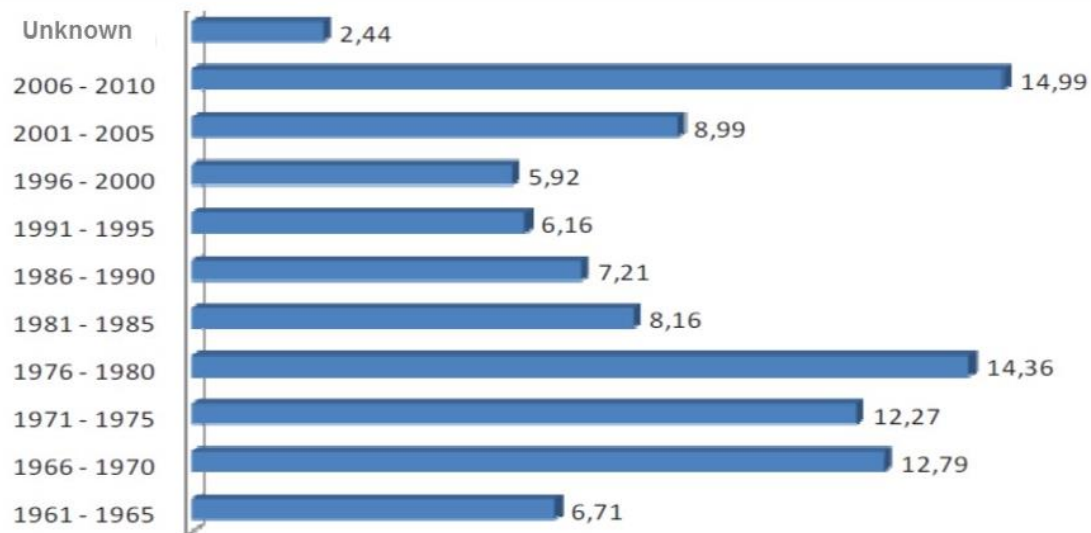


Figure 5: Percentage of housing in Vitoria-Gasteiz by construction year. Strategy for Sustainable Integrated Urban Development²⁷

Houses in the 80's and 90's meet basic requirements for thermal performance, but it was not until 2006 when more serious energy performance requirements were introduced in building regulations, taking some years their full implementation.

While the outskirts of the city have been mostly developed after the 80's, the inner city has the largest proportion of oldest housing with worst energy performance.

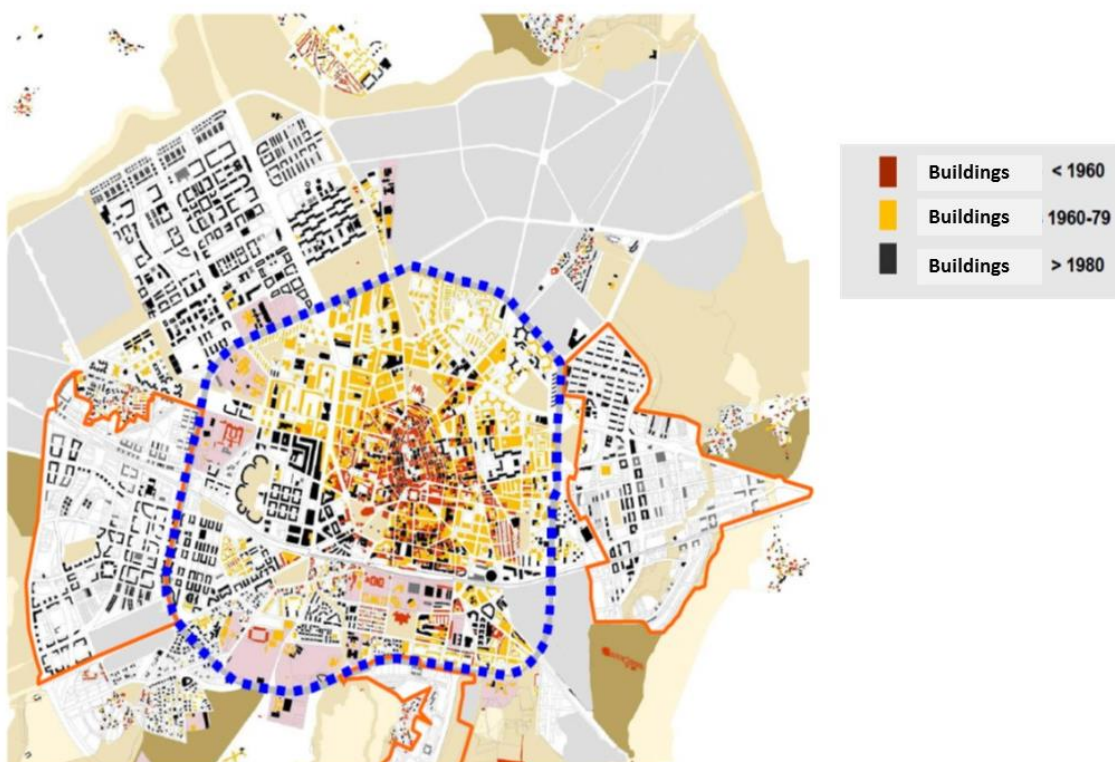


Figure 6: Buildings' construction date in Vitoria-Gasteiz²⁸

²⁷ Vitoria-Gasteiz Municipality (2016). Personal communication

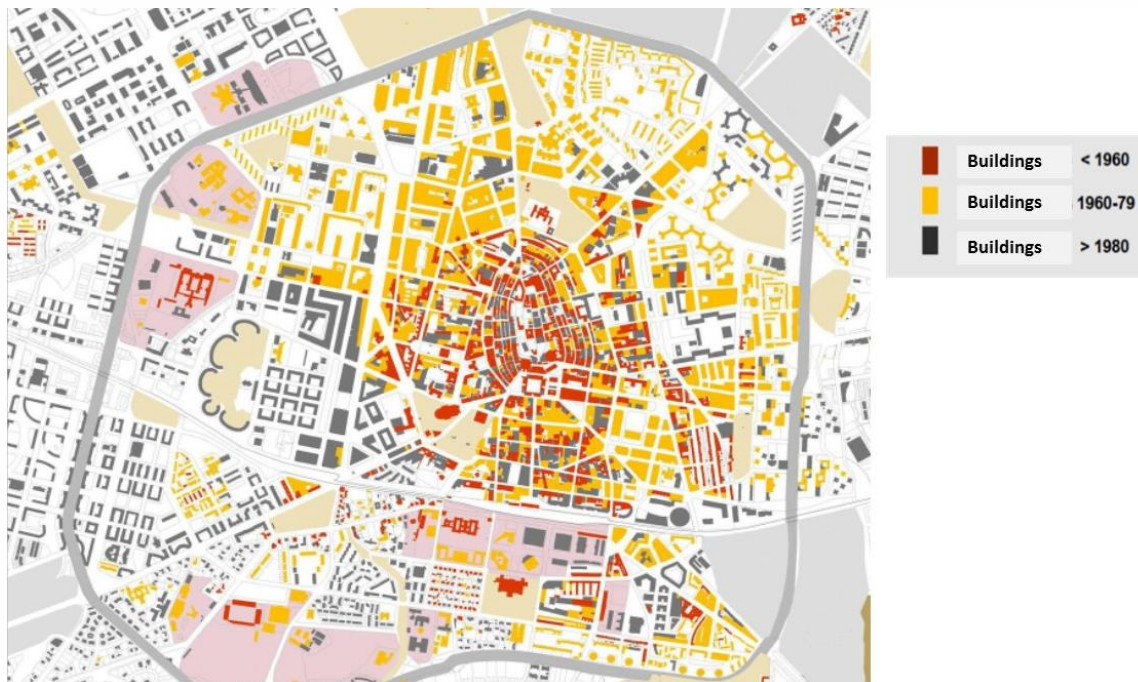


Figure 7: Buildings' construction date in Vitoria-Gasteiz. Inner city²⁸

Strategies and funding schemes

Vitoria-Gasteiz is now making efforts to improve sustainability of housing. A local regulation (ordinance) has been passed in September 2016, which will reduce the local property taxes in 50% to properties with an “A” energy rating, and in 25% to properties with a “B” energy rating.

Regarding funding mechanism for building refurbishment, The Ministry of Industry, Energy and Tourism, through the Institute for Energy Diversification and Savings (IDAE), set up the “PAREER-CRECE programme” to incentivise and promote energy rehabilitation of existing buildings, including improvements in energy efficiency, harnessing of renewable energy and reduced carbon emissions in existing buildings. This programme can be accessed independently of building use and the legal nature of their owners, and aims to contribute to achieve the energy efficiency targets set in Directive 2012/27/EU and the 2014-2020 Action Plan, while at the same time creating opportunities for growth and employment in different industries, particularly the building industry, and promoting urban regeneration.

In the Basque Country, the RENOVE Housing Rehabilitation Plan 2013-2016 was launched with the objective of increasing energy efficiency of homes and buildings, improving conditions of accessibility, reinforcing social cohesion and incentivising job creation. The RENOVE Housing Rehabilitation Plan 2013-2016 is also framed within the Europe 2020 Strategy, seeking to promote a low-carbon economy that will meet the targets of reducing carbon emissions by 20%, cutting energy consumption by 20% and increasing the use of renewable energy by 20%. The programme is articulated through five sub-programs:

²⁸ Vitoria-Gasteiz Municipality (2012). *Analysis and characterization of residential districts*

- Funding programme to help individuals and communities of property owners for the rehabilitation of buildings and homes.
- Funding programme to improve accessibility, form municipalities and local governments.
- Grant scheme for building conservation in Integrated Rehabilitation Areas or Residential Areas Degraded heritage.
- Grant scheme on efficient rehabilitation of homes and buildings for projects conserving building heritage.
- Grant program for urban regeneration

There is also a specific grant scheme from Vitoria-Gasteiz city council to support residential building refurbishment, which can provide between 10-20% funding depending on the family earnings. This funding goes up to between 20-40% for refurbishment in the historic centre and priority areas.

5.3.2 Fact box: Building stock of Vitoria-Gasteiz in numbers

Area	Field	Indicators	Value	Units	Data source	Comments
Energy supply network	Energy uses in building typologies	Total buildings energy consumption per year	1,823	GWh/year	AVG 2013	Residential:1,107; Non-residential: 716
		Public building energy consumption per year	84 GWh/yr	kWh/m ²	AVG	Data per surface not available. 2013
		Residential buildings energy consumption per year	0.0046	GWh/inhab.year	AVG	2013 (242,147inh)
		Total building energy consumption in the city per capita	0.0075	GWh/year per inhabitant	AVG	2013 (242,147inh.)
		Portion of households connected to the district heating and cooling	0	%	CEA	
		Total residential natural gas energy use per capita	2.608	kWh/inhab-year	AVG	2014
		Total residential oil energy use per capita	421	kWh/inhab-year	AVG	2014 (Oil C type)
		Percentage of the energy consumption by end use in residential buildings: space conditioning	NOT AVAILABLE	%	<i>Residential Sector Consumption in Spain (2010)</i>	At Spanish level, adding Heating+Electricity, data is 73.7% in 2010
		Percentage of the energy consumption by end use in residential buildings: domestic hot water	NOT AVAILABLE	%	<i>Residential Sector Consumption in Spain (2010)</i>	At Spanish level, data is 18.9% in 2010
		Percentage of energy consumption by end use in residential buildings: lighting and appliances	NOT AVAILABLE	%	<i>Residential Sector Consumption in Spain (2010)</i>	At Spanish level, data is 25.8% in 2010
		Percentage of the energy consumption by end use in public buildings: electrical uses	31.5	%	AVG	2013

Table 8: Buildings: common and optional indicators

5.4 Urban mobility

5.4.1 Urban mobility of Vitoria-Gasteiz

Vitoria-Gasteiz, as a result of its strong commitment towards sustainable mobility, has developed a very ambitious Sustainable Urban Mobility Plan (SUMP), which aims to reduce the use of private cars while increasing active and sustainable modes of mobility.

A recent mobility survey from 2014 shows a strong increase in cycling, while car traffic has diminished along last years. In fact, the cycling modal share doubled in only three years, up to 12.3 %, thus making Vitoria-Gasteiz the city with the highest confirmed cycling share in Spain.

Vitoria-Gasteiz takes part actively in several European initiatives towards sustainable mobility. Already finished and ongoing projects are:

- **CIVITAS MODERN**²⁹ project, in which Vitoria-Gasteiz, among other measures, set up an Electromobility Centre consisting in an information point, car-sharing base and recharging centre for electric vehicles.
- **European Biking Cities** project, coordinated by the German NGO for sustainable mobility Verkehrsclub Deutschland (VCD) within the LIFE+ project Clean Air.
- ICT4EVEU projects, aimed at the promotion of the electromobility in the city.
- Nowadays, apart from the SmartEnCity project, Vitoria-Gasteiz is involved in **MOVESMART**³⁰, a project to create a rapid route planning tool for energy efficient and personalised mobility.

Mobility city profile

Vitoria Gasteiz is a middle-size compact city of around 250,000 inhabitants that allows most displacements to be made on foot. However, most non-pedestrian journeys are made by car (25 % of modal share), being motorized traffic the second largest source of greenhouse gas emissions.

The fast geographical growth of the city during recent years was affecting its scale and structure to a great extent, and the overall urban mobility trends were becoming less and less sustainable. This is the reason why Vitoria-Gasteiz City Council defined a SUMP with a set of objectives to fight against this trend:

- To reduce transport impact within the city, easing accessibility to public spaces.
- To encourage citizens' engagement through participatory schemes and allow them to share their views on the mobility needs of the city.
- To involve sustainable mobility stakeholders (citizens, transport operators, local authorities, etc.)
- To design mobility management strategies to change modal split in a way that non-motorized transport is favoured over private cars and motorbikes.

During the CIVITAS MODERN project, important measures were implemented in this sense. One of them was the reorganization of the urban bus network (originally there were 17 bus lines that were reduced to 9 bus lines and 2 tram lines). Another measure was the increase

²⁹ CIVITAS website. <http://www.civitas.eu/past-awards-full>

³⁰ MOVESMART Project website. <http://www.movesmartfp7.eu/>



of pedestrian areas by more than 50 percent. Finally, bicycle lanes were extended from 38 km to 148 km.

Nowadays, Vitoria-Gasteiz has a new mobility and real time traffic information website that provides citizens with useful information to plan their displacements in an efficient way. A new electromobility center was created to provide first-hand information about electric vehicle models and the best financial schemes to face their purchase. Renting them is also possible from a new ecar-sharing scheme, and there are several charging points available.

As of 2014, data obtained from the EPOMM³¹ website revealed that Vitoria-Gasteiz is the Spanish city with the highest percentage of bicycle use. In addition, it is one of the cities with the lowest use of private cars and motorbikes, and the highest number of pedestrians.

The relatively low levels of public transport use can be explained by the city's small size.

City statistics for mobility

A series of surveys carried out in years 2006, 2011 and 2014 provides some mobility related statistics. One of the main figures shows that, for the first time, in 2014 the total number of trips by car decreased, changing the upwards trend seen previously.

Percentages		2006	2011	2014
GENERAL MODAL SHARE	Pedestrian	49.60%	54.00%	54.40%
	Bicycle	3.30%	6.80%	12.30%
	Public transport	7.70%	8.50%	7.60%
	Car or motorbike	36.90%	28.40%	24.70%
	Others	2.60%	2.20%	1.10%
	Total	100.00%	100.00%	100.00%

Table 9: Modal share of Vitoria-Gasteiz city (percentages). 2014 Vitoria-Gasteiz Mobility Survey³²

Trips		2006	2011	2014
GENERAL MODAL SHARE	Pedestrian	288,141	447,911	495,427
	Bicycle	19,051	56,400	111,851
	Public transport	45,045	70,854	69,491
	Car or motorbike	214,224	236,008	224,892
	Others	14,875	18,653	9,665

Table 10: Modal share of Vitoria-Gasteiz (trips). 2014 Vitoria-Gasteiz Mobility Survey³²

³¹ <http://www.epomm.eu/index.php>

³² TRANSyT (2014). 2014 Vitoria-Gasteiz Mobility Survey

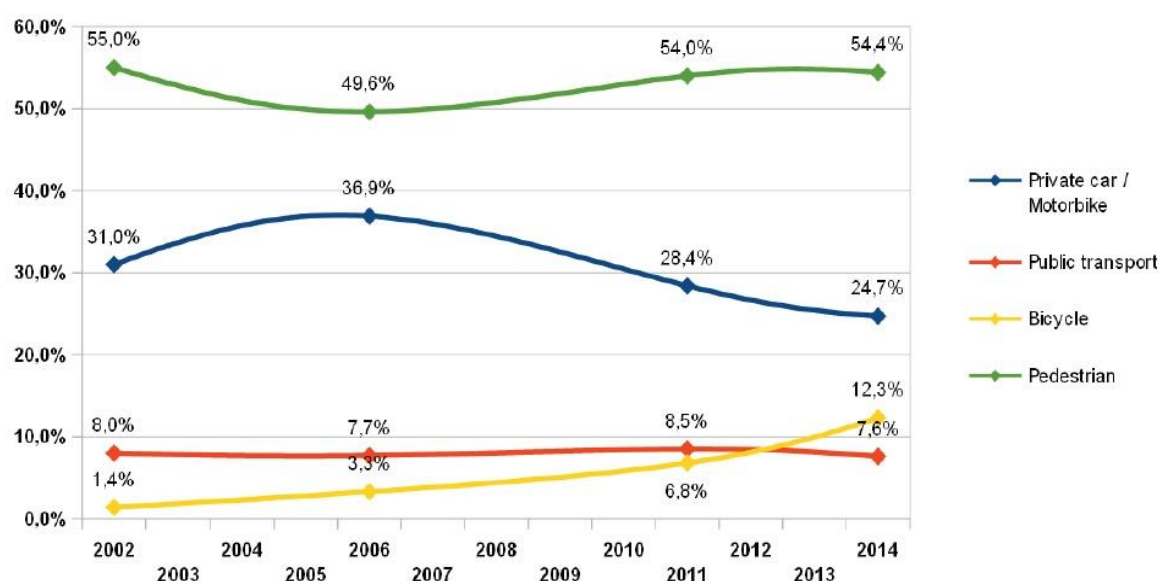


Figure 8: Trend in the modal share from 2002 to 2014. 2014 Vitoria-Gasteiz Mobility Survey³³

Figure 10 above shows a change in trend as of 2006 regarding the use of cars and motorbikes, which is confirmed by the 2014 survey. The use of cars and motorbikes decreased from 36.9 % to 24.7 %. On the other hand, a clear rising trend can be observed for the use of bicycle (from 3.3 % in 2006 to 12.3 % in 2014). Pedestrian modal share also increased from 49.6 % to 54.4 %.

In 2014 the total number of trips undertaken by car or motorbike was 224,000 trips, 12,000 fewer than in 2011.

Travelling on foot is the most common mean of commuting. With a significant share, private car and motorbike use are following in second position. The use of bicycle has surpassed public transport, which has decreased slightly along recent years. The increase in the use of public transport that took place from 2006 to 2011 was due to the introduction of trams and the new bus network. A remarkable change to be noted is the preferred use of bicycle over public transport, which is quite recent (as of 2012).

A **detailed analysis of modal share**, considering different vehicle types for public and private transport is shown below, both in terms of percentages and commutes.

Percentages		2006	2011	2014
DETAILED MODAL SHARE	On foot	49.60%	54.00%	54.40%
	Bicycle	3.30%	6.80%	12.30%
	City bus (TUVISA)	7.40%	4.70%	4.50%
	Tram	0.00%	3.50%	2.80%
	Intercity bus	0.30%	0.40%	0.40%

³³ TRANSyT (2014). 2014 Vitoria-Gasteiz Mobility Survey

	Car driver	29.70%	23.30%	20.20%
	Car passenger	6.30%	4.70%	3.50%
	Motorbike	0.90%	0.50%	0.90%
	Taxi	0.20%	0.10%	0.10%
	Truck or van	0.10%	0.10%	0.10%
	School or company bus or coach	1.90%	1.50%	0.60%
	Train	0.04%	0.00%	0.01%
	Group transport on request	0.00%	0.00%	0.10%
	Other individuals	0.00%	0.00%	0.20%
	Other groups	0.30%	0.50%	0.00%

Table 11: Detailed modal share (percentages). 2014 Vitoria-Gasteiz Mobility Survey³⁴

Commutes		2006	2011	2014
DETAILED MODAL SHARE	On foot	288,141	447,911	495,427
	Bicycle	19,051	56,400	111,851
	City bus (TUVISA)	43,159	38,727	40,739
	Tram	0	28,929	25,374
	Intercity bus	1,887	3,198	3,378
	Car driver	172,799	192,972	184,355
	Car passenger	36,410	38,711	32,003
	Motorbike	5,016	4,325	8,534
	Taxi	1,432	868	847
	Truck or van	510	1,062	815
	School or company bus or coach	11,168	12,739	5,422
	Train	243	0	137
	Group transport on request	0	0	753
	Other individuals	0	0	1,574
	Other groups	1,521	3,984	117

Table 12: Detailed modal share (commutes). 2014 Vitoria-Gasteiz Mobility Survey³⁴

The decrease in public transport use can be explained with a lower use of the tram, though it must be noted that both the use of City bus (TUVISA) and Intercity bus have increased.

³⁴ TRANSyT (2014). 2014 Vitoria-Gasteiz Mobility Survey

We can further analyze the reasons or motivations behind the different commutes, which can be seen below.

Year		2006	2011	2014
DISTRIBUTION BY MOTIVES	Work	26.30%	23.40%	18.80%
	Studies	10.00%	13.10%	7.40%
	Other:	63.80%	63.50%	73.80%
	- Shopping	19.00%	13.80%	17.70%
	- Medical/hospital	3.40%	3.30%	3.60%
	- Friend/family visit	6.40%	4.60%	5.80%
	- Accompanying individuals/school drop off, etc.	9.60%	10.10%	8.60%
	- Entertainment, lunch/dinner out	12.50%	18.70%	16.70%
	- Personal errands	9.40%	6.40%	9.30%
	- No specific destination, or an outing	0.30%	4.20%	11.60%
	- 2 nd residence	0.30%	0.40%	0.40%
	- Unknown/No response	2.90%	2.00%	0.00%

Table 13: Distribution by motive. 2014 Vitoria-Gasteiz Mobility Survey³⁵

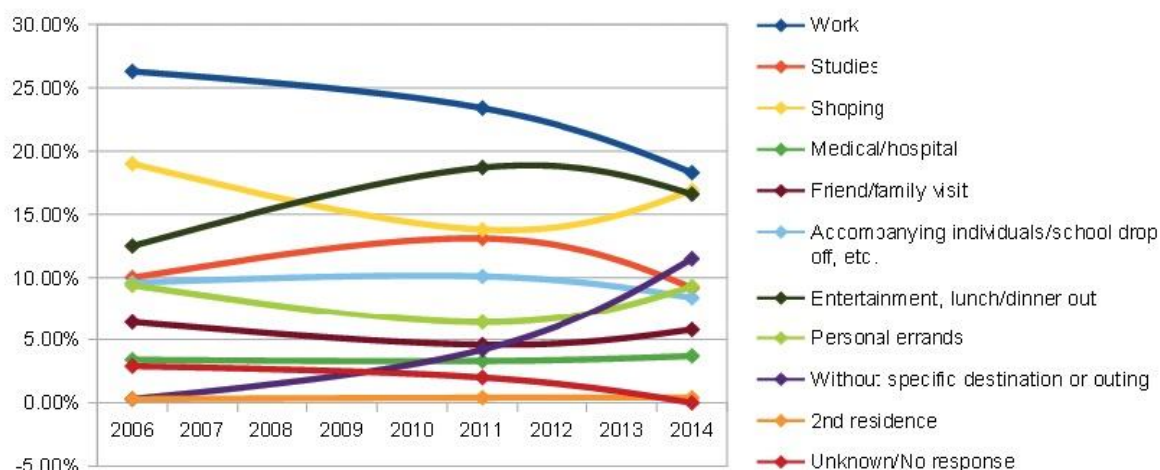


Figure 9: Distribution by motive. 2014 Vitoria-Gasteiz Mobility Survey³⁵

According to the table and graph above, commuting to work has decreased to a great extent for the last few years. One reason may be the increase of unemployment ratio (10,000 more unemployed people from 2011 to 2014 according to municipal statistics).

³⁵ TRANSyT (2014). 2014 Vitoria-Gasteiz Mobility Survey

Generally speaking, the distribution of trips related to different motivations and means of transport tends to keep constant over time. However, some changes can be noted from the above tables:

- Bicycle use related to work or studies is higher than for other uses.
- Cycling as a means of transport accounted for 12.30% of all journeys in 2014
- Travelling on foot is more frequent when motivation is other than work or studies.
- There has been a rise in the use of public transport to travel to school or university (18.50 % of students currently travel by bus or tram), but the percentage of people using public transport to travel to work has decreased.
- The use of a car or motorbike for motives other than travelling to work, school or university has remained constant, with levels always slightly lower than the general use of this means of transport.

Regarding trip duration, the average duration of a commute is decreasing, and whereas 30 % of commutes lasted for less than 10 minutes in 2006, 40 % did so in 2014. Similarly, commutes lasting for between 11 and 20 minutes were also reduced by the same proportion.

Policies and regulations

Vitoria-Gasteiz City Council is committed to sustainable development with the aim to ensure a high quality of life to all its citizens.

Following with this idea, the **Sustainable Urban Mobility Plan**³⁶ was adopted in 2008. Later on, in 2010, there followed a **Master Plan for Cyclist Mobility**, that promoted bicycle use within the city's transport policy and set the ambitious goal of 15 % cycling mode share by 2020 while maintaining the city's high level of walking (54.4 %).

The SUMP's main objective is the successful application of the management of public space based on the superblock model, aiming at two main targets:

- To stop and reverse the previous mobility model based on the predominance of the private car.
- To create a new kind of public space that encourages urban livability.

The SUMP has achieved a series of benefits for the city, which includes reversing the trend in the modal split, reducing the use of private car and increasing displacements in public transport, by bicycle and walking. Vitoria-Gasteiz has created functional networks for pedestrian mobility and for cyclists, which gave higher value to public space. The progress reached in the public transport system resulted primarily in reducing pollutant emissions and saving travel time for users.

One success that can be considered as derived from the plan is the implementation of the bus network, through an intensive process of participation and communication, increasing its use by more than 50 % in total figures. Another achievement to be noted was the development of a series of plans that derive from it.

The ultimate success was achieved when Vitoria-Gasteiz was honoured as Green Capital 2012 by the EU, thanks also to its actions in the mobility field.

³⁶ Vitoria-Gasteiz Municipality website. <http://www.vitoria-gasteiz.org/>

5.4.2 Fact box: Urban mobility of Vitoria-Gasteiz in numbers

Area	Field	Indicators	Value	Units	Data source	Comments
Transport and mobility	Mobility City Profile	Total number of vehicles in the city per capita	0.577	Number/inh	AVG 2015	243,918 inhabitants
		Total number of private cars per capita	0.455	Number/inh	AVG 2015	243,918 inhabitants
		Total number of taxis per capita	0.00077	Number/inh	INE 2015	188 taxis/ 243,918 inhabitants
		Total number of trucks per capita	0.0426	Number/inh	AVG 2015	243,918 inhabitants
		Total number of public buses per capita	0.00033	Number/inh	AVG 2015	81 buses from the local public transport company
		Total number of public bicycles per capita	0	Number/inh	CEA	
		Number of two-wheel motorized vehicles per capita	0.0586	Number/inh	AVG 2015	Motorcycles
	City Statistics for Mobility	Average age of motor vehicles for public transport	10	years	TUVISA	(Municipality Bus Company)
		Kilometers of high capacity public transport system per population	0	Km/inh	CEA	
		Kilometers of light passenger public transport system per population	0.000052	Km/inh	AVG 2016	Tram (12.8km)
		Kilometers of bicycle paths and lanes per population	0.00057	Km/inh	AVG 2016	140km/ 243,918 inhabitants
		Total annual number of trips	911,326	Number of trips	AVG 2014 survey	
		Total annual number of trips by private car	216,358	Number of trips	AVG 2014 survey	Available distinction between driver/passenger
		Total annual number of public transport trips	69,491	Number of trips	AVG 2014 survey	
		Total annual number of trips by bike	111,851	Number of trips	AVG 2014 survey	
		Total annual number of trips by motorbike	8,534	Number of trips	AVG 2014 survey	
		Total annual number of trips by taxi	847	Number of trips	AVG 2014 survey	
		Total annual number of trips on foot	495,427	Number of trips	AVG 2014 survey	
		Annual number of public transport trips per capita	0,318	Number trips /inh	AVG 2014 survey	218,515 (surveyed population)
		Daily average time by trip	20.7	min /vehicle-day	AVG 2014 survey	
		Daily average length by private car trip	9.52	km/ person ·day	AVG	2001 data
		Daily average length by bike trip	5.65	km/ person	AVG	2001 data



				·day		
	Daily average length by motorbike trip	4.29	km/ person	·day	AVG	2001 data
	Daily average length on foot trip	2.72	km/ person	·day	AVG	2001 data
	Percentage of electric cars	0.027	%		EVE	30 EVs from a car fleet of 111,053 (2015)
	Percentage of electric taxis	0	%		EVE	Data considering vehicles that received public grants for purchase (2011-2015)
	Percentage of electric motorcycles	0	%		EVE	Data considering vehicles that received public grants for purchase (2011-2015)
	Percentage of electric public buses	0	%		TUVISA	
	Percentage of biogas public buses	0	%		TUVISA	
	Number of public EV charging stations	6	Number		IBIL	One of them allows FAST charge
	Total number of recharges per year	NOT AVAILABLE	Number			Data requested to the responsible body: EVE
	Total kWh recharged in the EV charging stations	NOT AVAILABLE	kWh			Data requested to the responsible body: EVE
	Number of available parking slots per capita	0,80	Number/inh		CEA 2016	Included all types of parking places (public, private, on-street, underground)
	Pedestrian area per capita	18.27	m ² /inh		AVG 2015	Modified units from standard indicators table
	Cost of a monthly ticket for public transport in relation to the national minimum wage or average wage	4.5	%		CEA	29.5€ / 655.2 € (Spanish minimum monthly wage)
	Transportation fatalities per capita	0.000008	Number/inh		AVG 2015	2 fatalities in 2015; 2 fatalities in 2014
Environmental impact with mobility	Transport energy use per capita	3.47*	GWh/(pers·yr)		AVG 2013	Modified unit from standard indicators table (MWh to GWh). *Only trips within Municipality
	Transport greenhouse gas emissions per capita	0.91	t/(pers·yr)		AVG 2013	*Only trips within Municipality
	Percentage of renewable energy use in public transport	4	%		AVG 2013	*Only refers to % of biofuels in the public bus fleet

Table 14: Urban mobility and transportation: common and optional indicators³⁷³⁷ Vitoria-Gasteiz Municipality (2014). 2014 Statistics Report. Chapter 13, Mobility and commuting

5.5 ICT infrastructures and services

5.5.1 ICT infrastructures and services of Vitoria-Gasteiz

Monitoring & communication infrastructures of Vitoria-Gasteiz

The municipality of Vitoria-Gasteiz has different municipal infrastructures for monitoring and communication in different areas.

Regarding **communications**, Vitoria-Gasteiz Municipality has a diversified communications network, among which are overhead wires of optical fiber, multi-mode and single-mode. This optical fiber network is the basis for connectivity of different municipal systems, such as traffic infrastructure or the technology infrastructure of municipal buildings and civic centers.

The city of Vitoria-Gasteiz has a municipal wireless Internet network accessible from several municipal facilities, mostly civic centers. This WIFI network is mostly free of charge.

- Free WIFI areas (*wifi-vitoria-gasteiz* network)
 - Abetxuko civic center.
 - Aldabe civic center
 - Arana civic center
 - Ariznabarra civic center
 - Arriaga civic center
 - El Campillo civic center
 - El Pilar civic center
 - Hegoalde civic center
 - Ibaiondo civic center
 - Iparralde civic center
 - Judimendi civic center
 - Lakua civic center
 - Salburua civic center
 - Montehermoso cultural center
 - Municipal Office for Youth Information - Tourist Office
- WIFI payment areas (*vitoria-gasteiz* network)
 - Sancho el Sabio street, only accessible from thoroughfare.
 - Congress and Exhibition Centers: Europe Palace and Villasuso Palace. Service related to congress activity.
 - Business Center of Medieval Town.

Other elements of communications and signal conversion elements, or direct connection to the communication network, 3G systems, GPRS, etc. are deployed in the city. These elements support different monitoring systems of assets and urban services such as automatic watering system, street lighting, waste collection and street cleaning. These other elements of communications are usually maintained and paid by the awardee companies of those urban services.

In terms of **monitoring**, deployed infrastructures respond to different departmental initiatives, according to municipal management needs that arose throughout the years. The following lines describe deployed infrastructures for monitoring activities in Vitoria-Gasteiz.

Traffic management and control

In order to perform an optimal management and control of traffic in the city of Vitoria-Gasteiz, the Municipality has a monitoring infrastructure for controlling wheeled traffic, which management is centralized in a Traffic Management Center. This infrastructure consists of the following systems.



- Centralized management system of the circulation control systems.
- Circulation control system by traffic light network.
- Capacity systems and data collection.
- Observation and detection systems.
- Selective access control systems.
- Control systems of the signal respect.
- Data management, inventory, intercom, and remote control systems.
- User information systems.

The municipal website (www.vitoria-gasteiz.org)³⁸ provides information related to traffic in the city (traffic cameras, density of traffic, incidents, radars, parking, etc.).

Public transport

In addition to management systems and traffic control, the city of Vitoria-Gasteiz has a system of real-time location information of buses in the city, as well as their different routes. This information is provided to citizens through the municipal website and through information panels located on the multiple bus stops.

Weather stations

The Municipality of Vitoria-Gasteiz has weather stations strategically distributed by the parks and gardens of the city. These stations comprise various types of sensors including anemometers (speed and wind direction), thermometers, rain gauges and humidity sensors.

Air quality monitoring and control network

There is a monitoring and control of air quality automatic network that allows monitoring in six points of the city with different parameters related to air quality.

Energy monitoring of municipal facilities

Within the energy efficiency plans of the Municipality, a system of monitoring and remote management of heating, air conditioning and DHW has been deployed in the municipal buildings (civic centers and municipal swimming pools). This system allows controlling them, adjusting its operation to the instructions and strategies programmed on control systems, controlling at all times the correct status of the parameters, generating alarms if anomalies or malfunctions are detected.

Smart City Services in Vitoria-Gasteiz

The city of Vitoria-Gasteiz has various services and applications oriented to paradigms of the Smart City.

Vía Digital platform

Vía Digital is a platform for comprehensive management of public roads that allows, through orders and reports of work, management and control of maintenance labours. Assets of public streets such as street furniture, parks and gardens, public lighting, pavements, or traffic signage, among other maintenance labours, are controlled by *Vía Digital*.

³⁸ Vitoria-Gasteiz Municipality website. <http://www.vitoria-gasteiz.org/>

The platform integrates a common management model for the entire city in the field of Public Roads, consisting of fully integrated applications of municipal infrastructures. These applications are desktop, intranet, extranet and mobile applications. This common management model encompasses several municipal services with competence in public roads.

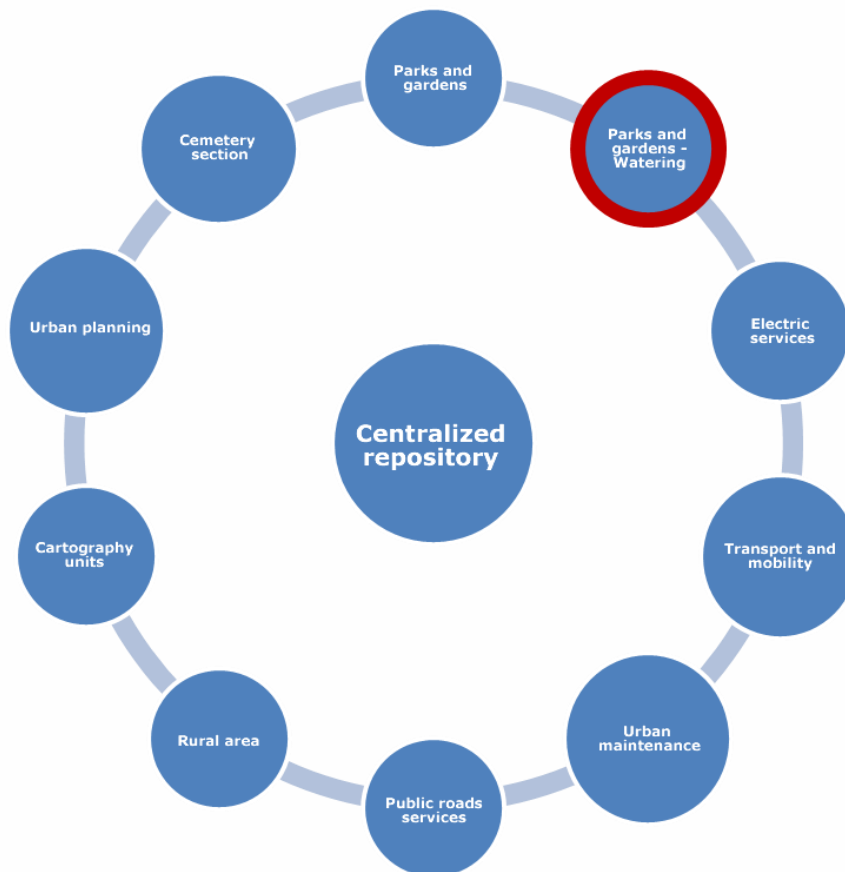


Figure 10: Via Digital platform interface³⁹

Telemanagement Automatic Irrigation System

Telemanagement Automatic Irrigation System is integrated as a module within the platform of *Via Digital* aforementioned described. This irrigation system was developed under the European project IrrigestLIFE (link; www.irrigestlife.eu). This Telemanagement Irrigation System allows monitoring and remote management of irrigation of parks and gardens of the city through 100 programmers or watering stations distributed in the city. For this purpose, sensors were deployed in land, providing insight and schedule irrigation needs, as well as conveying messages and alarms to the management center.



Figure 11: IrrigestLIFE European project⁴⁰

³⁹ Vitoria-Gasteiz Municipality. Personal communication

Public Lighting Telemanagement

In the historic center of the city, Public Lighting is monitored and remotely managed point-to-point or luminaire to luminaire. The implemented system allows knowing the electrical consumption, the status of the components of the different electrical switchboards, and turning on/off the lights, regulating the intensity of them and optimizing energy consumption. The system sends warnings and alarms that allow maintenance of lighting with telematic assistance.

Platform to control waste collection and street cleaning

The work of waste collection and street cleaning are monitored through an integrated platform in the municipal infrastructure. This platform provides real-time location of vehicles responsible for the work of waste collection and street cleaning (trucks, sweepers, vans, etc.), as well as knowing the actual paths of such vehicles, comparing them with the planned routes.

The system allows knowing the weight measurements of more than 3,000 waste containers distributed throughout the city, as well as the type of collected waste. There are available reports and statistics of the frequency, weight and type of collected waste.

Policies and regulations

The municipality of Vitoria-Gasteiz has various policies and regulations in the ICTs field, concerning both the use of held digital information or information transmitted through the municipal technological infrastructure, and the telematics relationship with the citizens.

These policies and regulations are framed in their jurisdiction, as local administration, responding to state, regional and municipal legal frameworks. Among these policies and regulations, the following ones stand out.

Data protection Law

The Municipality assumes the legal obligations regarding the protection of personal data established by the Organic Law 15/1999 of December 13, *Protection of Personal Data* (LOPD) especially with regard to:

- The existence of files or processing procedures involving personal data processing.
- The purpose of data collection.
- People who receive information.
- The optional or mandatory nature of questions that are made.
- The consequences of obtaining data or the refusal to supply.
- The possibility of exercising the rights of access, rectification, cancellation and opposition.
- The identity and address of the person responsible (or their representative) of processing data.

Regulation for the exercise of rights of access, rectification, cancellation and opposition of personal data of Vitoria-Gasteiz council, of 23rd May 2005, regulates how citizens can access municipal files in which are listed their personal data. Accordingly the Municipality of Vitoria-

⁴⁰ IRRIGEST Life project. <http://www.irrigestlife.eu/index.php/es/>

Gasteiz collaborates with the Data Protection Agency (AVPD) in compliance with the current law and the adoption of best practices in the management of information about people.

Website

The website is a secure environment that allows citizens to access information, services and electronic transactions of Vitoria-Gasteiz Municipality. This website is established on the site <https://sedeelectronica.vitoria-gasteiz.org>⁴¹, which is unique to the Municipality of Vitoria-Gasteiz and its assigned Autonomous Body. Ownership, management and administration of this website belong to the Municipality of Vitoria-Gasteiz in the exercise of its competency, in response to the following regulations:

- Ordinance of Electronic Administration of Vitoria-Gasteiz Municipality.
- 11/2007 law, of 22nd of June, about electronic access of the citizens to public services.
- Royal decree 1671/2009, of 6th of November, which partially develops the law 11/2007, of 22nd of June, of electronic access of the citizens to public services.
- Royal decree 3/2010, of 8th of January, by which the National Insurance Scheme is regulated in the field of Electronic Administration.
- Royal decree 4/2010, of 8th of January, by which the National Insurance Scheme is regulated in the field of Electronic Administration.

Citizens can access the website through two means of digital identification:

1. **Municipal Citizen card.** Vitoria-Gasteiz Municipality gives the *TMC* or Municipal Citizen Card that allows doing municipal paperwork online. This card does not incorporate a digital certificate.
2. **Cards with digital certificate.** They give the possibility of signing documents digitally with the same legal validity as a handwritten signature. The digital certificates accepted are:
 - Electronic ID.
 - *Ona* card.
 - *Izenpe* card; green card for citizens and blue for entities.
 - Other accepted digital certificates.

Development strategies and implementation of IT applications

Vitoria-Gasteiz Municipality has as strategy of development and implementation of applications the reuse of source code through the use of integrated routines in the municipal infrastructure, allowing for example the standardised and secure access to the databases of third parties territory (ID card, CIF, etc. / Street, number, etc.).

These routines allow to reuse different data sources (territory, registered third parties, register of inhabitants, industrial, etc.) as well as interfaces for search (e.g. search of Third Parties), being all applications integrated in the same way. With this purpose, there are conversational (search and selection assistant) and non-conversational (internal consultations of information) routines, depending on the required manner of integrating the information. Likewise it is given the possibility to integrate information graphically displayed through map services, making available the data stored in the municipal geodatabase repository.

⁴¹ Vitoria Gasteiz Municipality website for online services. <https://sedeelectronica.vitoria-gasteiz.org/>

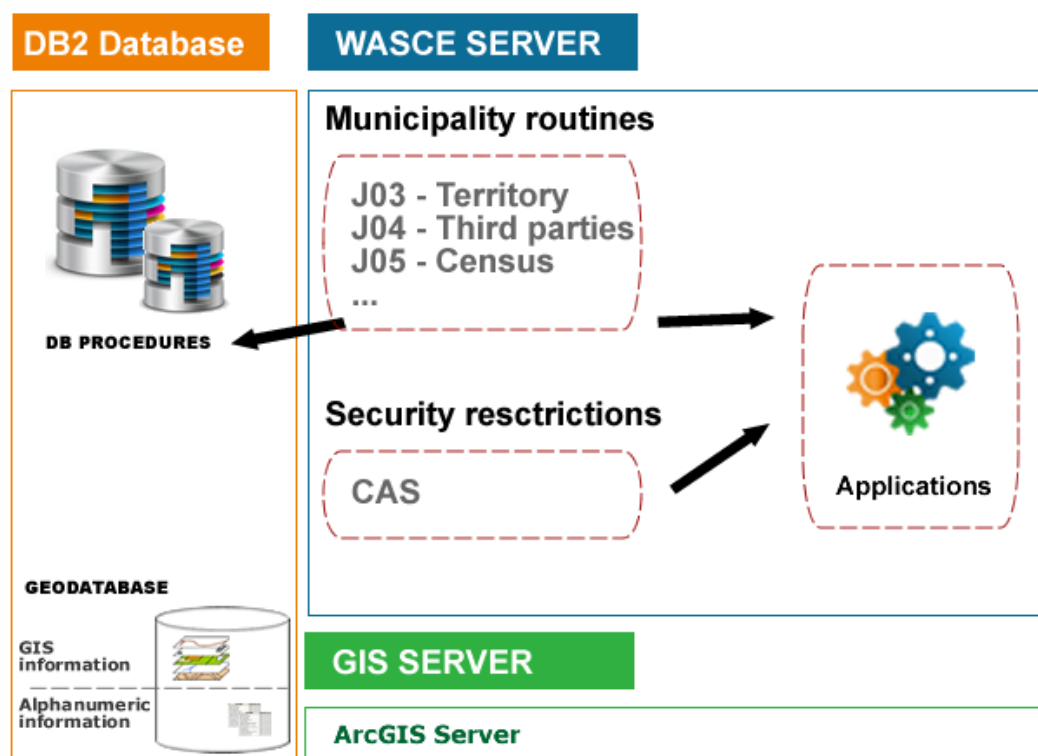


Figure 12: Data management procedures integrating GIS information

This policy also intends to reuse the source code, optimising public resources and avoiding dependency on external proprietary systems to the Municipality of Vitoria-Gasteiz. As system examples of this policy, the Digital Public Roads and the Control Platform of Waste Collection and Street Cleaning, and the Citizen Mailbox stand out in addition to those already mentioned above.

Citizen's mailbox is an electronic mailbox fully integrated into municipal infrastructure, therefore interoperating with other municipal systems such as GeoVitoria, accessible through the official website and official mobile applications developed for iPhone and Android. Through the citizen's mailbox, citizens can make suggestions and complaints electronically about aspects related to municipal management. Such suggestions and complaints are handled by the suitable department or municipal service depending on the case.

Divided into different categories of municipal management, the citizen's mailbox has proved to be a **valuable tool** for the interaction between the administration and citizens.

ICTs standards in Vitoria-Gasteiz

Regarding standards in the field of communications, the Municipality uses VPN connections based on standards to make accessible their internal network remotely and securely using encrypted connection, restricting the use depending on the logged user. Likewise, the Municipality has a private virtual mobile network, allowing through a private APN intercommunication with several devices located in different parts of the Municipality. This network allows municipal infrastructure to intercommunicate with devices using mobile networks on a protected mode.

Regarding standards at application development level, the Municipality follows a series of guidelines concerning the programming languages and technologies to be used in applications developed in the environment of the municipal technological infrastructure. These guidelines include the use of standards defined under the W3C (for purposes of nomenclature, accessibility, styles, etc.), reuse of libraries (using authorized repositories for that purpose), and use of templates to incorporate content on pages, in order to enable editing of menus and structure of the application.

From the point of view of standards related to information, standards like Open Geospatial Consortium and Datex are used in formats like GFTS, XLS, CSV, JSON, XML, Shape, WMS and WFS. In this sense, there are applications like GeoVitoria and SIAM offering citizens and business information in the mentioned standards.

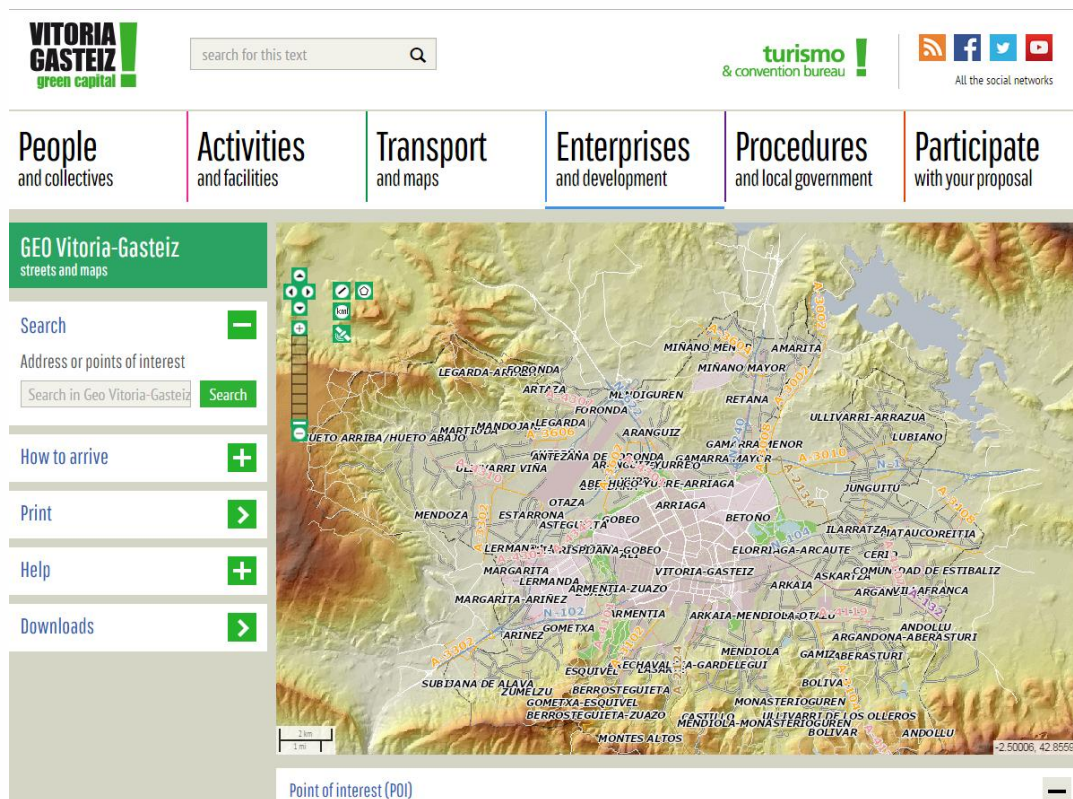


Figure 13: GEO Vitoria-Gasteiz interface⁴²

Open Data in Vitoria-Gasteiz

The Municipality of Vitoria-Gasteiz has recently deployed an Open Data platform that provides municipal data to citizens, businesses and other organizations. This platform consists of a single point of Access, which offers a variety of data produced by the institution. The available data can be used, reused, linked and redistributed freely and unrestrictedly, under the license of Creative Commons-Attribution (CC-by 4.0).

⁴² Vitoria-Gasteiz Municipality website. <http://www.vitoria-gasteiz.org/>

Available data in Open Data Vitoria-Gasteiz is provided in standard formats (XLS, GFTS, CSV, JSON, XML and KML) and grouped by categories: Culture and Leisure, Demographics, Employment, Finance, Environment, Rural, Public Sector and Dwelling.

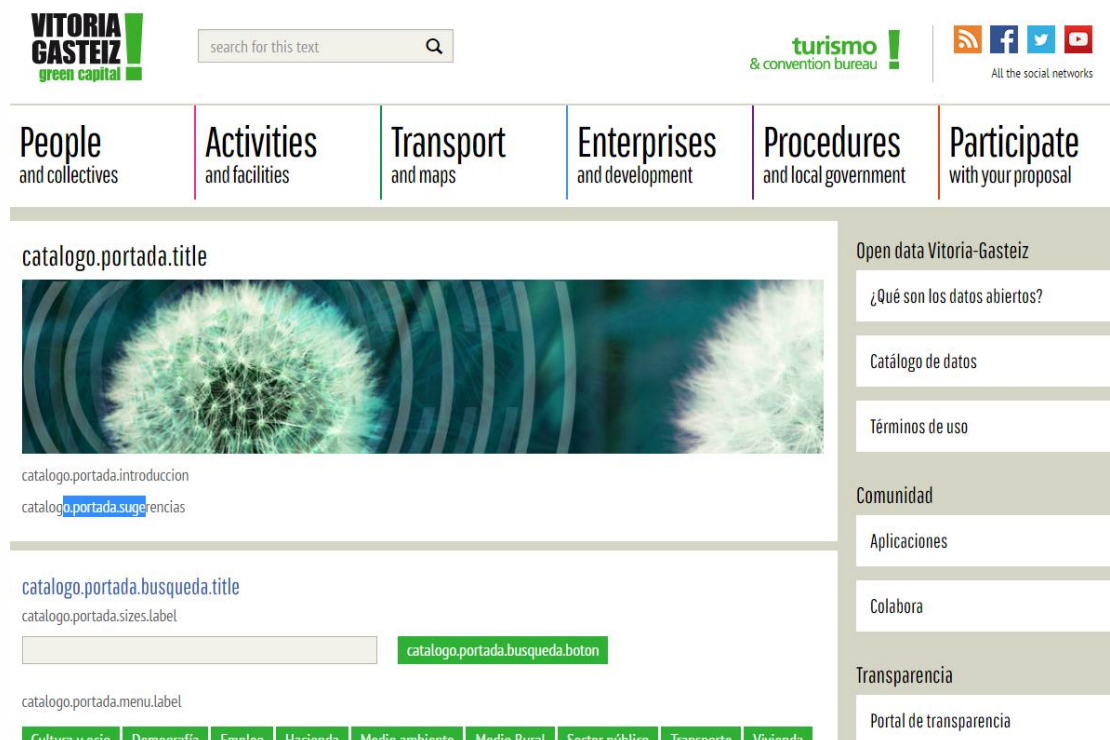


Figure 14: Open Data Vitoria-Gasteiz interface⁴³

Business model and funding

In the field of ICTs, it has not been developed nor tested a business model concerning, for example, the use of municipal data by third parties. In this sense, it should be pointed out the recently provided Open Data Vitoria-Gasteiz platform, which invites third parties through the "Applications" section to publish developed applications using open data published on the portal, as well as other experiences of reuse of such in documents or public domain works.

Open Data Vitoria encourages people or entities who have developed an application with open data of Open Data Vitoria, if they want, to have such space to disseminate their work. In order to do this, a form is provided in the section entitled *Cooperate*, ready to be filled out.

⁴³ Vitoria-Gasteiz Municipality website. <http://www.vitoria-gasteiz.org/>

5.5.2 Fact box: ICT infrastructures and services of Vitoria-Gasteiz in numbers

Area	Field	Indicators	Value	Units	Data source	Comments
Urban infrastructure	Existing city monitoring infrastructure	Number of parking information panels	12	Number	AVG	
		Number of air quality stations	4	Number	AVG 2015	Controlled by Basque Government
		Number of noise stations	7	Number	AVG 2015	Controlled by Municipality
		Number of weather stations	5	Number	AVG 2015	Controlled by Municipality
		Number of loan point for public bicycles	0	Ratio	CEA	
		ICT citizen oriented platforms	YES	YES/NO	AVG	Citizen's mailbox and 010 telephone services
		Data privacy	Disagree	Likert scale Strongly disagree/ Disagree/ Neither agree nor disagree/ Agree/ Strongly agree	AVG	Defined by the LOPD (Data protection Organic Law)
	Communication infrastructure in the city	Percentage of the population covered by a mobile-cellular network	79.4	%	Xataka, 2016	Approximately 195,588 citizens own a mobile phone (based on Spanish statistics)
		Percentage of the population covered by at least a 3G mobile network	63.6	%	Xataka, 2016	80% of the phones in Spain are currently smartphones
		3G Mobile network cells	654* (Movistar)	Number of 3G mobile network cells	Movistar	*Data requested to responsible bodies (Movistar/ Orange/ Vodafone)
		4G Mobile network cells	154* (Movistar)	Number of 4G mobile network cells	Movistar	*Data requested to responsible bodies (Movistar/ Orange/ Vodafone)
		Number of internet connections per capita	NOT AVAILABLE	Connections/inh		Data requested to the responsible body
		Number of landline phone connections per capita	0.44	Connections/inh	AVG	Based on a recent study of La Caixa (landline phone every 2.27 inh.)
		Smartphone penetration	NOT AVAILABLE	%		Data requested to the responsible body
		Free Wi-Fi zones	NOT AVAILABLE	Number of free Wi-Fi zones identified in the city		Data requested to the responsible body
		Cable Network	YES	YES/NO	AVG	
		Cable Network Types	Optic fibre, twisted pair, quad cable	Types of cable network available in the city (twisted pair cable, coaxial cable, fibre optic,...)	AVG	They depend on the owner of the infrastructure (AVG, Iberdrola, others)

Table 15: Urban infrastructure: common and optional indicators

5.6 Citizen and stakeholders engagement

5.6.1 Citizen and stakeholders engagement in Vitoria-Gasteiz Municipality

In the previous legislature, an exhaustive participatory process between the municipality political groups, the municipality technicians (from every department) and more than 60 agents/stakeholders and citizen associations led to the elaboration of a new Citizen Participation Plan (2015-2019)⁴⁴ in the Vitoria-Gasteiz city council ([link](#); in Spanish).



Figure 15: Citizen Engagement strategy of Vitoria-Gasteiz. Vitoria-Gasteiz Municipality

This document describes the roadmap (with guidelines) and details the conclusions of this participatory process, representing a paramount example of the extent of the citizen and stakeholder engagement in the decision making process in Vitoria-Gasteiz. However, the main conclusions of this document identify the need for a new institutional framework which enhances citizen participation in the local administration. For this reason, in the current legislature, the aforementioned guidelines are being followed, opening several participation processes which will lead to a more democratic and participatory administration (described at the end of this section).

The new participation strategy in the local administration allows citizens to interact with the technicians and political representatives when identifying city's needs and priorities. Besides that, the city council provides means of participation in a continuous and fully accessible way. In this regard, there are eleven information contact points for citizens (located mainly at the city network of civic centres) and two municipal websites where citizens can express their opinions and even vote in several participation processes (the city's digital office and the city council website itself). During 2015, on average, each citizen accessed around seventeen

⁴⁴ Vitoria-Gasteiz Municipality (2015). Citizen Engagement strategy of Vitoria-Gasteiz <http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/33/80/63380.pdf>

times to any of those websites, pointing the well-established participatory culture in Vitoria-Gasteiz's citizenship. Apart from those two websites, the municipality fosters citizen interaction through other tools such as city forums and social networks (56 interactive social media initiatives in the city in 2015 including, for example, several Twitter and Facebook dedicated accounts). As another example from 2014 (last data available), more than 200 awareness campaigns regarding sustainable development topics were organized by the Environmental Studies Centre (the main environmental education body of the city); these events were opened to all citizens (and also visitors), gathering high attendance levels (Activities report available at [CEA's webpage](#)⁴⁵; in Spanish only).

Objectives of Vitoria-Gasteiz Municipality citizens and stakeholders participation strategy

These are the main objectives of the strategy:

- To foster and further develop citizens participatory processes.
- To implement the needed changes as to promote a participatory and collaborative culture in the municipality management.
- To plan and organise citizen participation related activities.
- To ensure that citizen participation campaigns have a real impact in decision making processes of the city.
- To implement a flexible model, which can be continuously improved after evaluation.
- To further engage citizens by providing a better access to the information, including enhanced visibility of participation processes' results.

Strategic lines of Vitoria-Gasteiz Municipality

These are the strategic lines of the strategy:

- **Topic 1. Participation as a strategic axis in the municipality**⁴⁶

Actions performed so far: first draft of citizens' consultation regulation has been produced ([link](#); Spanish only).

- **Topic 2. Citizen participation tools and channels**⁴⁷

Actions performed so far: tools and channels to allow participation have been created (following a co-creation process, from November 2015 to February 2016, where citizens and stakeholders' proposals were taken into account). New participation bodies (namely *Elkarguneak*, *Auzoguneak* and the social council; see full description in the next section) were implemented by June 2016 (final document [link](#); Spanish only).

- **Topic 3. Promoting participation culture (information, communication and training)**

A participation culture based in values such as social commitment, co-responsibility, other's rights respect and an enhanced active role of citizens in the government is promoted.

⁴⁵ CEA Report 2014 (2014)

<http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/eu/25/65/62565.pdf>

⁴⁶ Vitoria-Gasteiz Municipality (2015). *Citizens' consultation report*.

<http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/35/53/63553.pdf>

⁴⁷ Vitoria-Gasteiz Municipality (2016). *Citizen engagement bodies*.

<http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/50/54/65054.pdf>



- **Topic 4. Higher quality participation**

Actions performed so far: the existing Participation and Partnership Observatory⁴⁸ regularly publishes its reports (report [example](#); Spanish only). Furthermore, the document “*Perception of associative movement in Vitoria-Gasteiz and attitudes towards citizen participation*” has been produced.

- **Topic 5. Citizenship Participation Service⁴⁹**

This service’s mission is to enable and coordinate the citizenship participation in the public matters within the municipality framework. Provided services include (links available, Spanish only):

- Information and counselling (*Información y asesoramiento*)
- Grants (*Subvenciones*)
- Provision of municipality premises for temporary use (*Cesión de locales*)
- Equipment loan (*Préstamo de material*)
- Translations (*Traducciones*)
- Information about premises availability (*Consultar la disponibilidad de locales*)

The service webpage is available in the municipality site ([link](#); Spanish only).

Participation bodies in Vitoria-Gasteiz

Participation bodies are one of the main channels which permit the interaction (and participation) between citizens and city council departments in the municipality.

After the new Participation Plan approval, the new structure of participation bodies includes:

- *Elkarguneak* (Meeting places/sites in Basque): participation bodies devoted to a certain topic.
- *Auzoguneak* (Neighbourhood places/sites in Basque): stable bodies assigned to the seven areas of influence of the existing city’s civil centres. They are open to the possibility of creating new forums/groups to respond to concrete matters.
- *Consejo social* (Social Council in Spanish): a forum that comprises all the participation bodies and that is convened when strategic projects/plans with ample putative impact are to be debated).

These bodies are open to citizens, associations (without the need of being registered in the municipality catalogue), stakeholders, the government and the rest of political parties in the municipality.

Besides this, the Citizens Participation Service offers several tools to the Associations to promote their participation. In this regard, it offers information and advice about any topic they demand. The different channels available for contacting include:

- Phone: +34 945 16 16 87
- In-person attention: in the ‘El Campillo’ civil center (C/ Santa María, 4)
- E-mail:

⁴⁸ Participation and Partnership Observatory (2012). *2011-2011Report*.

<http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/36/96/63696.pdf>

⁴⁹ Vitoria-Gasteiz Municipality website. Citizenship Participation Service. http://www.vitoria-gasteiz.org/we001/was/we001Action.do?aplicacion=wb021&tabla=contenido&uid=65c21a87_117e9336274_7fe4&idioma=es



- asociacionismo@vitoria-gasteiz.org (for questions regarding association creation and management).
- accesopuntual@vitoria-gasteiz.org (for municipality premises loan).
- prestamos.asociaciones@vitoria-gasteiz.org (for municipal equipment loan).
- participacion@vitoria-gasteiz.org (for questions regarding participation in general)

Finally, other participation tools (i.e. hearing request, popular consultation request, etc.) are described and accessible at the following [link](#)⁵⁰ (Spanish only).

Existing Participation processes in Vitoria-Gasteiz

A list of the current and previous citizen and stakeholders' active engagement activities can be found at the Vitoria-Gasteiz city council dedicated web space. In September 2016 there were four active processes:

- Improving Vitoria-Gasteiz; an opportunity for the citizens to submit ideas/proposals that will be considered for the next city's budget. Link (in Spanish): [Participa con tu propuesta en el presupuesto 2017-Mejorando Vitoria-Gasteiz Hobetuz](#)⁵¹.
- Participation process to produce the Agri-Food city's strategy (including private citizens, agri-food sector companies and technological centres). Link (in Spanish): [Estrategia Agroalimentaria de Vitoria-Gasteiz](#)⁵².
- Sustainable mobility citizens' forum (periodic meetings between city council technicians and citizens/stakeholders in order to discuss city's strategy for sustainable mobility). Link (in Spanish): [Foro Ciudadano por la Movilidad Sostenible](#)⁵³.
- Participation process to produce the new Social Politics Department's strategy 2016-2019⁵⁴ (including private citizens and related agents/stakeholders). Link (in Spanish): [Plan estratégico del Departamento de Políticas Sociales 2016-2019](#).

⁵⁰ Vitoria-Gasteiz Municipality website.

http://www.vitoria-gasteiz.org/we001/was/we001Action.do?aplicacion=wb021&tabla=contenido&idioma=es&uid=_651fa14c_11aa089bc19__7ff7

⁵¹ Vitoria-Gasteiz Municipality website. Budget participatory process.

http://www.vitoria-gasteiz.org/we001/was/we001Action.do?aplicacion=wb021&tabla=contenido&idioma=es&uid=u_7d3c2313_1540dd3767b__7d90

⁵² Vitoria-Gasteiz Municipality website. Agri-Food strategy.

http://www.vitoria-gasteiz.org/we001/was/we001Action.do?aplicacion=wb021&tabla=contenido&idioma=es&uid=u6d939fe2_1523968eb86__7e24

⁵³ Vitoria-Gasteiz Municipality website. Sustainable Mobility Forum

http://www.vitoria-gasteiz.org/we001/was/we001Action.do?aplicacion=wb021&tabla=contenido&idioma=es&uid=u_7972aadd_13a8bdc172d__7fcb

⁵⁴ Vitoria-Gasteiz Municipality website: Social Politics Department Strategy 2016-2019.

http://www.vitoria-gasteiz.org/we001/was/we001Action.do?aplicacion=wb021&tabla=contenido&idioma=es&uid=u_489270af_15479f8cfce__7ee5



5.6.2 Fact box: Citizen and stakeholders engagement in Vitoria-Gasteiz in numbers

Area	Field	Indicators	Value	Units	Data source	Comments
Citizens	Existing actions related to citizen engagement	Recycling rate	26.5	%	AVG 2015	
		Voter turnout in last municipal election	64.76	%	AVG 2015	
		Number of local associations per capita	0.0056	Number of consultations / inhab.	AVG	1,390 registered associations in September 2016
	Channels for citizen engagement	Number of information contact points for citizens	11	Number	AVG	
		Number of municipal websites for citizens	2	Number	AVG	1 city council website 1 city council digital office
		Number of websites consultation per capita	16.98	Number	AVG 2015	3,334,044 and 826,181 respectively (245,036 inh). More than one page could be consulted in each visit (data also available)
		Number of interactive social media initiatives	56	Number	AVG	Municipality: Facebook: 13; Twitter: 13; Flickr: 14; YouTube: 7; Pinterest: 1; Blogs: 5
		Number of discussion forums	1	Number	AVG	Different existing sub-sections
		Number of awareness raising campaigns	209	Number	CEA	2014 data
		Number of newspaper columns	~20	Number	AVG press department	
	Current scenarios of citizen engagement	Citizens participation in smart city projects	NOT AVAILABLE	Number		
		Professional stakeholder involvement	Agree	Likert scale Strongly disagree/ Disagree/ Neither agree nor disagree/ Agree/ Strongly agree	CEA	

Table 16: Citizen and stakeholders engagement: common and optional indicators

6 City needs definition and prioritization

This chapter intends to identify and define the gaps between current and desired conditions at a city level, through a needs assessment systematic process. Firstly, a SWOT analysis is performed at a city level, taking into account facts and figures of city characterization developed in the previous chapter (Chapter 5) and additional sources. Secondly, a specific spatial analysis identifies the most vulnerable areas of Vitoria-Gasteiz, narrowing down to Coronación district, where LH intervention takes place. Finally, the end of this section presents main points of Vitoria-Gasteiz's LH intervention.

6.1 Vitoria-Gasteiz SWOT analysis

In order to develop a vision for a city/neighborhood where specific objectives should consistently be framed, namely Vitoria-Gasteiz LH intervention, Leipzig Charter recommends analyzing its current situation in terms of strengths and weaknesses (D2.4). In the same line, local and external conditions of the city should be contrasted to ensure they are as aligned as possible with the intervention, taking advantage of both of them.

Accordingly, this section develops a SWOT analysis of Vitoria-Gasteiz based on the city characterization presented in Chapter 5, and the Sustainable Urban Development Strategy of Vitoria-Gasteiz, already drafted but not officially published yet (CEA)⁵⁵. Indicators measurements have already determined the performance of the city, providing key information to diagnose the current situation of Vitoria-Gasteiz. The following lines list the Strengths, Weaknesses, Opportunities and Threats identified for the city of Vitoria-Gasteiz.

6.1.1 Strengths

Local conditions

- Strategic location as a communications hub, connecting Spain and France.
- Vitoria-Gasteiz is the administrative capital of the Basque Country.
- Vitoria-Gasteiz has 20% of Basque Country's provisioned land dedicated to economic activities.
- Good level of average income in the city.
- Diversified economy, presenting a better situation than the average of Spain regarding the economic crisis impact.
- Increase of third sector and related services connected to industry.
- Increase of population range younger than 14 years old.
- Green spaces around the city have been protected, creating an inner green ring while balancing different land uses.
 - Green Ring of Vitoria-Gasteiz appointed as good practice by European Commission, as an example of green infrastructure that contributes to improve periurban ecosystems.
 - Vitoria-Gasteiz has diverse ecological environments, entailing a rich biodiversity.

⁵⁵ Environmental Studies Center of Vitoria-Gasteiz. Personal Communication



- Good environmental practices, being awarded as European Green Capital on 2012.
- Good air quality in the city.

Energy

- Vitoria-Gasteiz's goal towards carbon neutrality, besides striving for energy and food self-sufficiency.
 - Climate Change Plan of Vitoria-Gasteiz 2010-2020 oriented to reduce energy consumption and emissions.
 - Existence of local alternatives to fight against current dependency of energy sector.

Building stock and land use

- Compactness of built environment.
- Good general habitability conditions of the building stock.
- Good offer of subsidised housing.
- Municipality efforts to preserve the environment and good quality urbanism.
- Reservation of non-artificialized land.

Urban Mobility

- Ambitious Sustainable Urban Mobility Plan, directed to reduce energy consumption and emissions, while increasing the use of sustainable modes of transport such as walking, cycling and public transport.
- Master Plan for Cyclist Mobility, continuing with the already existing rising trend in the number of cyclists last years.

ICTs infrastructures and services

- Already implemented platform of management and control of city services.
- Integration of GIS information into data management procedures.
- Frequent use of IT tools that foster interaction between public administration and citizens (Citizen's mailbox, participatory website, open data)

Citizen Engagement

- Strong level of social cohesion. Strong connections among families, friends and neighbours.
- Strong institutional and citizenship culture, respect and protection of heritage goods.
- Good offer of district civic centers.
- Good citizens' perspective of quality of life
- Strong increase of environmental social awareness
- High education level at all scales in comparison to other regions.
- Social diversity and multicultural trend.
- Increase in selective waste collection.

6.1.2 Weaknesses

Local conditions

- Ageing of the population trend.
- Income inequality among Vitoria-Gasteiz's districts.



- Impact of economic crisis in terms of reduction of GDP and employment for industrial sectors.
 - Higher unemployment rate in the city than the average in the Basque region.
 - Low job opportunities for youth community despite a slight improvement of the situation last years.
 - Risk of long-term unemployed people.
 - Dependency on subsidies of vulnerable communities.

Energy

- Strong dependency on imported energy supply, mainly fossil fuels.
- Poor take-up of renewable resources.
- Poor take-up of waste resources (*waste-to-energy*, for example)

Building stock and land use

- Insufficient energy building retrofitting actions associated to efficiency, energy production, and energy consumption of the building stock.
- Mismatch between housing demand and an oversized building offer.
- Lack of affordable housing and insufficient renting offer.
- Urban voids due to overprovision of future housing urban land.
- Industrial areas require renovation and modernization.

6.1.3 Opportunities

- International recognition as European Green Capital 2012, projecting an attractive image of the city and its potential.
- European focus on sustainable development.
- Potential of innovation and development of new technologies, due to:
 - Proximity to technological centers
 - Among biggest regional budgets on Research, Development and Innovation.
 - Local industry with high potential in the integration of Key Enabling Technologies.
- Raising relevance of tourism sector in the city, showing a significant increase during last years, increasing public efforts and offer in this field.

6.1.4 Threats

- Trend of population loss.
- Increase of social inequalities among communities.
- Strong competitiveness of the global market, with advanced and modernised industries.
- Consolidation of long-term unemployed citizens, especially those over 45 years old.
- Loss of green spaces and natural environments.
- Energy dependency of the city from external sources.

6.2 Specific spatial analysis

Spatial dimension is highly relevant in urban planning and regeneration interventions. Issues covered by Vitoria-Gasteiz LH intervention have different spatial implications:



- Building issues can easily be assigned to some specific areas of the city (Coronación district)
- Mobility issues are mainly related to complex functional flows that involve the whole
- Urban infrastructures (energy supply, ICT) are basically ubiquitous and their improvement may imply city-wide or district-level interventions depending on the barriers to overcome or the gaps to be filled.

Taking into account these different implications, the intervention project should firstly identify city-level bottlenecks and district-level priority areas where the intervention is likely to have the greatest impact. Most of these issues are usually identified in urban and sectorial planning, so the integrated intervention should be devised from the basis of existing plans and policies at urban level, and focused on designing a strategy to deal with those problems through integrated smart solutions (D2.4).

6.2.1 Identification of priority areas in Vitoria-Gasteiz

The Vitoria-Gasteiz strategic vision is based on the maintenance of the environmental quality, the modernization of the business sector, the creation of opportunities for young people and the social inequity reduction.

These four guiding principles are closely related with the spatial urban model proposed for the city in its Master Plan (currently in revision). Related to the environmental quality, Vitoria-Gasteiz is well known because of its improvements consolidating a peripheral green infrastructure, which is expected to get into the inner city so as to achieve the natural ecosystem continuity. From the spatial point of view, the spatial analysis proposes a balanced city model, where environmentally good quality spaces are distributed all around the city in a homogeneous way. In this case, green infrastructure is not just seen as environmentally friendly, but also as a tool for social and urban equal distribution, connecting different districts and favouring cycling and walking mobility.

This environmental quality is also related to the aim of reducing greenhouse gas emissions while mitigating climate change effects through energy efficiency and production actions. As widely appointed, the building sector contributes up to 30% of global annual greenhouse gas emissions and consumes up to 40% of total energy. The inefficiencies of existing building stock built before the implementation of the Basic Building Standard Thermal Conditions (NBE-CT-79, Spanish legislation of 1979) concerning the enclosures of buildings is one of the main objectives to cope with.

Due to this reason, energy retrofitting of buildings built before 1980 is one of the main challenges Vitoria-Gasteiz must face in the near future, as stated in the *Action Plan Against Climate Change 2010-2020*⁵⁶. More than 50% of buildings were built after the 80s, accounting hence a relatively young building stock. However, this situation is not spread homogeneously around the city, being the districts around the old town (and the old town itself) those less energy efficient and with more need of retrofit.

As shows Figure 19, the city of Vitoria-Gasteiz has been developed following a ring structure around the old town. The first ring consists of districts developed during first decades of 20th century, accommodating most of migrants coming from the countryside to the city. In general, these districts are dense, with scarcity of green areas. The second ring

⁵⁶ Vitoria-Gasteiz Municipality. Action Plan Against Climate Change 2010-2020.
<http://www.vitoria-gasteiz.org/wb021/http/contenidosEstaticos/adjuntos/es/39/30/33930.pdf>

accommodates districts built after the 80s. Those districts are mainly residential areas, with more room for public space and public services, decreasing slightly the density level comparing to the previous ring. Finally, in a third ring, big districts from the first decade of 21st century were built. During those years, a big housing offer joined to an easier access to mortgages favoured the purchase of new houses for young families. This fact provoked a population decrease in some inner districts, mainly in the first ring of the city. For this reason, and after years of expansive growth, the focus of the Municipality has come back to the central areas of the city.



Figure 16: Neighbourhoods developed before 1980⁵⁷

This focus on the inner city do not just entails building retrofitting, but also general upgrade of the urban environment (buildings, green areas, public services, infrastructures, etc.), with an holistic perspective of urban regeneration interventions. The strategy intends to improve the environmental qualities, efficiency, services and spaces of the most degraded districts in order to favour social equity and reduction of vulnerable areas. In this line, Leipzig Charter emphasises the negative effect that the spiral of deprivation of degraded districts may have for the whole city, as well as the advantages of dealing with it in an early stage with an integrated approach. With these integrated perspective, Vitoria-Gasteiz defines several structuring axes in order to allow a more effective connection among districts of the city.

⁵⁷ Vitoria-Gasteiz Urbanism Department (2013). *General Urban Plan of Vitoria-Gasteiz's Office Review*

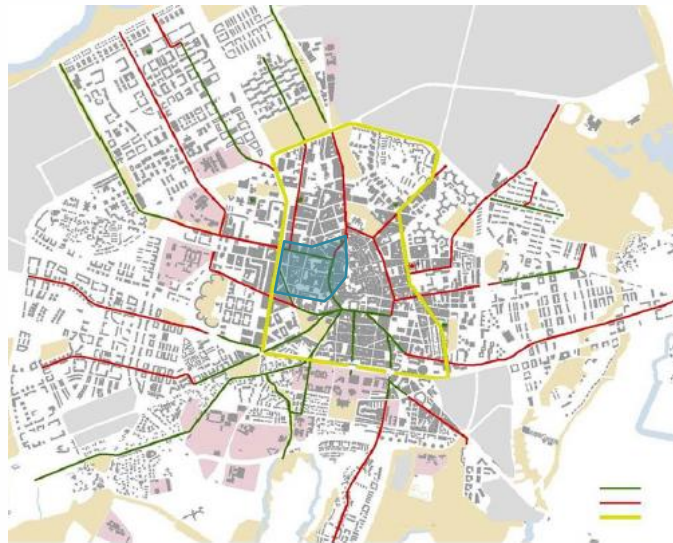


Figure 17: Structuring axes plan. Urban paths for Vitoria-Gasteiz⁵⁸

These axes are not just considered as mobility paths, but also as generators of local business activity, giving continuity to the already existing green infrastructure of the city. Two of these planned axes affect Coronación district, where LH intervention is being performed.

Social vulnerability and urban vulnerability

This districts spatial distribution related to their origin and age of their buildings entails a direct relationship with the social reality of those districts. Both the old town and nearby surrounding districts have a worse quality building stock, public space and public services, if they are compared to the rest of the city, where the urban fabric is not so dense. As a result, population of these slightly degraded areas tends to present a common pattern. Mainly immigrants and elderly population with low income occupy these neighbourhoods, while people with higher income leaves these areas to better quality districts. LUDA European project (Large Urban Distressed Areas, funded by FP5 2004-2006)⁵⁹ identified some common characteristics of deprived areas:

- They are marked by social exclusion and economic marginalisation;
- They often occur as a result of socio-economic changes;
- They have experienced a spiral of decline;
- Residents experience a lower quality of life in comparison to averages in cities and urban regions;

Coronación district, together with other districts such as Zaramaga, Adurtza or Ariznavarra, has been detected both by Basque Government and Vitoria-Gasteiz Municipality as a priority area of urban regeneration intervention. Due to this fact, in the year 2010 Vitoria-Gasteiz Municipality directed *Studies of alternatives* for these districts, establishing potential solutions and recommendations to overcome main problems detected in those areas.

⁵⁸ Vitoria-Gasteiz Urbanism Department (2013). *General Urban Plan of Vitoria-Gasteiz's Office Review*

⁵⁹ LUDA (2006). *LUDA E-Compendium: Handbook E2. Understanding Large Urban Distressed Areas*. LUDA, Improving the quality of life of Large Urban Distressed Areas. <http://www.luda-project.net/compendium/hbe2-200606.pdf>

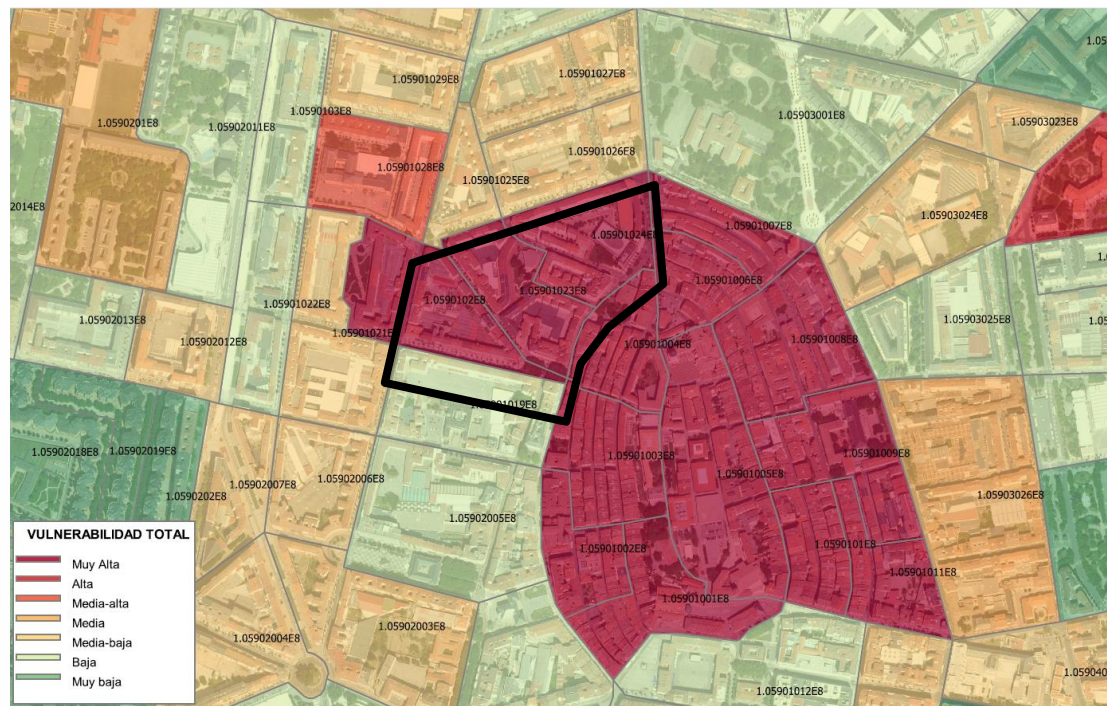


Figure 18: Vulnerable areas in Vitoria-Gasteiz, from green to red –less to more vulnerable-⁶⁰

6.2.2 Demarcation of intervention area: Coronación district

Coronación district is located in the north-west edge of the old town of Vitoria-Gasteiz. The district was built to accommodate mainly immigrants that were coming to the city during 50s and 60s to work in the industry. Coronación can be considered as the first neighbourhood of the first aforementioned city ring built before 1980. The orography around the *central almond* of the old town provoked a natural development adapted to the territory and the main streets already existing at that time, with the concept of urban expansion (*ensanche*) concerning facades and block courtyards. Most part of buildings were constructed during 60s and 70s (85% of dwellings were built before 1970), presenting minor urban changes after that period.

⁶⁰ Tecnalia and Basque Government (2011). Diagnosis of intervention necessities in the renovation of building stock in the Basque Country Autonomous Community



Figure 19: Intervention area in Coronación. Vitoria-Gasteiz Municipality website

In demographic terms, almost one third of the residents overcame 65 years old, whereas in the overall city, that population sector just accounts for the 20%. Furthermore, the foreign population rate in the district is 16.4%, almost doubling city rate (8.8%, Vitoria-Gasteiz Municipality). The overall population loss of the district added to high percentage of elderly residents implies a steady decrease in the number of residents, accounting in 2016 for 11,924 inhabitants and 6,100 dwellings (*Districts in numbers*⁶¹, Vitoria-Gasteiz Municipality).

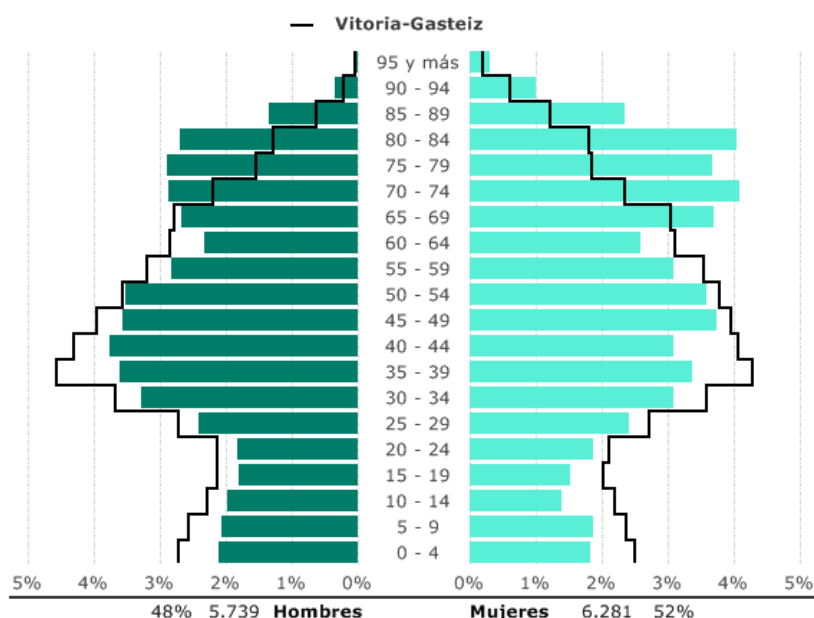


Figure 20: Residents age in Coronación. *Districts in numbers*, Vitoria-Gasteiz Municipality⁶²

⁶¹ Vitoria-Gasteiz Municipality website, districts in numbers. <http://www.vitoria-gasteiz.org/>

⁶² Vitoria-Gasteiz Municipality website, districts in numbers. <http://www.vitoria-gasteiz.org/>

According to Vitoria-Gasteiz's districts analysis, Coronación do not present attractive characteristics for families and businesses. Despite its close location to the city centre, the current social situation and a degraded building stock, mostly not renovated, are favouring a decrease in number of residents. In fact, in 2011 Coronación was appointed by the *Diagnostic of retrofitting intervention needs in residential buildings in the Basque Country*⁶³ as the district with more intervention needs. In this study, the most vulnerable districts of Vitoria-Gasteiz were analysed, taking into account aspects such as habitability, accessibility, energy efficiency and social values. Besides building stock issues, the district presents problems related to the environmental quality of the public space. According to sustainability indicators developed by the Municipality, ratios of green areas per inhabitant and number of trees per street slot are significantly far from minimum recommended values. Due to all these reasons, an integrated intervention in Coronación district is highly recommended in order to cope with the identified problems, always from a holistic perspective which bears in mind the urban, social and environmental reality that has to face.

After a thorough field study⁶⁴ analysis recently developed by Tecnalía concerning the intervention area, some relevant numbers and conclusions have been extracted.

- In terms of building accessibility, 68% of the buildings have an elevator (vertical accessibility), and 49% of buildings have an accessible entrance (horizontal accessibility). However, just 40% of buildings are completely accessible (both horizontally and vertically). Thus, there are a big number of buildings where a retrofit in the entrance and/or the elevator may imply a significant accessibility improvement. Special mention deserves the fact that 5 buildings with accessibility problems accommodate more than 50% of elderly residents. These are:
 - *Domingo Beltrán 26*
 - *Domingo Beltrán 28*
 - *Plaza Aldabe 20*
 - *Coronación de la Virgen Blanca 28*
 - *Badaia 12*
- Regarding building typologies combined with energy efficiency aspects, 51% of the buildings have individual heating, their facades are double-layer without insulation and between 50% and 70% of their windows have been replaced. Hence focusing on the energy efficiency perspective, a wide range of buildings present potential retrofitting improvements, especially in the envelope due to their non-insulated facades.
- Concerning structural security of buildings, most of them are in good condition. Just 2 buildings are in emergency situation and 20 buildings can be slightly improved in structural terms.

As a result of these conclusions, a proposal of building intervention priority has been developed in order to detect which buildings need a more urgent intervention, considering the building situation and the opportunity that entails each of them (Figure below - *red: very high; orange: high; yellow: medium; green: low; white: no data*).

⁶³ Tecnalía and Basque Government (2011). Diagnosis of intervention necessities in the renovation of building stock in the Basque Country Autonomous Community

⁶⁴ Tecnalía (2015). *Coronación field study*.



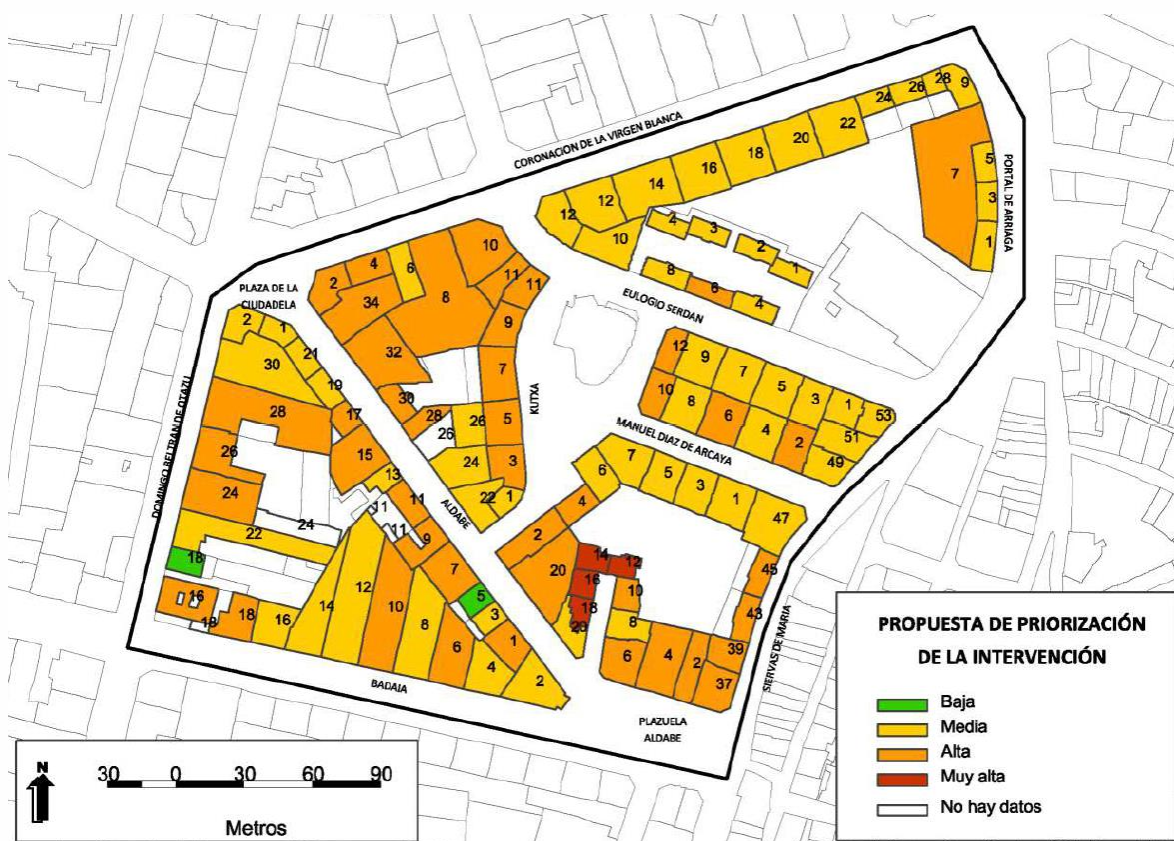


Figure 21: Prioritisation retrofitting proposal of Coronación intervention. Tecnalía⁶⁵

This prioritisation concludes that 4 buildings need a short-term intervention (3.7% of buildings of the demarked area), and recommends that 44 buildings need to be intervened in a short/medium-term (40% of buildings of the demarked area).

6.3 Pre-definition of the district integrated intervention

The LH intervention in Coronación district will transform the area into a more sustainable environment, where quality of life standards will be improved, boosting local resources and economy. The project started this year (2016) and intends to be completed in 2021, fulfilling the following objectives⁶⁶:

- Reducing the energy demand of the district.
- Replacing fossil-fuels by renewable energy sources.
- Improving habitability of housing while improving comfort conditions.
- Saving heating and hot water bill costs.
- Shifting district mobility to a more sustainable pattern.
- Engaging neighbours into the definition of the project.

In order to achieve these objectives, a district integrated intervention will foster the urban regeneration of the area. This intervention is focused on the following lines:

⁶⁵ Tecnalía (2015). *Coronación field study*.

⁶⁶ Description of action. SmartEnCity project

- Energy-buildings retrofitting of the area, including envelope and installations improvements.
- New district heating facilities for housing heating and hot water provision, with local wood as renewable resource (biomass).
- Public space intervention, with specific projects for several streets and squares, pavements, urban furniture, gardening and landscape, etc.
- Promotion of the use of electric vehicles, promoting purchases of electric vehicles, deploying recharge home and public infrastructure, and promoting last mile logistic.

	Field	Demonstrator	Responsible partner
VITORIA-GASTEIZ DEMO ACTION LIST	Zero energy districts	Energy Efficient Building retrofitting of 750 dwellings	VIS
		District heating network based in RES	GIR
		Thermal/Electric Grid integration	MON
		Public Space Conditioning (no funding requested)	CEA
	Sustainable Mobility	EV Logistics fleet	FED
		EV Taxis + Charging infrastructure	CEA
		Private EVs	CEA
		EV charging infrastructure	CEA
		Multimodal Bike hub	CEA
	ICT	Urban Management system deployment	MON

Table 17. Comprehensive demo action list and responsible partners in Vitoria-Gasteiz LH

These main lines need a detailed planning in order to be implemented on-site. Accordingly, VISESA has organised the activities of the intervention project in the demo area. The following table shows a list of these activities, as well as the planned start/end of those, and the responsible partner for each of them.

	VITORIA-GASTEIZ LIGHTHOUSE	Coronación		
1	ANALYSIS, DIAGNOSIS AND PROPOSED DISTRICT INTERVENTION	START	END	RESPONSIBLE PARTNER
1.1	Diagnosis analysis section (doc previous Tecnalía and LKS)	01/01/2016	01/03/2016	Tecnalia
1.2	Diagnosis complete neighborhood (doc previous Tecnalía and LKS)	01/01/2016	01/04/2016	Tecnalia
1.3	Preliminary design project development for global intervention (rehabilitation, DH, urbanisation, mobility, ICTs)	01/03/2016	01/06/2016	AVG
D3.1	Vitoria Diagnosis and Baseline (M09)	01/05/2016	31/10/2016	Tecnalia
2	CITIZEN ENGAGEMENT			
2.1	Flyer distribution	01/01/2016	01/02/2016	Visesa



2.2	Municipal website	01/01/2016	01/02/2016	AVG
2.3	Kick off	01/02/2016	03/02/2016	Tecnalia
2.4	Development of a global strategy for the intervention	01/02/2016	01/04/2016	H-Enea
2.5	Presentation of project progress to the municipal political groups and collectives	14/04/2016	14/04/2016	AVG
2.6	Event for presentation to citizens	18/04/2016	18/04/2016	AVG/ Visesa
2.7	Review of communication plan for 2016	01/06/2016	30/06/2016	H-Enea
2.8	Workshops and other awareness actions (Mobility Week)	01/06/2016	30/09/2016	AVG
2.9	Opening of district on-site office	01/10/2016	30/10/2016	AVG
3	MARKETING & FINANCING			
3.1	Design contract for building refurbishment with the home owners	01/06/2016	01/08/2016	Visesa
3.2	Design contract for electric vehicles	01/06/2016	01/08/2016	AVG
3.3	Design of Guarantee Fund allocation processes	01/06/2016	01/08/2016	Visesa
3.4	Design contract with the home owners for connection to the heat network	01/07/2016	01/09/2016	Giroa
3.5	Meetings with communities of owners to transfer information about building level interventions and district heating	01/07/2016	01/09/2016	Visesa
3.6	Meetings with communities of owners for agreement and decision about the interventions	01/09/2016	01/01/2017	Visesa
3.7	Agreements with communities of owners	01/09/2016	01/01/2017	Visesa
3.8	Signatures between communities of owners and Visesa	01/09/2016	01/01/2017	Visesa
3.9	Signatures between communities of owners and District Heating operator	01/09/2016	01/01/2017	Giroa
3.10	Signatures between private owners and V-G city council for electric vehicles	01/09/2016	01/01/2017	Visesa
3.11	Financial management, agreements with financial entities	01/09/2016	01/04/2017	Visesa
3.12	Management of grants	01/09/2016	01/04/2017	Visesa
D3.9	Citizen engagement and replication	01/08/2016	31/07/2019	H-Enea
4	URBAN MANAGEMENT			
4.1	Drafting of Special Plan (including district heating network and building)	01/02/2016	01/06/2016	LKS
4.2	Review to include business plan outline	01/06/2016	01/07/2016	AVG, Visesa
4.3	Special Plan initial approval	01/07/2016	01/08/2016	AVG
4.4	Public presentation of Special Plan	01/08/2016	01/09/2016	AVG
4.5	Final Approval of Special Plan	01/09/2016	01/11/2016	AVG
5	URBAN DESIGN PROJECT DEVELOPMENT AND PROJECT MANAGEMENT			
5.1	Preliminary design urban landscape (including district heating network)	01/03/2016	01/06/2016	AVG
5.2	Participatory process for defining interventions	01/06/2016	01/10/2016	AVG
5.3	Urban Design Project development	01/10/2016	01/01/2017	AVG
5.4	Contracting urban construction works	01/01/2017	01/06/2017	AVG
5.5	Urban construction works(including district heating network)	01/06/2017	01/06/2018	AVG
6	DISTRICT HEATING			
6.1	Preliminary design project for heating network and boiler room	01/03/2016	01/06/2016	Giroa
6.2	Preliminary design project for boiler building and related landscaping (decisions on location and criteria by AVG needed)	01/03/2016	01/06/2016	LKS
6.3	Execution project for district heating network and boiler building (with collaboration from GIROA)	01/06/2016	01/09/2016	LKS

6.4	District heating boiler room activity licence	01/03/2016	01/05/2016	LKS
6.5	Business plan	01/06/2016	01/09/2016	Visesa, EVE
6.6	Package for information to customers (tariffs, supply conditions, standard contract)	01/06/2016	01/09/2016	Visesa, EVE
6.7	Application for construction works licence and for activity licence	01/09/2016	01/10/2016	AVG
6.8	Drafting tender for construction works and exploitation of district heating	01/07/2016	01/10/2016	AVG
6.9	Public tender for construction works and exploitation of district heating	01/10/2016	01/03/2017	AVG
6.10	Founding of district heating financing and exploitation institution.	01/03/2017	01/04/2017	AVG
6.11	Boiler building and district heating networks construction works (various phases)	01/03/2017	01/02/2018	ESE
D3.4	District heating network deployed and in use (M36)	01/08/2016	31/01/2019	MON
7	INTEGRATION OF ELECTRICITY AND THERMAL NETWORKS			
7.1	Drafting project for district heating equipment and network	01/01/2016	01/03/2016	MON
7.2	Integrated Infrastructures and Communication	01/04/2016	01/01/2019	MON-MU
D3.4	District heating network deployed and in use (M36)	01/08/2016	31/01/2019	MON
8	BUILDING REFURBISHMENT			
8.1	Preliminary design project for "zone 0" and catalog of constructive solutions	01/01/2016	01/03/2016	LKS
8.2	Building typologies selection for drafting building refurbishment projects	01/02/2016	01/03/2016	Tecnalia
8.3	Diagnosis, current state analysis, and prioritization of requirements for different building typologies	01/02/2016	01/03/2016	Tecnalia
8.4	Preliminary design project contracting for different building typologies	01/03/2016	01/05/2016	Visesa
8.5	Preliminary design projects for different building typologies	01/04/2016	01/06/2016	Visesa
8.6	Preparation of information records for each building portal			
8.7	Current state analysis and prioritization of other requirements for intervention (building structure, accessibility, energy, others ...)	01/12/2016	01/02/2017	Tecnalia
8.8	Data collection for the development of detailed project and construction documents (thermographies, inspection, etc)	01/12/2016	01/02/2017	Tecnalia
8.9	Drafting of basic projects for building refurbishment	01/12/2016	01/03/2017	Visesa
8.10	Processing building permits	01/03/2017	01/06/2017	Visesa
8.11	Detailed project and construction documents development	01/03/2017	31/07/2017	Visesa
8.12	Study of clustering construction works for tendering	01/01/2017	31/01/2018	Visesa
8.13	Tendering of construction works			
8.14	Building works (first phase)	01/11/2017	01/01/2019	Visesa
8.15	Building works (other phases)	01/01/2018	01/07/2019	Visesa
D3.3	Building retrofitting interventions completed (M36)	01/08/2016	31/01/2019	Visesa
9	MOBILITY			
9.1	Design business proposals to be implemented	01/02/2016	31/07/2016	EMS
9.2	Definition of the technical specifications of vehicles and infrastructure	01/05/2016	30/09/2016	EMS
9.3	Procurement of vehicles and infrastructure	01/05/2016	30/09/2016	EMS
9.4	Definition of the technical specifications of the charging infrastructure	01/09/2016	31/10/2016	EMS
9.5	Procurement and installation of charging infrastructure	01/09/2016	31/10/2016	EMS
9.6	Starting operation of vehicles	01/11/2016	31/12/2016	EMS
9.7	Tracking and monitoring	01/01/2017	31/12/2018	EMS
D3.5	EV vehicle purchases completed, vehicles in operation (M36)	01/08/2016	31/01/2019	CEA



D3.6	EV charging Infrastructure deployed and in use (M36)	01/08/2016	31/01/2019	CEA
D3.7	Last mile logistic infrastructure electric deployed and in use (M36)	01/08/2016	31/01/2019	CEA
10	ICTs and Monitoring			
10.1	City Platform requirements definition	01/01/2016	01/06/2016	Tecnalia
10.2	Development of City Platform	01/01/2016	01/11/2017	MON-MU
10.3	Platform integration and validation	01/05/2017	01/01/2018	Tecnalia
10.4	ICT-systems monitoring and evaluation	01/03/2016		MON-MU
D3.8	ICT Infrastructure deployed and commissioned. City Information Open Platform (CIOP) in use (M42)	01/08/2016	31/01/2019	MON

Table 18: Activities planned for Vitoria-Gasteiz LH intervention. Visesa

A more in-depth description and detail of management procedures and deployment plans to implement demonstration actions in Coronación district will be presented in D3.2 *Vitoria – Gasteiz Integrated planning report* (July 2017).

7 SmartEnCity Evaluation Framework for intervention baseline

SmartEnCity aims to develop an urban regeneration model towards the Smart Zero Carbon City concept to be implemented in three lighthouse cities, Vitoria-Gasteiz (Spain), Tartu (Estonia) and Sonderborg (Denmark), for improving energy efficiency in main consuming sectors in cities, while increasing their supply of renewable energies. The three cities will develop a number of coordinated actions aimed at reducing the energy demand of residential building stock through cost-effective low energy retrofitting actions at district scale; increasing the RES share of energy supply through extensive leveraging of local potentials; enhancing the use of clean energy in urban mobility by means of extensive deployment of green vehicles and infrastructure; using ICTs for the integration and consistency in demo planning and implementation; and engaging activities to secure the involvement of citizens.

In this regard, SmartEnCity will demonstrate that the interventions performed in the cities as well as the strategies addressing non-technical barriers (business models, citizen engagement strategies and public procurement among others) meet the foreseen ambitious objectives in the three LH. Given the complexity of the project, a common and holistic methodology will be defined in order to assess the interventions performance from multiple points of view based in the comparison of the **post-retrofit period** (called as *final performance*) against the period before the intervention, which is named as **baseline**.

The definition of this holistic methodology for the assessment of the performance of interventions in the three LH cities will be deployed in D7.3 where different protocols will describe how to evaluate the presumed benefits of SmartEnCity. This deliverable will also explain how to address the process for data collection, the adjustment required to estimate the baseline model and measurement requirements for the post-intervention period. These protocols will be based in a complete set of KPIs which should be useful during the entire renovation project. This is mainly because both in the baseline and in final performance, the evaluation should be carried out through well-established indicators in order to compare the before and after of the demo area.

Five protocols will take part of the methodology for evaluating SmartEnCity interventions in terms of energy consumption and greenhouse gas emissions savings, efficiency, social acceptance, economic performance and citizen engagement. During the next months, partners will be working in defining such protocols.

In this section of the deliverable some ideas are presented as the starting point for detecting how the baseline must be evaluated. In a further step, baseline will be calculated (D3.2, D4.2, D5.2) taking into account the protocols to be developed in D7.3. Following lines describe **each of the phases** which cover the evaluation of intervention performance and some details are introduced about how it is foreseen to deal with the baseline calculation. This description includes:

- Technical definition of the integrated intervention
- Evaluation plan
- Data collection approach for the evaluation of intervention performance
- Installation of monitoring equipment
- Data collection
- Performance evaluation



7.1 Technical definition of the integrated intervention

Technical definition of the district integrated intervention consists of the description of the main demo area characteristics, where project and implementation plans will be executed. Information included below would be needed to be compiled in order to make compatible the evaluation plan with the demo area features and procedures to be applied in each city.

For whole interventions, it is required to know the definitive technical solutions, the citizen engagement strategies, partners and stakeholders which will take part and their responsibilities and financial schemes, as well as the periods where they will be implemented. For the evaluation of district intervention, it is also recommended to count with the constructive characteristics of buildings and the current energy system of the district as well as the type of residents. All these issues must be considered for defining the baseline evaluation approach.

7.2 Evaluation plan

7.2.1 KPIs for the intervention evaluation

The framework for the evaluation of interventions was defined in D7.2, where potential KPIs to be used in the project were identified for each type of intervention/action (district renovation, sustainable mobility and citizen engagement), in order to measure the objectives to be met according with the information collected from the DoA⁶⁷. Thus, four types of objectives and KPIs were proposed taking into account the expectation of the project.

- Technical
- Environmental
- Social
- Economic

Figure below shows the framework of evaluation described in D7.2.

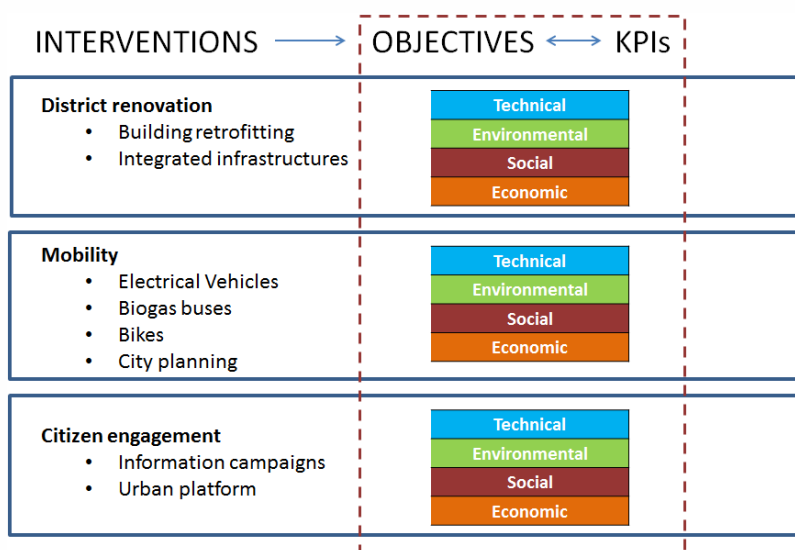


Figure 22: Types of interventions, objectives and KPIs. CARTIF

⁶⁷ Description of action. SmartEnCity project

Table below compiles the KPIs proposed in D7.2 grouped by categories.

	Technical KPIs	Environmental KPIs	Social KPIs	Economic KPIs
District renovation	18	7	26	8
Mobility	9	3	13	8
Citizen engagement	23	3	10	3

Table 19: KPIs proposed in D7.2

These KPIs will be validated by the partners involved in LH cities and merged in the different **Protocols** to be deployed in D7.3.

- *Energy Assessment Protocol*
- *ICTs Protocol*
- *Life Cycle Analysis (LCA) Protocol*
- *Mobility Protocol*
- *Protocol for cross cutting issues*

7.2.2 Protocols for the intervention evaluation

Each of the protocols will be deployed by small groups with representative partners from the three LH cities which will collaborate in the definition of the scope, approach and set of KPIs to be included in these protocols taking as reference the evaluation framework described in D7.2.

Foreseen scope of each Protocol is described below, which will be totally defined in D7.3.

- *Energy Assessment Protocol* to cover the energy savings achieved with the implementation of energy performance solutions in the districts, the associated CO₂ avoided and the thermal comfort achieved.
- *ICTs Protocol* in order to carry out the evaluation of the efficiency gained and the higher use of RES in the district due to the implementation of ICT strategies during the intervention.
- *Life Cycle Analysis (LCA) Protocol* to determine the reduction of environmental impacts due to the district intervention.
- *Mobility Protocol* to calculate the energy and CO₂ emissions avoided with the implementation of mobility actions in the cities as well as the affections in the traffic and journey delays.
- *Protocol for cross cutting issues* which covers social acceptance, citizen engagement and economic performance to be measured through different tools.
 - Social acceptance protocol could aim to evaluate the perception of potential target groups: residents, drivers/vehicle owners and citizens about the project and the quality of life improvements achieved.
 - Economic protocol could deal with the cost effectiveness of the solutions and the return of the investments for potential target groups: residents, drivers/vehicle owners and municipality.
 - Citizen engagement protocol could cover the influence of the information campaigns and the urban platform in potential target groups (residents,

drivers/vehicle owners and citizens), as engagement activities carried out in the cities, and the improvement of the urban ICT infrastructure. It will measure the success of interventions, the use of web and other ICT applications, and the attendance to information campaigns.

Regarding KPIs, common indicators will be used for the whole process of evaluation, despite thinking about the possibility of using only a few KPIs for baseline definition in the case of some Protocols (e.g. ICT, social and citizen engagement), where it might not be useful to deploy all the set of KPIs but only the most representative ones.

Table below introduces the foreseen **scope, approach and KPIs** for each Protocol according to the current working plan defined in WP7.

Protocol	Scope proposed	Approach	Type of KPIs
Energy assessment protocol	Energy and emissions savings & thermal comfort in district due to renovation	Deployment of IPMVP Protocol and adaptation to the district scale. Selection of options defined in this protocol according to the possibilities: data gathered from meters or from energy bills or simulation of the energy use of the whole facility	Technical and environmental indicators for district intervention from D7.2
ICT protocol	Energy efficiency & share of RES/self-energy supply in district due to the use of ICT	Tailored protocol for evaluating the data collected in meters	Technical indicators for district intervention from D7.2
LCA protocol	Reduction in the environment impact due to the intervention in the district	Tailored and simplified procedure for evaluating the data collected from the energy systems and materials of construction used in the district (before and after SmartEnCity). The LCA should be calculated through software SIMAPRO or GABI and the Life cycle inventory database ECOINVENT	Environmental indicators for district intervention from D7.2
Mobility protocol	Energy and emissions savings & traffic and journey delays reduction by mobility actions	Tailored protocol for evaluating the data collected in meters to be installed in vehicles and questionnaires to be distributed to drivers	Technical and environmental indicators for mobility action from D7.2
Social acceptance protocol	Social acceptance of project and interventions & quality life gained with interventions/actions in residents, drivers/vehicle owners and citizens	Tailored protocol for evaluating the data from the target groups selected	Social indicators for district intervention, mobility action and citizen engagement from D7.2
Citizen engagement protocol	Success of citizen engagement strategy implemented in the cities by the achievements in workshops/information campaigns and ICT platform (e.g. number of attendees and users from each target group (residents, drivers/vehicle owners and citizens) and deployment of the urban ICT platform	Tailored protocol for evaluating the information collected through questionnaires and ICT platform	Technical and environmental indicators for citizen engagement from D7.2
Economic performance protocol	Cost, economic savings & payback associated to the interventions for residents, drivers and municipality	Tailored protocol for evaluating the data collected in questionnaires/interviews and through ICT platform to the target groups selected	Economic indicators for district intervention, mobility action and citizen engagement from D7.2

Table 20: Protocols: scope and KPIs

In addition, this report includes some **details for each Protocol** approach in order to be considered as an introduction for the baseline definition.

Energy Assessment Protocol

Measurement and Verification (M&V) is a well-defined process, which reliably verifies the savings in terms of energy and greenhouse gas emissions achieved by an Energy Conservation Measure (ECM).

Since energy savings cannot be directly measured because this concept represents the absence of energy consumption, the savings have to be determined by comparison of the consumption between the periods before and after renovation, implementing adjustments when needed. With the aim of drawing the concept graphically, Figure below depicts the stages in the M&V plans, where the baseline is the period before the intervention; reporting period represents the post-retrofit period; and separating them, the refurbishment itself.

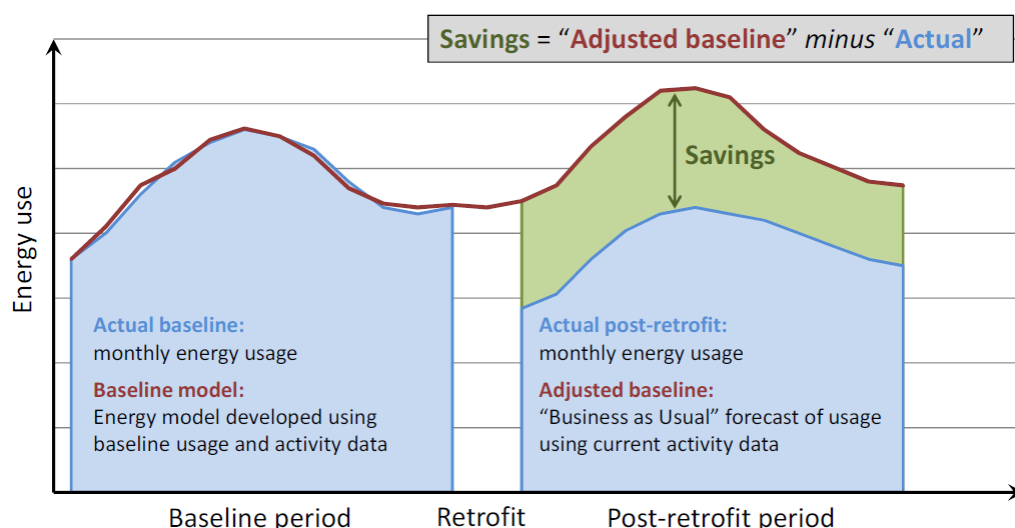


Figure 23: Measurement & Verification stages. CARTIF

IPMVP⁶⁸ is the protocol selected at proposal stage for measuring the energy performance in SmartEnCity, being also the protocol implemented in other projects focused in energy renovations of districts. Each LH must establish its own specific Measure & Verification plan (M&V plan) based in the four options defined in IPMVP: (A) individual ECM with measured and estimated parameters; (B) single ECM, but all the values are metered; (C) whole facilities through measurements; (D) entire or partial installation by means of simulation.

In any case, the energy savings are calculated by means of a key-condition for long-term success. The equation below represents the baseline measurements, the actual energy and the adjustments which are used to re-formulate the baseline consumption under the same conditions than the ones in the reporting period.

$$\text{Energy savings} = \text{Baseline energy} - \text{Post retrofit energy} \pm \text{Adjustments}$$

Regarding the measurement periods, these ought to be selected to determine all the operational modes of the installation. Thus, they must cover a complete operational cycle

⁶⁸ Documents available at <http://evo-world.org/en/>

from the minimum energy consumption to the maximum one. In a lot of projects, IPMVP recommends one year, taking into consideration the climate conditions that affect the energy consumption.

About the adjustments, IPMVP presents two possibilities: routine and non-routine. The first group describes the parameters that influence the energy, varying along the life cycle. On the other hand, the second one considers those variables that remain almost constant during the renovation project.

Finally, an important part within IPMVP is the definition of the boundary. The protocol offers a certain freedom degree for the selection of the boundary, but always considering the facilities involved in the renovation project inside it. In fact, the objective is to reduce the efforts in the independent metering variables. Thus, the boundary can cover an individual element (for instance, a pipe), a group of elements (for example, a boiler with its distribution circuit) and/or the whole building or group of buildings. Within this boundary, the metering equipment is in charge of taking the samples, ensuring to apply the quality assurance concept. In this way, IPMVP establishes that the electricity consumption must be measured in the same way than in the company (i.e. similar equipment, poll rate, demand peak, etc.). As well, a calibration procedure is set up according to the law procedures so as to decrease the error percentage in the equipment measurements and/or simulation software.

For the case of baseline evaluation, one of the four options has to be selected and applied taking into account that this scenario is proposed to be quantified in an early stage of the project (M18).

- (A) Individual ECM with measured and estimated parameters
- (B) Single ECM, but all the values are metered
- (C) Whole facilities through measurements
- (D) Entire or partial installation by means of simulation

Protocols for Social Acceptance, Economic Performance and Citizen Engagement

Tailored protocols must be defined according to the possibilities to be implemented in the LH cities. D7.2 introduced the potential evaluation which includes the target groups (residents, drivers/vehicle owners, citizens and municipality) and the tools (questionnaire or interview to be launched via workshops, telephone calls, door to door, or urban platforms).

Questionnaires are proposed to be launched to residents (tenants/owners), drivers/vehicle owners, citizens and the municipality in order to know information related to social acceptance to the project and economic savings and payback reached with the project, as well as the success achieved through the project. These questionnaires can be distributed in workshop/information campaigns already foreseen in the project, being also possible to arrange another specific action for collecting this information. Furthermore, with the aim to know if it has produced a change in the opinions due to the implementation of actions/interventions, it is thought to launch them in two occasions (before interventions for evaluating the baseline and after the intervention for evaluating the final performance). For an accurate evaluation, the same people/people profile must participate in both stages. Finally, it must be remarked that an only questionnaire will be designed for each target group dealing with all the previous issues.

During the protocol definition, it should be agreed if all these groups can be involved as well as the most suitable tools to be used. These decisions must be made for the whole process of evaluation: baseline and final performance, being aligned with the citizen engagement strategies established in the cities, since involving citizens in this type of activities is not easy.

Different situations can occur:

- A well-established citizen engagement strategy has not been defined, finding difficulties in the collaboration of citizens. In addition, they do not have the knowledge to reply certain questions.
- Although a well-established citizen engagement strategy has been defined, it is considered that this type of actions can difficult the implementation of the intervention since, for example, residents can feel annoyed with this type of actions.

For the final performance, in which a continuous communication with residents, drivers/vehicle owners and citizens has been reached along the project, this type of evaluation should not imply any problem. However, for the case of baseline, which is intended to be evaluated at the beginning of the Project (M18), these difficulties can arise.

Mobility Protocols

Unlike in the building and district evaluation case, for which there is a well-known and established protocol, there is no standard protocol to evaluate the impact of the mobility actions to be implemented in the SmartEnCity. Nevertheless, the core concepts provided by the IPMVP can still be applied (setting a baseline, measuring, computing and reporting savings) with some limitations regarding the scope of the monitoring or the boundaries, given the differences between the studied systems.

As in the building retrofitting case, the baseline period should represent all operating models of the energy systems with a period length sufficient to represent all situations of energy consumption (e.g. different travel habits, weather conditions, holiday seasons, etc.). For the mobility case, this makes a desirable period of at least one year, since it is the minimum period that contains all the periodic holiday seasons and also contains the different weather conditions for all seasons.

Also, data should be gathered at the period immediately before the introduced actions, since periods further back in time would not reflect the starting conditions existing before so accurately.

The scope of the baseline, in terms of energy savings, could be an equivalent number and typology of internal combustion vehicles to the ones introduced by the different measures funded by the SmartEnCity project, although other indicators should be taken at the city level/demo site for those measures not directly related with clean vehicles introduction, such as the usage of public transport or average travel times.

ICTs Protocol

The assessment methodology for the ICT tools aim at ensuring that the implemented monitoring system is able to manage all variables and parameters, and must do it in a reliable and efficient way. Specifically, through this protocol it is expected to know the energy consumption profile of buildings, which allows to manage the energy demand of each substation and to adjust the power delivered by the generator of heat, the reliability of the



system based in power interruptions, the ratio of energy produced at local level over the energy consumption, the share of renewable energy in energy consumption/demand of buildings, among other information.

A specific procedure, which includes the selection of only a few KPIs, will be defined for baseline evaluation taking into account that the information that can be gathered at the beginning of the project is related to the existing monitoring tools implemented in the demo site.

Life Cycle Analysis (LCA) Protocol

SmartEnCity intends to deploy a simplified environmental assessment of the renovation actions, undertaking a Life Cycle Assessment (LCA) study, one of the most internationally recognized and accepted methods to investigate the environmental benefits of the life cycle of products, processes and services. Environmental impacts include those from emissions into the environment and through the consumption of resources, as well as other interventions (e.g. land use) associated with providing products that occur when extracting resources, producing materials, manufacturing the products, during consumption/use, and at the products' end-of-life (collection/sorting, reuse, recycling, waste disposal). These emissions and consumptions contribute to a wide range of impacts, such as climate change.

The main objective of this study in SmartEnCity project is to assess the environmental impact associated with the current situation in the district (baseline) in comparison to a future scenario in which efficient energy solutions are implemented in the districts. The final performance will also include the affections to the environment during the retrofitting activity. Therefore, the aim is to consider the changes that will be incorporated in the districts throughout the project development comparing to the baseline scenario. This way, the environmental burdens associated with the demonstrative intervention will be characterised. Finally, LCA will permit to evaluate and identify critical points of the stages or subsystems of the renovation actions, from extraction of raw materials to the end of life of the involved products.

7.3 Data collection approach for the evaluation of intervention performance

Once the protocols are developed, it is necessary to define the programs that compile the monitoring requirements for metering data from interventions (e.g. variables and frequency), as well as the approach which allows to collect data and store them in urban platforms or other storage sources (e.g. questionnaires fulfilled). Monitoring program and data collection approach will include the specifications for baseline and post-intervention period.

These tasks correspond with T7.2 (monitoring program) and T7.3 (data collection approach) which have M18 as deadline. A coordination with the partners involved in the definition of evaluation protocols, monitoring programs, execution of interventions and actions, and performance evaluation must be done in order to align all these issues. There is room in the project for that purpose, establishing the procedure to start such collaboration (T7.4).

The figure below represents the stages until the final performance evaluation of the interventions is completed.



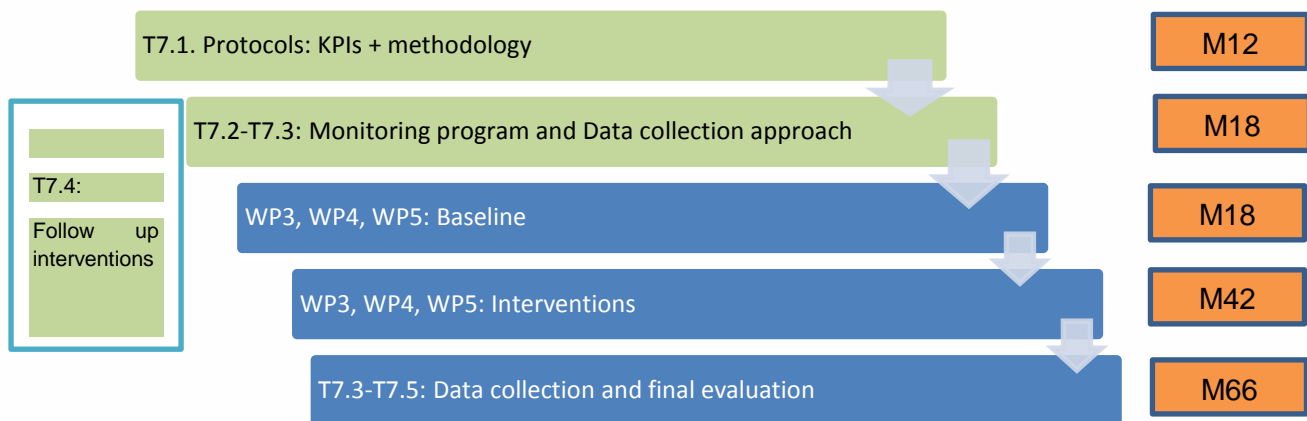


Figure 24: Stages of interventions performance evaluation. CARTIF

For the case of baseline to be evaluated at M18, monitoring programs and collection approach will be defined as follows.

- *Energy Assessment Protocol.* Simulation seems the best way to evaluate the energy behavior of the district, since it seems there is not possibility to implement meters with time enough to evaluate the energy consumption before the retrofitting works. If this is the scenario, monitoring metering will not be defined for baseline and data collection approach will refer to collect the data from the district which allows to simulating the buildings.
- *ICTs Protocol.* Since this protocol is related to the information compiled through the ICT solutions (meters), the monitoring program and data collection for the baseline evaluation will be established according to the available information at the beginning of the project and the monitoring systems previously implemented in demonstrators.
- *Life Cycle Analysis (LCA) Protocol.* The own protocol could define all the aspects of data collection approach and monitoring requirements for evaluating the environmental impacts.
- *Mobility Protocol.* It is not well-known how monitoring and data collection approach will be defined for measuring the performance of mobility action, since it will be related to the tailored procedure to be designed.
- *Protocol for cross cutting issues,* which covers the social acceptance, citizen engagement and economic performance. The data collection approach and monitoring requirements are supposed to be part of the own Protocol.

7.4 Installation of monitoring equipment

Once the monitoring program and collection approach is defined, monitoring equipment will be selected and installed according to them in district and vehicles.

The implementation of the monitoring systems has to be developed in parallel to the construction works in districts, whereas for the mobility action, it will be defined a specific strategy for the implementation of monitoring equipment in the vehicles. Then, once the monitoring equipment is available, it is needed a commissioning phase to ensure that the implementation plan has been properly deployed in the three demo sites and that all the data

acquisition systems work as expected, to assure that monitoring is performed in an appropriate manner. For the case of baseline, all these aspects must be considered.

7.5 Data collection

Concerning the period considered for collecting data, it will depend on the type of intervention. For the case of district renovation and mobility, it is important to meter all energy consumption data of the building and vehicles before the retrofitting works and mobility actions start during at least one year. Once the works have been concluded, it is recommended monitoring the energy generation, supply and consumption for at least two years in order to guarantee a consistent evaluation.

For the protocols which does not require a continuous collection of data through meters (LCA, Social acceptance, economic performance, citizen engagement), the data collection will finish once all the expected data has been gathered.

7.6 Performance evaluation

The evaluation of the intervention performance must be done according to the protocols established. All the details about how to implement them in baseline will be defined in D7.3.

Consequently, deliverables from WP7 will detail all the aspects related to how to evaluate baseline, dealing this section with some starting descriptions about how to deal with this issue.

8 Deviations to the plan

Evaluation Framework for Intervention Baseline

Intervention baseline of Vitoria-Gasteiz has been delayed due to a revision of the DoA, where stated that baseline should be defined by M9, before the development of protocols at M12. Baseline will be evaluated at M18 once these protocols are designed.

Regarding indicators selection and calculation

In Vitoria-Gasteiz characterization process (Chapter 5) there are few missing indicators which were identified as *mandatory*. After reviewing the proposal for the three cities, those indicators were identified as relevant, but after a hard gathering and calculating process by CEA, some of them were unavailable. Main reasons were lack of management time to request and receive data from the different responsible bodies, and data availability.

The difficulty of this task has been very useful to identify the potential barriers any city can face in the search, selection and calculation of indicators. This reflection will be a relevant output to include and develop in further generic urban regeneration strategies (D2.7/D2.8), even more bearing in mind the high environmental awareness of Vitoria-Gasteiz.

9 Outputs for other WPs

This figure shows the connection of Vitoria-Gasteiz Diagnosis (D3.1) with the next deliverables, being the Urban Regeneration Strategy (D2.7/D2.8) the most immediate report where bearing in mind the conclusions obtained in this deliverable. As the figure shows, the output of D3.1 is in line with D4.1 and D5.1 outputs (Tartu and Sonderborg diagnosis).

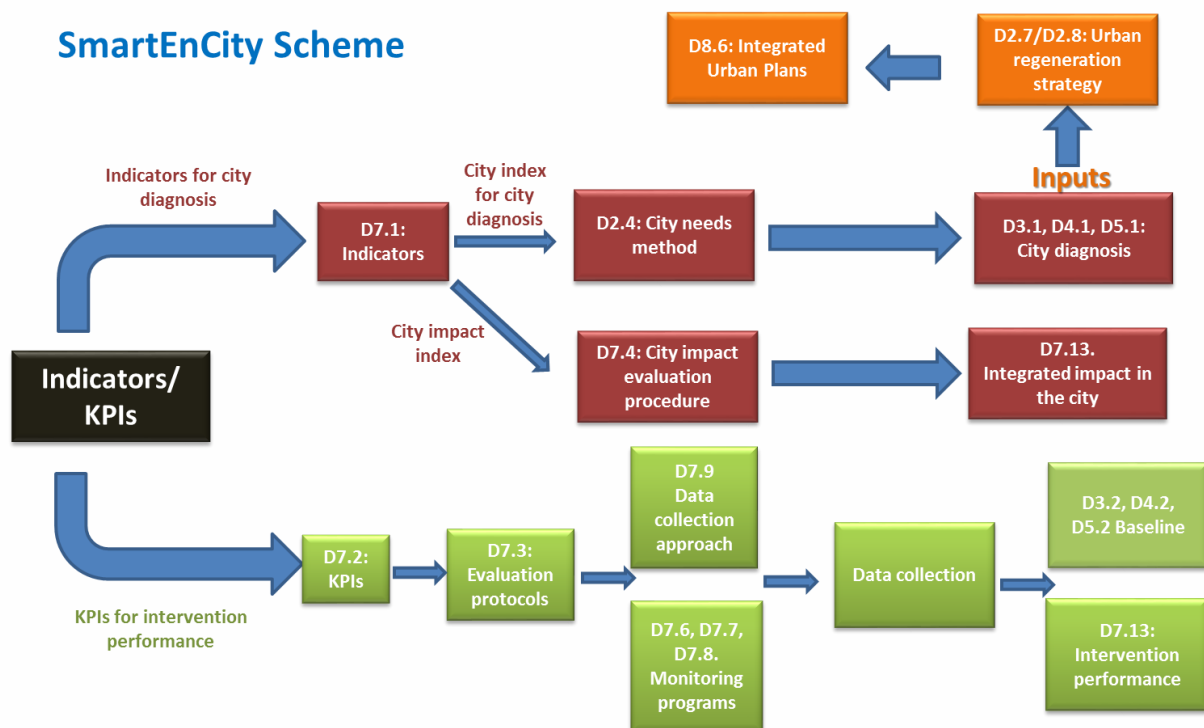


Figure 25: SmartEnCity Indicators/KPIs scheme. CARTIF

The city diagnosis will define the city needs and therefore it is an output for defining Integrated Urban Plans (WP8, D8.6). In addition, the city diagnosis will be the starting point for the city impact evaluation to be done at WP7 (D7.13).

Finally, diagnosis and baseline definition of D3.1 sets the common ground for the remaining WP3 deliverables, which will deal with LH intervention in Vitoria-Gasteiz.

Annex A1. List of final indicators for city diagnosis

The indicators agreed with cities as mandatory (green cells) and optional (yellow cells) have been included in these tables, with updated definitions for those indicators which were classified as optional due to be unfamiliar for some partners as well as not relevant enough. There are also a few changes with mandatory indicators regarding previous versions.

For optional indicators, it is up to the city if they want to include them in the city diagnosis. Also, the city can incorporate (or not) data from other scales (e.g. regional or national) in case there are no available data at city level. These indications were provided by email to the partners.

All these indicators were introduced in D7.1 with the definitions. Then in D2.4, a further selection was developed, taking into account the opinion of the cities.

List of indicators for city diagnosis				
Area	Field	Indicators	Description	Unit
City characterization	Key features of the city	Size	Land area of city (total city surface)	km ²
		Population	Total number of persons inhabiting a city	Inhabitant (inh)
		Population density	Population per unit area in the city	Inh./km ²
		Annual population change	Change in the number of inhabitants in the last year	%
		Median population age	Median age is the age that divides a population into two numerically equal groups	Years
		% of population > 75	Number of persons older than 75 years	%
		Land consumption	Formula: <i>Total built surface/Total city surface</i> This indicator measures the land use intensity and urban areas density	Km ² /Km ²
	Socio-economic features of the city (Current economic performance of the city)	GDP per capita	The gross domestic product is the monetary value of all the finished goods and services produced within a city's borders in a specific time period considering the number of inhabitants	M€/inh
		Median disposable income	Median disposable annual household income	€
		Energy intensity of economy	Formula: <i>GDP value of the city /total energy consumption</i> This indicator is the ratio between the gross inland consumption of energy and the gross domestic product (GDP) for a given calendar year. The gross inland consumption of energy is calculated as the sum of the gross inland consumption of five energy types: coal, electricity, oil, natural gas and renewable energy sources. It measures the energy consumption of an economy and its overall energy efficiency and will serve to understand the energy consumed in relation with the economic situation of the city	MWh/M€
	Socio-economic features of the city (City prosperity)	New business registered per population	Number of births of enterprises in a city per the number of inhabitants (or by region in the case) In can be found in EUROSTAT as Employer business demography by size class and NUTS 3 region in this link: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=bd_esize_r3&lang=en Alava can be found for the case of Vitoria. In the case of Denmark, I don't know if the regions that appear in the list include the city of Sonderborg.	Number

		Proportion of working age population with higher education	Proportion of working age population (18-65 years) qualified at level 5 or 6 ISCED (Short-cycle tertiary education or bachelor's or equivalent level)	%
		City unemployment rate	Unemployed citizens in relation to employed and unemployed who are legally eligible to work	%
		Youth unemployment rate	Percentage of youth labor force unemployed	%
		Percentage of the stock reserved for social housing	<i>Formula: Number of dwellings built dedicated for social housing/number of total dwellings built in a city</i> It a measure of the governmental action to improve housing accessibility	%
		Energy poverty level	Share of average energy expenses relative to the average disposable income (income minus taxes). The energy poverty can be understood as a lack of access to “modern” energy services and to goods comfort conditions. There are a lot of definitions for energy poverty but we will consider this ratio: It is considered that families belongs to energy poverty level if this ratio is higher than 10%.	%
		Waste generated per capita	The amount of municipal solid waste generated per capita annually. It includes all economic activities and in addition waste generated by households.	Ton/inh
		Nitrogen dioxide emissions	Average annual nitrogen dioxide emissions per capita collected by environmental stations located in the city. It will also be reported the maximum amount allowed	$\mu\text{g} / \text{m}^3$
		Fine particulate matter emissions	Average annual fine particulate matter emissions (PM 2.5) per capita collected by environmental stations located in the city. It will also be reported the maximum amount allowed	$\mu\text{g} / \text{m}^3$
		Air quality index	Average annual concentration of relevant air pollutants (NOx and fine particles). It will also be reported the maximum amount allowed. This index represents the city's general air quality conditions throughout the year and compare to European air quality norms. This index is based on the pollutants year average compare to annual limit values, and updated once a year.	ppp or $\mu\text{g} / \text{m}^3$
		Days PM10 > 50 $\mu\text{g}/\text{m}^3$	Number of days in a year in which the concentration of particles in the city is higher than 50 $\mu\text{g}/\text{m}^3$.	days/year
		Noise pollution	Share of the population affected by noise >55 dB(a) at night time	%
		Green space	Percentage of preserved areas/reservoirs/waterways/parks in relation to total city surface.	ha/ha

Energy supply network	City energy profile	Primary Energy Consumption in the city per year	Gross inland consumption of the city excluding non-energy uses	MWh/year
		Final Energy produced in the city per year	This indicator refers to the renewable & non-renewable energy generated in the city. The energy generation shall be expressed independently by type of energy produced.	MWh/year
		Public lighting energy use per year	Final energy consumption in the city for public lighting uses. The energy consumption of public lighting represents usually an important portion of the costs and of the energy consumed in the service sector of cities and it will be useful to evaluate the impact of investing in the public lighting	kWh/year
		Total buildings energy consumption per year	Final energy consumption of energy in whole buildings of the city (<u>it includes residential and non-residential buildings</u>) for heating and electricity uses Consider to split this in two: 1. Buildings heat consumption 2. Buildings electricity consumption.	GWh/year
		Public building energy consumption per year	Final energy consumption of energy in public buildings of the city for heating and electricity uses Consider to split this in two: 1. Public buildings heat consumption 2. Public buildings electricity consumption. It will be useful to evaluate the importance/impact of investing in the retrofitting of public buildings	kWh/m ²
		Residential buildings energy consumption per year	Final energy consumption of energy in residential buildings of the city for heating and electricity uses Consider to split this in two: 1. Residential heat consumption 2. Residential electricity consumption. It will be useful to know the share of energy consumption in heat and electricity in the buildings	GWh/inhab.year
		Primary Energy Consumption in the city per capita	Primary Energy consumption in the city per year and considering the number of inhabitants It will be required the data per capita in order to compare the three cities	MWh/year per inhabitant
		Final Energy produced in the city per capita	Final Energy produced in the city per year and considering the number of inhabitants It will be required the data per capita in order to compare the three cities	MWh/year per inhabitant
		Public lighting energy use per capita	Public lighting energy use in the city per year and considering the number of inhabitants It will be required the data per capita in order to compare the three cities	kWh/year per inhabitant
		Total building energy consumption in the city per capita	Residential + non-residential consumption in the city for heating and electricity uses considering the number of inhabitants It will be required the data per capita in order to compare the three cities	kWh/year per inhabitant
		Public buildings energy consumption per capita	Energy consumption by public buildings considering the surface of public buildings It will be required the data per capita in order to compare the three cities	kWh/m ²
		Residential buildings energy consumption per	Residential consumption in the city for heating and electricity uses considering the number of inhabitants	GWh/inhab.year per inhabitant

Energy uses in building typologies	capita		
	Portion of households connected to the district heating and cooling	<p>Formula: $\text{Number of households connected to the district heating and/or cooling network} / \text{total number of households}$</p> <p>The existence of decentralized energy generation in a city is in many cases linked to renewable energy generation. The district networks help to integrate the renewable energy and low carbon energy technologies in the energy mix.</p>	%
	Total residential natural gas energy use per capita	<p>Total annual residential natural gas use / Total city population</p> <p>It will be required the data per capita in order to compare the three cities</p>	kWh/hab-year
	Total residential oil energy use per capita	<p>Total annual residential oil use / Total city population</p> <p>It will be required the data per capita in order to compare the three cities</p>	kWh/hab-year
	Total residential biomass energy use per capita	Total annual residential biomass use / Total city population	kWh/hab-year
	Percentage of the energy consumption by end use in residential buildings: space conditioning	<p>Measure of the total energy consumption of heating and cooling in residential buildings.</p> <p>Formula: $[\text{Energy consumption in the domestic sector related to heating and cooling over a calendar year} / \text{Total residential buildings energy consumption}] \times 100$</p>	%
	Percentage of the energy consumption by end use in residential buildings: domestic hot water	<p>Measure of the total energy consumption of DHW in residential buildings</p> <p>Formula: $[\text{Energy consumption in the domestic sector related to domestic hot water over a calendar year} / \text{Total residential buildings energy consumption}] \times 100$</p>	%
	Percentage of energy consumption by end use in residential buildings: lighting and appliances	<p>Measure of the electricity consumption in residential buildings</p> <p>Formula: $[\text{Energy consumption in residential buildings related to lighting and appliances over a calendar year} / \text{Total residential buildings energy consumption}] \times 100$</p>	%
	Percentage of the energy consumption by end use in public buildings: thermal and cooling uses	<p>Measure of the electricity consumption in public buildings</p> <p>Formula: $[\text{Energy consumption in public buildings related to heating, DHW and cooling over a calendar year} / \text{Total public buildings energy consumption}] \times 100$</p>	%
	Percentage of the energy consumption by end use in public buildings: electrical uses	<p>Measure of the electricity consumption in public buildings</p> <p>Formula: $[\text{Energy consumption in public buildings related to lighting and appliances over a calendar year} / \text{Total public buildings energy consumption}] \times 100$</p>	%
Potential local renewable energy resources	Percentage of total energy derived from renewable sources	Total renewable energy consumption in the city / gross inland consumption in the city	%
	Energy use from District Heating	Total energy supplied by district heating sources in the city/ Total energy consumption in the city	kWh/year
	Energy use from	Total energy supplied by biomass sources in the city/ Total energy	kWh/year



		Biomass	consumption in the city	
		Energy use from PV	Total energy supplied by photovoltaic sources (photovoltaic plants or distributed photovoltaic elements) in the city/Total energy consumption in the city	kWh/year
		Energy use from Solar Thermal	Total energy supplied by solar thermal sources/Total energy consumption in the city	kWh/year
		Energy use from Hydraulic	Total energy supplied by water sources (hydraulic plants)/ Total energy consumption in the city	kWh/year
		Energy use from Mini-Eolica	Total energy supplied by wind sources/ Total energy consumption in the city	kWh/year
	Potential local renewable energy resources	Energy use from Geothermal	Total energy supplied by geothermal sources/ Total energy consumption in the city	kWh/year
		Budgets devoted to renewable energies and Energy Efficiency	Public Budget (from the city council) of the projects related to Renewable Energy and Energy Efficiency /population	Euros / Persons
	Environmental impacts of the energy consumption	Global Warming Potential (GWP) per capita	Emissions of residential and non residential sectors / city population	Tn equi. CO ₂ / year capita

City plans and regulation & Governance	City plans and strategies	Existence of plans/programs to promote energy efficient buildings	Is there any specific document promoted by the municipality which details a set of intended actions for promoting energy efficient buildings in the city?	YES/NO
		Existence of plans/programs to promote sustainable mobility	Is there any specific document promoted by the municipality which details a set of intended actions for promoting sustainable mobility in the city?	YES/NO
		Existence of local sustainability action plans	Is there any specific document in the city which provides direction on common management issues associated with water, waste, energy, biodiversity and pollution in the city?	YES/NO
		Signature of Covenant of Mayors	Has the municipality signed the Covenant of Mayors?	YES/NO
		Existence of Smart Cities strategies	Is there any specific urban development vision to improve quality of life by using technology to meet residents' needs and improve the efficiency of services (e.g. government services, transport and traffic management, energy, health care, water, innovative urban agriculture and waste management)?	YES/NO
		Existence of public incentives to promote energy efficient districts	Are there any specific public incentives for promoting the energy efficient districts in the city coming from the municipality (e.g. grant, tax exemptions and special loans)?	YES/NO
		Existence of public incentives to promote sustainable mobility	Are there any specific public incentives for promoting sustainable mobility in the city coming from the municipality (e.g. grant, tax exemptions and special loans)?	YES/NO
	Public procurement procedures & Regulations and normative	Existence of regulations for development of energy efficient districts	Is there any specific official rule or law performed by the municipality that says how to develop energy efficient districts in the city?	YES/NO
		Existence of regulations for development of sustainable mobility	Is there any specific official rule or law performed by the municipality that says how to develop sustainable mobility in the city?	YES/NO



		Existence of local/national Energy Performance Certificate (EPC)	Is there any specific EPC for buildings in the city?	YES/NO
		Share of Green Public Procurement	Percentage of annual procurements in the city administration (public transport, construction, health services and education) that include environmental criteria	%
	Governance	Involvement of the administration on smart city projects	The extent to which the smart city strategy has been assigned to one department/director and staff resources have been allocated. The valuation will be made by working team working in the city diagnosis	Likert scale Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree
		Involvement of the administration on smart city projects	What extent to which the local authority is involved in the development of smart city projects, other than financial? The valuation will be made by working team working in the city diagnosis	Likert scale Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree
		Multilevel government	The extent to which the city cooperates with other authorities from different levels. The valuation will be made by working team working in the city diagnosis	Likert scale Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree
		Paperless government (incl e-signature)	The extent to which the Information and Communication Technologies (ICTs), and other web-based telecommunication technologies have been deployed in the city to enhance the efficiency and effectiveness of service delivery in the public sector. The valuation will be made by working team working in the city diagnosis	Likert scale Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree
	Transport and mobility	Total number of vehicles in the city per capita	Number of public and private vehicles registered in the city divided by the number of inhabitants	Number/inh
		Total number of private cars per capita	Number of private cars registered in the city divided by the number of inhabitants	Number/inh
		Total number of commercial vehicles per capita	Number of vehicles used for the delivery of goods and services divided by the number of inhabitants	Number/inh
		Total number of taxis per capita	Number of taxis registered in the city divided by the number of inhabitants	Number/inh
		Total number of trucks per capita	Number of trucks registered in the city divided by the number of inhabitants	Number/inh
		Total number of public buses per capita	Number of buses registered in the city for public services divided by the number of inhabitants	Number/inh
		Total number of public bicycles per capita	Number of available bicycles in public initiatives divided by the number of inhabitants	Number/inh
		Number of bicycles per capita	Number of private bicycles registered in the city divided by the number of inhabitants	Number/inh
		Number of two-wheel motorized vehicles per capita	Total number of two-wheel motorized vehicles (including scooters and motorcycles, but no bicycles), related to the total number of inhabitants	Number/inh

**City Statistics
for Mobility**

Average age of motor vehicles for public transport	Mesure of the average age of motor vehicles for public transport	years
Kilometers of high capacity public transport system per population	Length of high capacity public transport network (heavy rail metro, subway and commuter rail systems)	Km/inh
Kilometers of light passenger public transport system per population	Length of light capacity public transport network (light rail streetcars, tramways, bus, trolleybus and other)	Km/inh
Kilometers of bicycle paths and lanes per population	Length of bicycle paths (independent roads or parts of a road designated for cycles and signed-posted as such) and lanes (part of carriageways designated for cycles and distinguished from the rest by longitudinal road markings)	Km/inh
Total annual number of trips	Total annual number of trips in the city	Number of trips
Total annual number of trips by private car	Total annual number of trips by private car	Number of trips
Total annual number of public transport trips	Total annual number of trips in public transport	Number of trips
Total annual number of trips by bike	Total annual number of trips by bike	Number of trips
Total annual number of trips by motorbike	Total annual number of trips by motorbike	Number of trips
Total annual number of trips by taxi	Total annual number of trips by taxi	Number of trips
Total annual number of trips on foot	Total annual number of trips on foot	Number of trips
Annual number of public transport trips per capita	No. of trips made by public transport per year / Total city population	Number trips /inh
Daily average time by trip	Annual time of total trips / total number of vehicles / 365	min / vehicle ·day
Daily average length by trip	Annual length of total trips / total number of vehicles / 365	km/ vehicle ·day
Daily average length by private car trip	Annual length of total trips by private car/ total number of vehicles / 365	km/ vehicle ·day
Daily average length by public transport trip	Annual length of total trips by public transport/ total number of vehicles / 365	km/ vehicle ·day
Daily average length by bike trip	Annual length of total trips by bike/ total number of vehicles / 365	km/ vehicle ·day
Daily average length by motorbike trip	Annual length of total trips by motorbike/ total number of vehicles / 365	km/ vehicle ·day
Daily average length by taxi trip	Annual length of total trips by taxi/ total number of vehicles / 365	km/ vehicle ·day
Daily average length by foot trip	Annual length of total trips on foot/ total city population / 365	km/ vehicle ·day
Percentage of electric private cars	Number of electric vehicles related to total number of private cars	%
Percentage of electric	Number of electric vehicles related to total number of commercial cars (vehicles for delivery goods)	%



		commercial cars		
		Percentage of electric taxis	Number of electric vehicles related to total number of taxis	%
		Percentage of electric motorcycles	Number of electric vehicles related to total number of motorcycles	%
		Percentage of electric public buses	Number of electric vehicles related to total number of public buses	%
		Percentage of biogas public buses	Number of biogas vehicles related to total number of public buses	%
		Number of public EV charging stations	Total number of public EV charging stations in the city	Number
		Total number of recharges per year	Total number of recharges during a year in the public EV charging stations	Number
		Total kWh recharged in the EV charging stations	Number of estimated kWh recharged during a year in the public EV charging stations	kWh
		Parking facilities per capita	[No. of public and private parking facilities / Total city population] Measure of the facility to park vehicles.	Number/inh
		Number of public parking areas per capita	Total public parking areas in the city/Total city population	Number/inh
		Number of available parking slots per capita	Total number of public parking slots in the city	Number/inh
		Pedestrian area per capita	Surface in the city reserved for pedestrians related total surface in the city. It is a measure of the facility for pedestrian movement.	Km ² /km ²
		Cost of a monthly ticket for public transport in relation to the national minimum wage or average wage	[Price of a monthly ticket for public transport in the city / National minimum or average wage] x 100. It is a measure of the weight of public transport in the household economy.	%
		Transportation fatalities per capita	[No. of transportation fatalities in the city over a calendar year / Total city population]. It is a measure of the overall safety of the transportation system.	Number/inh
Environmental impact with mobility		Transport energy use per capita	Transport energy use over a calendar year / Total city population. Measure of the total energy use per capita due to public and private transport.	kWh /pers.·a
		Transport greenhouse gas emissions per capita	Transport GHG emissions, in equivalent CO ₂ units, generated over a calendar year / Total city population Measure of the total greenhouse gas emissions per capita due to public and private transport.	t /(pers.·a)
		Percentage of renewable energy use in public transport	[Renewable energy use in public transport over a calendar year (kWh) / Public transport energy use over a calendar year (kWh)] x100 Measure of the use of renewable energy in public transport.	%

Urban infrastructure	Existing city monitoring infrastructure	Number of parking information panels	Total numbers of panels in the city with availability information in public parkings	Number
		Number of air quality stations	Total number of air monitoring stations/points located in the city related to the minimum stations required by the law	Ratio
		Number of noise stations	Total number of noise monitoring stations/points located in the city related to the minimum stations required by the law	Ratio
		Number of weather stations	Total number of weather stations/points located in the city related to the minimum stations required by the law	Ratio
		Number of loan point for public bicycles	Total hire-points in the city to enable users to pick up and return public bicycles related to the number of public bikes	Ratio
		Number of smart-meters installed	Total number of smart-meters installed in the city related to the number of inhabitants	Ratio
		ICT citizen oriented platforms	Is there any public ICT global platform available for citizen offering general information about the city and including institutional mechanisms which allow to provide to the managers or policy makers of the city the problems identified by the citizens in order to trigger administration action?	YES/NO
		Data privacy	The level of data protection by the city is defined as how the ownership of the data has been clearly defined and accepted by the residents	Likert scale: Strongly disagree/Disagree Neither agree nor disagree/Agree/ Strongly agree
	Communication infrastructure in the city	Percentage of the population covered by a mobile-cellular network	Number of persons who own a mobile cellular related to the city population	%
		Percentage of the population covered by at least a 3G mobile network	Number of persons who own a mobile cellular at least 3G related to the city population	%
		3G Mobile network cells	Total number of 3G (UMTS & CDMA2000) mobile network cells to cover the land area of the city from a mobile phone perspective	Number of 3G mobile network cells
		4G Mobile network cells	Total number of 4G (WiMAX) mobile network cells to cover the land area of the city from a mobile phone perspective	Number of 4G mobile network cells
		Number of cell phone connections per capita	Total number of cell phone connections in the city in relation to the population of the city	Connections/inh
		Number of internet connections per capita	Total number of internet connections in the city in relation to the population of the city	Connections/inh
		Number of landline phone connections per capita	Total number of landline phone connections (excluding cellular connections) in the city in relation to the population of the city	Connections/inh
		Smartphone penetration	Number of smartphones in relation to total mobile phones	%
		Free Wi-Fi zones	Total number of free Wi-Fi zones offered to citizens	Number of free Wi-Fi zones identified in the city
		Cable Network	Is there any network cable system deployed in the city?	YES/NO

		Cable Network Types	Different types of networks deployed <u>in the city</u>	Types of cable network available in the city (twisted pair cable, coaxial cable, fibre optic,...)
Citizens	Existing actions related to citizen engagement	Recycling rate	Amount of solid waste recycled/amount of municipal solid waste generated	%
		Voter turnout in last municipal election	Voter participation level: [Number of persons that voted in the last municipal election /Total city population eligible to vote] x 100	%
		Number of local associations per capita	Total number of citizen associations in the city: Number of associations / Total city population	Number of consultations / inhab.
	Channels for citizen engagement	Number of information contact points for citizens	Total number of information contact points for energy efficiency, sustainable mobility, environment, etc in the municipality	Number
		Number of municipal websites for citizens	Total number of available websites for informing citizens about the city	Number
		Number of websites consultation per capita	Total number of visits in the websites related to total city population	Number
		Number of interactive social media initiatives	Total number of municipality links in social media channel as Facebook, Twitter, YouTube, etc (It is required to mention the channels) as well as total number of followers of each initiative related to the population of the city	Number
		Number of discussion forums	Total number of internet discussion site dedicated to the citizens	Number
		Number of awareness raising campaigns	Average number of awareness raising campaigns carried out in the city yearly for energy, mobility and environmental	Number
		Number of thematic events	Number of thematic events dedicated to citizens in the topics energy efficiency, sustainable mobility and environment. Previous term (awareness campaigns) tries to provide information about a topic to improve understanding as well as mobilising the society to bring about the necessary change in attitudes and behaviour. In this case, the purpose is only to inform about a topic	Number
		Number of newspaper columns	Number of columns addressed to topics related to energy efficiency, sustainable mobility, environment which appear in local newspapers each week	Number
	Current scenarios of citizen engagement	Citizens participation in smart city projects	The number of projects in which citizens actively participated as a percentage of the total projects executed	Number
		Professional stakeholder involvement	What extent to which professional stakeholders are involved in planning and execution of urban strategies in your city?	Likert scale: Strongly disagree/Disagree Neither agree nor disagree/Agree/ Strongly agree

Table 21: Common and optional indicators. CARTIF