

URBAN GreenUP

D2.1: Report on the diagnosis of Valladolid

WP 2, T 2.1

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0 Executive summary

Climate Change is already happening and URBAN GreenUP aims to contribute both to the adaptation and to the mitigation of climate change with a new strategy for Re-naturing Cities through Nature-Based Solutions.

The objective of this deliverable is to deploy a diagnosis of the Valladolid city, with a detailed assessment and prioritization of the main environmental challenges. The City has been subject of analysis in challenges, basis on the report published by the Expert Working Group on EKLIPSE [1].

The document starts with a general description and characteristics of the city: their location, climate and socio-demographic characterization, land use and communication, as well as the cultural heritage and innovation characterisation, vegetation and green public spaces structure.

The City is committed to improve the well-being of the citizens and the environment for years, as we can see in this deliverable. For instance, Valladolid was a city pioneer in implementing buses powered by autogas to reduce pollutants emissions from public transport fleet (Figure 1).



Figure 1: The world's fountain in the Spain square in Valladolid with buses powered by autogas

However, Valladolid still has to face important environmental and social challenges to improve the well-being of its citizens. For this reason, Valladolid bet for the NBS, as a new tool to improve the future of the city, citizens and environment. The interventions planned for the municipality within the URBAN GreenUP project have been divided in three Sub-Demo Areas:

- Sub-Demo A "Valladolid Urban Green Corridor" with actions like green pavements, SUDs integration in the green cycle lane or Installation of green noise barriers along the new Urban Green Corridor.
- Sub-Demo B "NBS to reduce heat island effect and improve Air Quality" with actions like Convert the 2 units of covering shelters of the Spain Square zone, in Green covering shelters or an Electro-wetland roof.
- Sub-Demo C "Retrofit urban ecosystems to improve well-being and to avoid flood risk. New models of re-naturing urban areas". A natural wastewater treatment plant (NWTP) to produce water for irrigations purposes or a Floodable park for the Esgueva River (both with educational routes) will be installed in Valladolid. Furthermore, other actions with educational and engagement purposes like community composting will be carried out in an urban orchard area.





In addition some non-technical interventions for engagement, city coaching and support activities, that will be developed in the three Sub-Demo Areas indistinctly.

This report collects the analysis of the municipality according to the challenges, basis on the schema of the Expert Working Group on EKLIPSE: Climate resilience, Water management, Green space management, Air quality, Urban regeneration, Planning and governance, Social justice and social cohesion, Public health and well-being, Economic opportunities and green jobs [1].

In each section, we can identify an introduction, followed by the EU legislation, Spanish legislation of the topic and a final part with the summary of challenges detected and potential actions to be taken.

Conclusions are the ended, where we can see that Valladolid has a proactive role for smart, sustainable and urban growth. Work at city level on **climate change adaption** has intensified within the **Covenant of Mayors for Climate and Energy** and introduced its **Action Plan for Sustainable Energy (SEAP)** to achieve several environmental objectives in direct relation with the improvement of Valladolid's climate resilience. The city of Valladolid was committed to reducing its CO₂ emissions by at least 20 % by 2020. The **Integrated Sustainable Urban Development Strategy** (EDUSI) was approved. Its objective is to serve as a frame of reference for achieving a sustainable and inclusive growth, promoting innovation and having the citizenship as essential protagonist of the city.

But besides this SEAP and EDUSI strategies, Valladolid has **other urban plans** (Green Vehicle Programme, Plan for integral urban mobility, Valladolid by 2016, Strategic proposals and Local Agenda 21) related to different aspects of the city and all of them include climate change resilience topics and actions.

The **green space management:** Valladolid is applying European indicators for sustainability, and aims to increase the percentage of citizens living less than five hundred meters from a public green zone. Currently, Valladolid dispose of between 20 -25 m² of public green zone per capita already qualified in the municipality, with a horizon that can reach 35 - 40 m² accessible park per capita.

Main problems regarding **Air quality** in Valladolid are caused by episodes of high concentration of ozone. Valladolid has been working in the development of an **Action Plan for Alert Situations**. With the application of the new Action Plan, traffic restrictions have been imposed in the city center during several days. This is one of the main environmental challenges facing the city.

The **Action Plan against Noise of Valladolid** reveals the places in the city that suffer the highest noise levels and where it is more urgent to act. In the case of the municipality of Valladolid, the percentage of population affected by levels above 55 dB (A) was in 2008 higher than 40 percent, although the updated map of 2012 reduces this condition to 37 percent of the population on that date. It is a very significant proportion in any case.

"Governance" In Valladolid, the plenary meetings are public, citizens can participate to present their arguments, but they cannot vote. Citizen participation is a set of mechanisms for the citizens to access government decisions without needing to be part of the public administration





or a political party. Citizen participation includes the access to municipal information and the possibility of participating in municipal management using different ways.

There is no specific legislation to promote the **social justice and cohesion** within the city. Some of the strategies followed for the urban planning include some social considerations. Valladolid has developed several Action Plans in social matters such as Municipal Accessibility Plan, Municipal Plan on Drugs, Municipal Children Plan, Plan against Gender Violence, Municipal Plan for Equal Opportunities between men and women or Municipal plan on Immigration - intercultural coexistence.

The urban environment significantly affects the **health and well-being of residents**. Nature or green space may contribute to health through four principal and interacting pathways: improved air quality, enhanced physical activity, stress reduction and greater social cohesion.

Physical activity constitutes one of the main factors to promote health and well-being. This is closely related to green infrastructures in which citizen can practice sport. In 2013 Valladolid had 26 sport focused associations. There are reasons to suggest that Valladolid's dwellers are interested with sport-related issues and hence, will integrate any NBS that promoted sportive lifestyle thus improving populations' health. For example, "presupuestos participativos 2018" consultancy collected most of the proposals related with sports investments followed by urbanism and environment and cleanliness.

Valladolid City Council supports the development of sustainable projects to promote the green **economy opportunities** and the generation of **quality employment** with programmes like GREENWEEKEND. Furthermore, it carries out other plans and actions to increase business opportunities in the city and to promote more and more quality employs (employment plan 2016-2019, CREA programme or Talent return plan). However, employment remains one of the main issues of social concern and in which, both in Valladolid and in Spain in general, more has to be innovated to solve it. Green economy and green jobs are a great opportunity in this regard.

Thanks to this deliverable, URBAN GreenUP project will be able to build a methodology to set a Valladolid city baseline, to create a set of KPIs to measure NBSs performances, to monitor NBSs performance and evaluate cost and benefits of NBS.





1 Introduction

NBS can be defined as "solutions that are inspired and supported by nature, which are costeffective, simultaneously provide environmental, social and economic benefits and help build resilience"[2].

The objective of WP2 is to deploy a set of NBS in the city of Valladolid following a holistic approach. The idea is to address specific challenges to be described in the City and area diagnosis and baseline calculation procedure by means of several pilots in well-selected areas of the city. This WP will be devoted to make the detailed diagnosis, specify interventions, support the tendering process and establish the monitoring programmes to be followed in WP5 guidelines. After this, a rigorous supervision of the interventions will be carried out to guarantee a high quality deployment of the solutions. More than 30 NBS will be implemented, with a strong participation of the City Councils stakeholders and citizens (co-creation approach). This implementation will be in close contact with WP1 to support the development of the re-naturing strategy and serve as validation test-bed as far as possible. WP3-Liverpool and WP4-Izmir will work in parallel, so to strengthen this collaboration a cross-cutting activity has been set up, common to the three WPs.

In this deliverable D2.1, a rigorous diagnosis of the Climate Change Mitigation challenges and water resilience situation has been carried out. The basis of its development has been the report [3] published by the Expert Working Group on EKLIPSE project that contains a list of 10 challenges to which NBS are often positioned as 'solutions'. This assessment challenge faces the lack of a robust evidence base on how NBS can contribute to meeting urban sustainability goals across European cities. New approaches are needed that advance the knowledge frontier to comprehensively assess existing practice, account for the multiple and systemic impacts of NBS and identify how these are valued by diverse stakeholders and communities. For this reason, part 3 of this deliverable reviews different approaches to the assessment of the City of Valladolid from the ecological/biophysical, economic across various challenge areas considering relevant indicators and methods.

The diagnosis has been developed based on the situation of these specific environmental challenges referred to Valladolid and it may help to identify its key problems referred to NBS implementation. The results here included allow project to know how the priorization of the interventions can be faced regarding the natural system or environment, social system, economic system and the vision of the community to know and to participate in the strategies of sustainability. The conclusions are centered in the City Council's and population's interest concerning the environment, as well as on the preoccupation of factors that socially and economically affect the satisfaction of basic needs and the local development.





2 Predefinition of the City and Area Diagnosis

URBAN GreenUP project aims to create evidence about the NBSs impact in cities to fight climate change, improve wellbeing and build more sustainable livelihoods.

In URBAN GreenUP project WP1, WP5 and WP7 are dedicated i) to the construction of a methodology to set a city baseline, ii) to create a set of KPIs to measure NBSs performances, iii) to monitor NBSs performances and iv) to evaluate cost and benefits of NBSs. Each NBS generates several impacts; these may be assessed through a set of indicators by using specific types of methods. An objective method to evaluate the actions, impacts and performance is necessary. URBAN GreenUP will adopt several KPIs for the evaluation of NBSs impacts in front-runner cities. The EKLIPSE [1] framework will be used as starting point to elaborate a homogeneous framework for the evaluation of NBS and to compare results through cities. Other KPIs will be adopted in order to frame the project evaluation not just in the European context but also in an international one. This framework will take into consideration all NBS impacts at different scales. Initiatives that have been included are: *European Green Capital Award, Sustainable Development Goals (SDGs), Convention on Biological Diversity - Aichi targets, The Economics of Ecosystem Services (TEEB) and Mapping and Assessment of Ecosystem Services (MAES).*

The chapter is composed of three paragraphs. The first one will describe the EKLIPSE framework and methodology used to evaluate NBSs. The second paragraph will introduce the Ecosystem Services Assessment (ESA) methodology. The last paragraph will describe i) the KPIs construction process adopted in URBAN GreenUP, ii) the results obtained and iii) the next steps needed to complete the process.

The European Commission requested the EKLIPSE H2020 project to help building up an evidence and knowledge base on the benefits and challenges of applying NBS. The aim of this EKLIPSE activity is to devise an impact evaluation framework that can guide the design, development, implementation and assessment of NBS demonstration projects in urban contexts. The framework takes into account insights from recent studies into the mapping and assessment of ecosystems and their services, ecosystem-based adaptation projects, and relevant information on climate adaptation, natural water retention, green infrastructure, greening cities and other European Commission based initiatives.

The result of the EKLIPSE activities is a methodology to evaluate NBSs on the basis of 10 challenges [1]:

- 1. Climate mitigation and adaptation;
- 2. Water management;
- 3. Coastal resilience;
- 4. Green space management (including enhancing/conserving urban biodiversity);
- 5. Air/ambient quality;
- 6. Urban regeneration;
- 7. Participatory planning and governance;
- 8. Social justice and social cohesion;
- 9. Public health and well-being;





10. Potential for new economic opportunities and green jobs.

For each challenge, a set of KPIs to measure NBSs impacts at different scales (micro-scale, mesoscale and macro-scale) has been individuated. URBAN GreenUP aims to integrate the EKLIPSE methodology with the Ecosystem Services Approach (ESA) in order to generate a homogeneous evaluation framework to be adopted by cities during the project. This framework is based on the ecosystem services produced or enhanced by NBSs and will take into consideration all NBSs impacts at different scales.





3 Valladolid diagnosis

3.1 Overall City Description

3.1.1 General Description and Characteristics

Etymology



Vallisoletum, 1574, by Braun and Hogenberg.

"There is no direct evidence for the origin of the modern name of Valladolid. One widely held etymological theory suggests that the modern name *Valladolid* derives from the Celtiberian language expression *Vallis Tolitum*, meaning "valley of waters", referring to the confluence of rivers in the area. Another theory suggests that the name derives from the Arabic expression *Ballad Al-Walid Al-Walid*, which means "city of Al-Walid", referring to Al-Walid I. Yet a third claims that it derives from *Vallis Olivetum*, meaning "valley of the olives". In texts from the middle ages the town is called *Vallisoletum*, meaning "sunny valley", and a person from the town was a *Vallisoletano*.

The city is also popularly called *Pucela*, a nickname whose origin is not clear, but may refer to knights in the service of Joan of Arc, known as La Pucelle. Another theory is that *Pucela* comes from the fact that Pozzolana cement was sold there, the only city in Spain that sold it." [4]

Location and Natural Characteristics

Valladolid is a municipality and a city located in the Northwest part or Spain. It is placed in the middle of the Meseta Castellana (Figure 2), as it is called the wide plain that constitutes the biggest part of the Castilla y León region.

Valladolid is the capital of the autonomous region of Castilla y León (Figure 3). It is one of the biggest regions in the European Union. Surrounded by mountains, it has an average surface of 94,224 km² (almost 2.13 % of the EU territory). In the city of Valladolid there are the Courts and the Castilla y León Board, the regional legislative and government bodies.









Figure 2: Spanish urban system (source: INE, 2011)

Figure 3: Aerial view of the city of Valladolid

With an area of 19,250 Ha, the municipality is located in the center of the Duero river sedimentary basin, in contact between the calcareous wastelands and the sandy fields, respectively to the North and South of the Duero river valley, segmented by the rivers Pisuerga (1,979 Hm³) and Esgueva (61 Hm³). The landscape draws a characteristic alluvial relief whose essential elements are limestone moors, elevated plains, the valleys of the rivers Pisuerga, Duero and Esgueva, many slopes and sandy countryside in the South.

Valladolid has also two artificial water channels: Canal de Castilla (Figure 4), built between XVIII-XIX centuries, to facilitate the transport of wheat from Castilla to the ports of the North; and the Canal del Duero, built in the XIX century, to ensure the water supply to the capital and crops irrigation.

Agricultural and forestry systems of the Duero River consist of the vineyards of the northern of the municipality and the irrigation systems of the Duero, Esgueva and



Figure 4: Canal de Castilla and Valladolid regional landscape (Source: CUVA en bici)

Pisuerga river valleys. Valladolid is located within five winegrowing regions: Ribera del Duero, Rueda, Toro, Tierra de León, and Cigales.



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Climate

Climate in Valladolid is Cold Mediterranean. Mediterranean because of the Latitude among 30 – 40 degrees, and cold because of the altitude of 698 m above sea level, isolated from oceanic influence. Its main characteristics are the irregularity of temperature and precipitation (Figure 5), and summer dryness. The situation among river valleys leads to a low speed of the wind and the persistence of fog.



With extreme temperatures, summer is warm with an average of 21.2 °C and winter is cold, with 5.7 °C on average. Winter is considered from November to March, two months longer than the astronomical average. Summer gets from June to September, another four months. So, spring and autumn are short, they get only three months.

The average precipitation is 433 mm per year (between 400 - 600 mm). It is irregularly distributed, from 13 mm in July to 55 mm in October (Figure 6). That is why the Pisuerga and Esgueva rivers have high volume between December and May, and a strong drought in summer.



Figure 6: Climate chart of Valladolid (Spain)

Table 1 shows the main climate reference values for Valladolid, obtained from the National Meteorological Agency (AEMET).



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Month	Т	TM	Tm	R	RH	DR	DN	DT	DF	DH	DD	1
January	4.2	8.2	0.2	40.0	83.0	6.3	3.0	0.0	10.4	15.9	3.5	101.0
February	5.9	11.2	0.7	27.0	72.0	5.2	2.1	0.1	3.7	12.8	4.3	147.0
March	9.0	15.2	2.8	22.0	62.0	4.8	0.8	0.2	1.6	6.7	6.0	215.0
April	10.7	16.9	4.6	46.0	62.0	7.8	0.8	1.4	0.9	2.3	3.9	232.0
May	14.5	21.0	7.9	49.0	60.0	7.9	-	3.6	0.9	0.3	3.5	272.0
June	19.3	27.0	11.6	29.0	52.0	4.5	-	3.6	0.6	0.0	7.8	322.0
July	22.3	30.7	14.0	13.0	45.0	2.1	-	2.9	0.3	0.0	14.1	363.0
August	22.1	30.1	14.1	16.0	48.0	2.3	-	2.6	0.2	0.0	11.8	334.0
September	18.5	25.6	11.3	31.0	56.0	4.3	-	1.8	0.9	0.0	7.5	254.0
October	13.2	18.9	7.6	55.0	70.0	7.5	-	0.7	3.0	0.5	4.2	182.0
November	7.9	12.4	3.5	52.0	79.0	7.1	-	0.1	7.1	5.8	3.5	117.0
December	5.0	8.6	1.3	53.0	84.0	7.7	1.4	0.0	9.2	12.4	3.2	89.0
Year	12.7	18.8	6.6	433.0	64.0	67.7	-	17.5	39.8	56.2	72.8	2,624.0

Table 1: Climate values for Valladolid (reference period 1981-2010)

Legend: T: monthly average temperature; TM: Monthly average of highest daily temperatures; Tm: Monthly average of lowest daily temperatures; R: monthly average of rainfall; RH: monthly average of relative humidity; DR: monthly average of rainy days (rainfall \geq 1mm); DN: monthly average of snow days; DT: monthly average of storm days; DF: monthly average of foggy days; DH: monthly average of frost days; DD: monthly average of cloudless days; I: monthly average of sunny hours.

Socio-demographic Characterization

The municipality of Valladolid (Figure 7) has an urban agglomeration of 301,876 inhabitants (INE, 2016) and it is located in the center of the 23 municipalities of the province of Valladolid, which has a surface of thousand square kilometers and a population of 410,000 inhabitants. It is the northwestern Spain's biggest city.



Figure 7: Cities in Spain by population (metropolitan areas)

From a territorial point of view, low energy prices, the development of road transport infrastructures, and a rising of housing prices, lead to a process of urbanization loss and transfer







of the population to adjacent urban centers, like Laguna de Duero (22,696 inhabitants), Arroyo de la Encomienda (19,042 inhab.) or La Cistérniga (8,895 inhab.). The Metropolitan area of Valladolid has a population of 407,000 inhabitants, adding 22 nearby municipalities (Figure 8 and Figure 9).





Figure 9: Evolution of the population of Valladolid municipality (source: INE)

The economic characterization of Valladolid is explained in three quarters by the Services sector. While the Industry sector constitutes the fourth part, due to the industrial development of the 70'-80's. The industry has relocated to nearby municipalities, due to the lack of industrial land in the municipality and the increase in prices.

The urban growth model for the city of Valladolid is a fragmented city type (**Figure 10**). The development of buildings is in height, with the construction of high blocks of households. As mentioned before, the city is growing in the peri-urban area, in the nearby municipalities.



Figure 10: Panoramic photo of the city of Valladolid (Spain)





Land Use and Communication

In the municipality of Valladolid, agricultural uses are the majority, affecting 70.3 % of the total area (Table 2). Forestry uses also mean an important entity, accounting for 22.8 % of the total municipality (34.4 % excluding urbanized land).

Land use	Area (Ha)	% municipality central area
Urban uses	879.39	5.89
Agricultural uses	10,500.55	70.34
Forestry uses	3,405.24	22.81
Water	142.30	0.95
Sub-total Rural Land	14,927.49	76.07
Sub-total Urban Land	4,696.97	23.93
Total Valladolid central	19,250.52	100.00

Table 2: Land use in Valladolid municipality (PGOU, 2017)

The following map (Figure 11) shows the land uses of the municipality of Valladolid, according to the revision of the General Plan of Urban Planning of 2017 (PGOU). The map shows the territorial enclaves of Navabuena and El Rebollar, which are separated from the central area of the municipality.



Figure 11: Current land uses in Valladolid municipality (General Urban Management Plan, revision 2017)



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The accessibility of the urban agglomeration from almost all directions is good. Valladolid is very well communicated by road, train and plane. It is integrated into the Spanish high-speed network AVE. The high-speed rail line connects Valladolid with Madrid, the capital of Spain, in one-hour trip.

There are also many highways that connect the city with the rest of the country, to link North and South, like the transverse structural axis A-62, and secondary strategic transport corridors like A-601 and N-601 roads. Valladolid airport is located at 10 km of the city, in Villanubla municipality.

Cultural Heritage and Innovation Characterisation

Valladolid has many cultural and patrimonial values (historical, artistic, ethnographic, archaeological and landscape). The city was founded in the Middle Ages. The Old Town has a variety of historic houses, palaces, churches, plazas, avenues and parks. It includes the Cathedral, the National Museum of Sculpture and the Museum of Contemporary Art 'Patio Herreriano'.

Among the cultural events that are held each year in the city there are Easter Week, declared Intangible Cultural Heritage by UNESCO; Valladolid International Film Week (Seminci); and the Theatre Festival and Street Arts (TAC).

Valladolid is central base to one of the most important universities in Spain, the University of Valladolid, in whose Scientific & Technological Park the City Council is actively involved.

Valladolid is part of an innovative Smart City initiative together with Palencia, a city of 80,000 inhabitants located at a distance of 50 km. The Smart City VyP is an initiative of the two City Councils and coordinated by a Permanent Commission. This unique Smart City project is focused on five different axes: Energy, Environment, Logistics and Transport, Citizens and Tourism.

Vegetation and Green Public Spaces Structure

The landscape is integrated by valley vegetation and river terraces, as well as different agricultural crops. In higher areas, there are coniferous and oaks. Some of the tree classes which live in there are *Pinus*, *Quercus*, *Populus* and *Salix*, along with scrub and pastureland spaces.

The municipality of Valladolid is affected by three natural areas of the Red Natura 2000, the Special Areas of Conservation (ZEC) related to the Duero, Adaja and Cega rivers. The Pisuerga River constitutes the backbone of the forest connectivity through the urban area of Valladolid.

Locally, Valladolid is developing a systemic project for urban parks and green corridors, like a dual strategy for the protection of local environmental resources and their sustainable recovery. It has been developing a new double green ring that will be an "equipped urban parks system" at the service of citizens.

The Inner Green Ring is an urban parks system (Figure 12 and Figure 13) where there are existing parks, and others new parks will be added. Pisuerga and Esgueva rivers, as well as Canal de Castilla and Duero river, are the main actors in this Inner green system.





The Outside Green Ring connects rural and urban green areas. In this green ring there will be meeting points between the city and nearby villages, where equipment for free time and other systems will be settled.



Figure 12: Open space strategy for Valladolid municipality, with theFigure 13: Ecological corridors and
connectivity for the city of Valladolid.creation of a double system of parks founded on a double road
ring vertebrate by the river Pisuerga and its banks
(source: PGOU, 2017)Green ring proposal
(source; PGOU, 2017)

Nowadays the city has approximately 500 hectares of green areas, which means a ratio of 16 m² per capita (2017, Environment and Sustainability). And the 96.1 % of the population has access to those green areas [5] of more than 5,000 m². Campo Grande is the most singular green area of Valladolid, a historic urban garden of 11.5 Ha with very mature vegetation and small watercourses.

Indicator	2008	2009	2010	2011	2012	2013
Green areas (m ²)	4,131,655	4,375,303	4,500,665	5,157,944	5,157,944	5,171,469
Green surface per capita (m²/hab)	12.97	13.76	14.26	16.64	16.64	16.7
Leafy trees plantation	3,124	3,040	2,976	2,976	1,387	1,765
Conifers plantation	526	585	602	602	325	425
Shrubbery plantation	23,428	25,632	28,646	28,646	31,420	33,510
Rosebush plantation	725	815	702	425	630	425
Seasonal trees plantation	462,300	461,200	465,300	182,326	167,242	168,113

In the following Table 3, information about green surfaces and other relevant information about vegetation in Valladolid can be found.

Table 3: Green and public spaces main indicators of Valladolid





Valladolid at a Glance

- Population of 301,876 (city urban area of 407,000 approx.).
- <u>Agency</u> for Innovation and Economic Development (2012).
- <u>Smart City</u> strategy for Valladolid and Palencia (2010).
- INNOLID 2020+ Sustainable and Integrated Urban Development Strategy for the city of Valladolid (2016).
- General Plan for Urban Development, PGOUVA (2004 on review 2017).
- Valladolid is a member of the Spanish Network of Intelligent Cities (<u>RECI</u>).
- Distinctive "City of Science and Innovation" awarded by the Ministry of Science and Innovation of Spain (2010).
- Member of the Spanish Network of Cities for <u>Agroecology</u> (2017).

3.1.2 Main Challenges of the City of Valladolid

The urban dominant model in Spain, which is characterized by the diversification of activities and population increase, has aggravated the urban risks and environmental problems that already existed, such as the high consumption of soil, energy, water, and air pollution. It is also important to highlight the significant difficulties caused by the increase in distances, and the permanent requirement of the use of the car.

The strategic line of Valladolid is situated within the frame of the urban city model. Its objectives are to develop an innovative and entrepreneurial culture, and to improve several aspects of the quality of life in Valladolid, dealing with the urban environment in general, but also, in particular, urbanism, mobility, energy and natural resources rational use, among other areas, including sustainable development.

Freezing the expansive model of the city is one of the objectives of the new Urban Management Plan (PGOU, 2017). Get a compact city, controlling carefully the building land expansion and promoting urban regeneration. Valladolid aims to promote urban mobility, improving pedestrian walks and public transport.

Valladolid is facing urban problems such as the loss of air quality, decreased availability of water due to long periods of drought and increased levels of noise.

Environmental Quality: Air Quality

Valladolid has a network of sensors for controlling air pollution in different areas of the city. This network is made up of stations (Figure 14) that measure the conditions of the atmosphere. The service is called Air Pollution Control Network of the Valladolid City Council (RCCAVA).

Air quality is characterized by the importance of emissions of atmospheric chemical pollutants from urban traffic and the group formed by highways, roads and bypasses, given



Figure 14: Air quality stations in Valladolid (source: RCCAVA)



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the potential pollutant of more than 250,000 vehicles that on average travel daily through these routes. To a lesser extent, industrial areas also affect to air quality.

The pollutant in which the attention of the municipality is focused is tropospheric ozone. In June 2017 the alert threshold was reached (Figure 15).



Figure 15: Evolution of tropospheric ozone in Valladolid atmosphere (1992-2016)

Environmental Quality: Noise Quality

The Valladolid Road Noise Maps show that 119,900 people, 76,800 homes, 7 hospitals and 97 schools in the Valladolid Metropolitan area during the 24-hour integrated period (Lden) are exposed to disturbing noise levels, which is the worst of the scenarios considered.

In the case of the municipality of Valladolid (Figure 16), the percentage of population affected by levels above 55 dB (A) was in 2008 higher than 40 percent, although the updated map of 2012 reduces this condition to 37 percent of the population on that date. It is a very significant proportion in any case.



Figure 16: Noise levels during Night period (Ln)

Environmental Quality: Water Quality

Valladolid has six stations in the Integrated Water Quality Control Network (ICA Network), owned by the Duero River Basin (CHD).

The general quality of the water of the Pisuerga river in the provincial limit of Palencia is already delicate, although it is being gradually degraded as they are incorporated into the urban and industrial wastewater in the municipality of Valladolid.

Occasionally, the legal limits for detergents, barium or manganese are exceeded. From the microbiological point of view, total coliforms, fecal coliforms and fecal streptococci require chemical and disinfection treatments for drinking water supply, and in summer they also condition the use for the bath, coinciding with the dry season.





Environmental Quality: Hydrological Risks

The expected hydrological risks in the municipality of Valladolid are associated with natural flooding processes. Big rivers suffer sheet flows, due to persistent rainfall in low slope basins like the Pisuerga river (Figure 17). The risk of flooding increases with intense precipitation (Spring) and thawing (Winter).

On the other hand, Esgueva is a plain river with a rain regime, and without any infrastructure of flow regulation. There are frequent large avenues, once catastrophic, as well as very steep periods, which can dry up in several sections largely due to the heavy drainage of water for irrigation.



Figure 17: Pisuerga river flood increase in 2011 (Source: El Norte de Castilla)

3.1.3 NBS for the City of Valladolid by URBAN GreenUP

The following is a general description of the interventions planned for the municipality of Valladolid within the URBAN GreenUP project in the three Sub-Demo Areas (A, B, C).

It is important to highlight some non-technical interventions for engagement, city coaching and support activities, that will be developed in the three Sub-Demo Areas indistinctly. Some of these activities are the engagement portal for citizens, sponsored activities, a single desk for RUP deployment, and mentoring and supporting to citizen projects of NBS.

Sub-Demo A "Valladolid Urban Green Corridor"

The proposed green corridor will serve as an important communication route between the City Centre and other populated areas with important recreational areas (e.g. football stadium) seeking to facilitate sustainable transport and provide important ecosystem services for urban biodiversity.

- New green cycle lane with cycle-pedestrian green paths areas, with green resting areas, and natural pollinator's modules.
- Plantation of trees along the Green Corridor, over smart soils as substrate.
- Installation of a tree shady place in leisure area next to Football Stadium, with new trees.
- Construction of SUDs for the green cycle lane.
- Installation of green noise barriers along the Valladolid Urban Green Corridor.

Sub-Demo B "NBS to reduce heat island effect and improve Air Quality"

It will be deployed in the City Center of Valladolid. This Sub-Demo B includes different types of green infrastructure (GI) that will reduce maximum/averages temperatures, will increase relative humidity and will reduce air pollutants. In this zone, it will be used NBS adapted to high-urbanized areas.

- Installation of vertical mobile garden.
- Green façade in a public building.





- Green roof installed in the Campillo Market building, to connect this area with España Square.
- Convert the 2 units of covering shelters of the España Square zone, in Green covering shelters, which integrate specific vegetation in the curve surface.
- Electro-wetland roof, that is an innovative wetland surface which can provide electricity through microbial fuel cell technology, to be used in the irrigation of nearby gardens and illumination.
- Urban garden bio-filter to purify polluted air in Zorrilla Square zone.
- Installation of green-shady structures of fast-growing creepers and climbing plants
- Installation of green noise barriers.
- Installation of compacted pollinator's modules installed in mobile window boxes, with smart soil as substrate, a fountain, housing facility for pollinators and birds, bushes and aromatics species.
- Plantation of shade and cooling trees in City Centre, over smart soils as substrate.

Sub-Demo C "Retrofit urban ecosystems to improve well-being and to avoid flood risk. New models of re-naturing urban areas"

It includes a set of actions that will develop sustainable GI with a high ecological value and low maintenance costs. This Sub-Demo C will be deployed in different locations in Valladolid. A Natural Wastewater Treatment Plant will be installed inside of an urban park as a model of a source of sustainable water for irrigation, close to the Football Stadium area. Additionally, a floodable park at the entrance of Esgueva River in the city, will integrate several NBS to minimize flooding risks and provide co-benefits to Climate Change such as water storage, biodiversity, quality public spaces, health, and wellbeing for citizens. In the third location, in Alameda Park area, urban farming facilities will be constructed.

Football Stadium area (parking and sustainable park)

- Green pavement for the parking of the Zorrilla Football Stadium.
- Construction of SUDs in the parking area, as well as Rain Gardens.
- Plantation of trees to re-naturing Football Stadium parking, over smart soils as substrate.
- Natural wastewater treatment plant (NWTP) based on Waterharmonica concept, whose treated water will be used for the irrigation surrounding green areas. It includes the plantation of trees in a sustainable park, using smart soils as substrate, with compacted pollinator's modules and an educational path.

Floodable park (Esgueva River)

- Floodable park where the Esgueva River causes floods in storm periods.
- Green filter area with trees, integrated into the floodable park that will filter Esgueva River water to irrigate nearby garden zones.
- Urban Carbon Sink, that consists in the plantation of urban woodland with trees.
- U with high capacity of carbon sequestration, allocated in specific arboreal series.
- Urban orchard area in the Floodable park zone and an educational path.





Alameda park zone (Urban farming)

- Urban orchard area in Alameda park zone.
- Community composting facility (with educational and engagement purpose) will be installed in the urban orchard area of Alameda Park zone.
- Small-scale urban livestock facility (henhouse) also next to urban orchard area.
- Environmental education and awareness activities.





3.2 Climate Resilience

3.2.1 Introduction

"Climate change will increase the urban heat island effect in the years to come. This meteorological phenomenon is linked to high density areas and characterized by high annual average air and surface temperatures, little cooling occurring at night, air pollution, an increased vegetation period and changing wind and rainfall patterns. Strategies to improve the urban climate include reducing the heat stored in cities, stimulating evaporation and storing rainwater for lengthy periods. Greening of the roofs and facades of buildings helps ameliorating the urban climate, while also being a means of adapting to climate change. Green roofs and green facades smooth temperatures or humidity changes, naturally cooling down temperatures during the summer and keeping warmth in winter. They also isolate from noise, provide clean and oxygenated air, store humidity and protect from extreme weather events. They are a natural habitat for fauna and flora, have a positive impact on the local microclimate and are actively contributing to the conservation of the environment and nature and to reducing operational costs in the long run."

Extracted from COMMISSION STAFF WORKING DOCUMENT "Adapting infrastructure to climate change" Brussels, 16.4.2013 / SWD(2013) 137 final

A resilient city is one that is prepared for existing and future climate impacts, thereby limiting their magnitude and severity. Building resilience requires not only robust decision making by those in positions of formal authority, but also a strong NET of institutional and social relationships that can provide a safety net for vulnerable populations.

The quality of life in European cities and in most of the world is threatened by a number of factors. The drivers include increasing pollution levels, urban heat islands, flooding and extreme events related to climate change, as well as decreased biodiversity (Grimm et al., 2008). These can have detrimental effects for human health and well-being. At the same time, cities are a large source of carbon emissions. The importance of action on carbon mitigation and greenhouse gas control at the urban level was addressed at the COP21 in Paris, highlighting that as the world becomes more urbanized, local action is becoming increasingly important (UNFCCC, 2016). For example, the European Commission's Covenant of Mayors [6] obliges European cities to establish an Action Plan to reduce their carbon emissions by over 20 %, including by using NBS and through the sustainable management of green space. Each city will need to aim for **carbon-neutral urban development**.

Climate resilience is based on two interacting concepts: "adaptation", that is the capacity to react and respond to an external stimulus or stress such as climate change, and "mitigation", that is the potential of improving the current status of a parameter or driver through active or passive behaviour, in this case through reducing greenhouse gas emissions or sequestering carbon. In the case of NBS, which involve elements of ecosystems, the two concepts are closely linked as any adaptation of an ecosystem can further influence the mitigation potential (e.g. by sequestering carbon in vegetation), with an overall dramatic effect on climate resilience [7], [8]).





One of the major issues in implementing NBS for urban climate resilience and in understanding their potential impact and effectiveness is related to the scale of intervention. Action on climate mitigation can span the micro level of a single building, the meso level of the whole city or country and the macro level of the entire planet, though it has essentially a macro (global) scale effect through affecting global concentrations of greenhouse gases. Climate adaptation is more often planned and implemented at the meso (national) to micro (local) level, and the impacts are also at these levels. There are some common actions and indicators, but also some that are specific to the different scales of climate action to be addressed, as identified below.

The severity of climate impacts on infrastructures will vary across the EU according to individual locations and their geophysical risk exposure, the existing adaptive capacity and resilience, and the level of regional economic development. Long and medium term climatic trends (e.g. increasing average temperatures, modified rainfall patterns) and an inherently rising frequency of extreme weather events impact differently from site to site. Climate impacts not only show regional and seasonal patterns (e.g. North/South, winter/summer) but also differ between territorial settings (e.g. urban/rural/coastal). Therefore, adapting infrastructure usually requires a complex, site-based analysis of different trends and impact patterns.

The impacts of climate change vary considerably across Europe, in terms of the regions, territories and sectors affected. The warming of the earth has far-reaching consequences on several climatic parameters, triggering changes in precipitation and temperature patterns, changes in intensity and frequency of extreme weather events (e.g. extreme precipitation, heat waves, cold spells and storms), sea level rise and changing wind patterns. All of these climate phenomena may impact on the stability and the functioning of infrastructure. Therefore they also need to be considered when making climate-resilient investment decisions for new infrastructure and upgrades of existing infrastructure.

The location of an infrastructure, together with the adaptive capacity of local businesses, governments and communities, usually determines an asset's climate sensitivity and vulnerability. This vulnerability to various climate parameters is also strongly sector specific and closely linked to the technology used for construction and operation (e.g. less precipitation causing decreased efficiency of hydro-power plants). Climate change will also affect the environmental and social systems around infrastructure assets and their interactions with these systems. For instance, reductions in rainfall may affect the availability and quality of water resources on which industrial assets depend. This highlights the importance of thinking in an integrated, cross-sectoral way to consider climate risks and resilience.

3.2.2 EU Legislation on Climate Resilience

The European Union is strongly committed to the GHG Emission Trading Scheme as a mechanism to boost GHG emissions reductions in an effective and economically efficient form. This has materialized in a relatively brief period of time in which the necessary legal framework has been developed to give legal coverage to all the elements of this innovative instrument.

The **EU Strategy on Adaptation to Climate Change**, adopted in April 2013, provides a framework and mechanisms to improve the preparedness of the EU for current and future impacts of





climate change. The implementation of adaptation policies in many European countries and worldwide is gradually picking up pace, recently buttressed by the Paris Agreement. The agreement sets out a global action plan to avoid dangerous climate change by limiting global warning to well below 2°C. In relation to climate adaptation, governments agreed to strengthen societies' ability to deal with the impact of climate change. Particular attention is given to transboundary issues and sectors that are closely integrated at EU level through common policies.

To avoid the most serious risks of climate change, particularly large-scale irreversible impacts, the international community has agreed that global warming must be kept below 2°C compared to the pre-industrial temperature. International action to reduce greenhouse gas emissions will therefore be needed for decades to come. But however successful these mitigation efforts prove to be, the impact of climate change will increase in the coming decades due to the delayed impacts of past and current greenhouse gas emissions. Europe and other parts of the world therefore have no choice but to take adaptation measures to deal with the unavoidable climate impacts and their economic, environmental and social costs. By prioritising coherent, flexible and participatory approaches, it will be much cheaper to take early, planned adaptation action than to pay the price of not adapting to climate change.

By taking a coherent approach and providing for improved coordination, the EU Strategy on Adaptation to Climate Change enhances the preparedness and capacity of all governance levels to respond to the impacts of climate change. It focuses on three key objectives:

- Promoting action by Member States: The Commission encourages all Member States to adopt comprehensive adaptation strategies (currently 21 have strategies) and provides funding to help them build up their adaptation capacities and take action. It also supports adaptation in cities through the Covenant of Mayors for Climate and Energy initiative. Additionally, the revised Energy Performance of Buildings Directive (EU) 2018/844 has huge potential for efficiency gains in the EU building sector, the largest single energy consumer in Europe. It includes measures that will accelerate the rate of building renovation towards more energy efficient systems and NBS must be one the alternative in this sense.
- 'Climate-proofing' action at EU level by further promoting adaptation in key vulnerable sectors such as agriculture, fisheries and cohesion policy, ensuring that Europe's infrastructure is made more resilient, and promoting the use of insurance against natural and man-made disasters.
- Better informed decision-making by addressing gaps in knowledge about adaptation and further developing the European climate adaptation platform (Climate-ADAPT) as the 'onestop shop' for adaptation information in Europe.

An assessment of an infrastructure's risk-exposure and vulnerability to climate change impacts is vital to guarantee its long-term sustainability. Accordingly, for some EU policy areas, climate resilience has already been taken up as a parameter in obligatory cost-benefit analyses during the project development phase. To support project managers to make their physical assets more climate resilient, the Commission will publish, as part of the EU Adaptation Strategy package, the "**Guidelines for project managers: Making vulnerable investment climate resilient**". The primary objective of these Guidelines is to help developers of physical assets and infrastructure





incorporate resilience to current climate variability and future climate change within their projects. They include a methodology and step-by-step guidance to systematically assess the climate resilience of infrastructure projects and improve their sustainability and liability in changing climate conditions. The guidelines are intended to complement existing project appraisal and development procedures but not to replace them. The Commission strongly encourages the use of the Guidelines, both in EU-funded projects and more widely. They sit within the evolving policy context on adaptation in the Commission, which is seeing climate resilience being incorporated into a number of policy areas and financing instruments of relevance to asset and infrastructure.

Apart from this guideline, the working document from Commission staff called **"Adapting infrastructure to climate change"** (Brussels, 16.4.2013 / SWD (2013) 137 final) highlights the needs of improving the climate resilience of existing and future infrastructure, ensuring that the impact of climate change is predominantly a Member State responsibility and emphasizing that the private and the public sector play an essential role to achieve it. This may apply during design and planning but also in the course of retrofitting. Most infrastructure sectors are strongly regulated, which means that policies governing these sectors play an important role and might need to be revised in the light of current and future climate changes. One of the most important type of instrument used to regulate infrastructure sectors are standards at EU level, which often include references to (directly or indirectly) weather/climate related pressures. Furthermore, revised guidelines for the Environmental Impact Assessment and the Strategic Environment Assessment as well as the Floods directive contribute to climate resilient investment. Additionally, guidelines for climate-proofing infrastructure projects can support this process.

When revising existing or building new structures, **technical standards** are used in every phase during the lifetime cycle of an infrastructure. Standards can apply during the planning phase (e.g. risk assessments, environmental standards), the design phase (e.g. Eurocodes), the construction phase (European and national product standards, implementation standards) and the maintenance phase (e.g. environmental standards, safety standards). Thus standards have an important impact on the resilience of products, processes and construction. In this process, both European/international standards as well national or sector-specific requirements play a central role.

At European level, **Eurocodes** can be a suitable instrument for addressing climate resilience in different infrastructure sectors. Eurocodes are a set of European Standards (EN) for the structural design of buildings and civil engineering works, produced by the European Committee for Standardisation (CEN) to be used in the European Union. They provide for compliance with the requirements for mechanical strength, stability and safety as basis for design and engineering contract specifications. The Eurocodes embody national experience and research output together with the expertise of CEN Technical Committee 250 (CEN/TC250) and of International Technical and Scientific Organisations and represent a world-class standard for structural design. The Commission has asked CEN to prepare a proposal for how to incorporate climate change and extreme weather events in the Eurocodes.

The Environmental Impact Assessment (EIA) and the Strategic Environmental Assessment (SEA) can be appropriate instruments to mainstream adaptation, helping to improve the climate





resilience of infrastructure. The Environmental Impact Assessment (EIA) is a procedural and systematic tool that is in principle well suited to incorporate considerations of climate change impacts and adaptation within existing modalities for project design, approval, and implementation.

The **EIA Directive** is in force since 1985 and applies to a wide range of defined public and private projects. It requires that environmental impact assessments shall identify, describe and assess the direct and indirect effects of a project on the human beings, fauna and flora, soil, water, air, climate, the landscape, material assets and cultural heritage and the interactions between these factors (Article 3). The EIA Directive of 1985 has been amended three times, in 1997, in 2003 and in 2009, proposing new, clearer amendments towards addressing new challenges, i.e. biodiversity, climate change, disaster risks and availability of natural resources throughout the whole EIA process. As an example, a **"Practical Guidance for Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EIA) Procedures"** was published during 2013 and it aims to help Member States improve the way in which climate change and biodiversity are integrated in Environmental Impact Assessments (EIAs) carried out across the EU.

The **Strategic Environment Assessment (SEA)** can also serve as an effective tool for climate change adaptation, especially by introducing climate change considerations into development and planning processes. The Intergovernmental Panel on Climate Change (IPCC) concluded that consideration of climate change impacts at the planning stage is key to boosting adaptive capacity: "One way of increasing adaptive capacity is by introducing the consideration of climate change impacts in development planning, for example, by including adaptation measures in land-use planning and infrastructure design".

At last but not least, it is important to explain the **Covenant of Mayors for Climate and Energy** initiative. It brings together local and regional authorities voluntarily committing to implementing the EU's climate and energy objectives on their territory. Within the new Covenant of Mayors for Climate and Energy, adaptation has been merged with mitigation efforts in a European initiative involving over 7,000 cities around the world, aims at promoting additional integrated adaptation and mitigation action in an urban context. This unique bottom-up movement, which started in 2008 with the support of the European Commission, now counts over 7,500 signatories. In 2015, the initiative took on new objectives: the Covenant of Mayors for Climate and Energy steps up the initial CO₂-reduction commitment and includes adaptation to climate change. Signatory local authorities share a vision for making cities decarbonised and resilient, where citizens have access to secure, sustainable and affordable energy.

They commit to developing Sustainable Energy and Climate Action Plans for 2030 and to implementing local climate change mitigation and adaptation activities.





The Covenant of Mayors for Climate and Energy is open to all local authorities democratically constituted with elected representatives, whatever their size and whatever the stage of implementation of



Figure 18: Signatories' vision and commitments (source: Covenant of Mayors leaflet)

their energy and climate policies. Signatories that had previously committed to the 2020 targets and/or to Mayors Adapt are invited to sign up again to the 2030 targets (Figure 18). Neighbouring small and medium-sized local authorities can also, under certain conditions, join as a group of signatories.

Subnational and national authorities as well as other non-profit organisations can support signatories by providing them with resources and know-how and be recognised as Covenant of Mayors Coordinators or Supporters.

At last but not least, **the Spanish Climate Change and Clean Energy Strategy (EECCEL)** is part of the Spanish Sustainable Development Strategy (EEDS). The EECCEL includes different measures that contribute to sustainable development within the scope of climate change and clean energy. It includes a series of policies and measures to mitigate climate change, to palliate its adverse effects, and to enable the fulfilment of the commitments assumed by Spain, facilitating public and private initiatives oriented towards increasing efforts of all kinds and from all sectors to fight against climate change, focusing on reaching the objectives under the Kyoto Protocol.

Moreover, it considers measures to achieve energy consumption patterns that are compatible with sustainable development. These measures will constitute the basis for the energy planning of the public administrations and other private and public entities, and it will encourage citizens to contribute to the fight against climate change.

3.2.3 The Case of Valladolid

Valladolid, as an open and socially cohesive city has as main objectives to contribute to improve citizens' quality of life; to direct the collective construction of Valladolid and its metropolitan area, and to promote a common framework to promote effective management relations between citizens, institutions and businesses. In the last few years, the city of Valladolid has taken a proactive role for smart, sustainable and urban growth.

Work at city level on climate change adaption has intensified in the last period. Climate policy in cities has been supported by the Paris Agreement recognition of cities as key actors in implementation and has been one of the priorities when implementing the EU Adaptation Strategy. Within the **Covenant of Mayors for Climate and Energy**, adaptation has been merged with mitigation efforts in a European initiative involving over 7,000 cities around the world. The





Covenant aims at promoting additional integrated adaptation and mitigation action in an urban context and it was conceived at the end of January 2008, in the framework of the 7th ManagEnergy Annual Conference during the EU Sustainable Energy Week. It was considered as the response of the most active cities to Global Warming formalising, by this way, a strong commitment to reduce their CO_2 emissions beyond the 20 % target set by the European Union. Through this Pact, Local and Regional Governments are jointly responsible to the National Governments of the fight against global warming.

Valladolid signed the Covenant of Mayors in 2011 (Figure 19) and introduced its **Action Plan for Sustainable Energy** (SEAP) to achieve several environmental objectives in direct relation with the improvement of Valladolid's climate resilience.

for Climate & Energy	Covenantofmayors.eu My Covenant
ගි About Actions Participation Support Media	Search OK العربية (ar) ×
Signatories	Find a Signatory
Overview Action Plan fi Signatory Mayor (or equivalent): Fco Javier Leon de la Riva Population: 325,000 inhabitants	Find a Signatory or
fi Covenant status	Latest Action Plans
Date of adhesion: 1 April 2011 Signature Action Plan submitted Results monitored	Fiume Veneto, Italy CO ₂ emissions reduction target by 2020 -21%
fi Contact	Postalesio, Italy CO ₂ emissions reduction target by 2020 -20%
Main contact: Jose Carlos Garcia Perez Position: Director del Servicio de Medio Ambiente	Mentana, Italy CO ₂ emissions reduction target by 2020 -20%
Last updated at: 21 May 2013	Bagnolo Mella, Italy CO ₂ emissions reduction target by 2020 -40%
Disclaimer: The sole responsibility for the content of this website lies with the authors. It does not reflect the opinion of the European Union. The European Commission is not responsible for any use that may be made of the information contained therein.	Veggiano, Italy CO ₂ emissions reduction target by 2020 -20%
Disclaimer: The sole responsibility for the content of this website lies with the authors. It does not reflect the opinion of the European Inon. The European Commission is not responsible for any use that may be made of the information contained therein.	Veggiano, Italy CO ₂ emissions reduction target by 2020 -20

Figure 19: Valladolid signature Covenant of Mayors

Among the actions required when the Pact was signed, the city of Valladolid was committed to reducing its CO_2 emissions by at least 20 % by 2020, through the specific implementation of a SEAP. It was prepared in the year following the official incorporation of the city to this Covenant of Mayors as well as a baseline emission inventory.

In January 2016, the **Integrated Sustainable Urban Development Strategy** (EDUSI) was approved by Valladolid City Council under the name of INNOLID 2020 and it has been promoted, updated and improved since then. Its objective is to serve as a frame of reference for achieving a sustainable and inclusive growth, promoting innovation and having the citizenship as essential protagonist of the city. It is structured in four main axes that seek to establish operational and




practical actions that allow continuing the sustainable development of the city, considering the sustainability in its three dimensions: economic, social and environmental.

Accordingly, INNOLID 2020+ focuses on the functional restructuring of the city aiming at achieving the following seven groups of expected strategic results:

REE1: Achieve better urban planning and improvement of urban and landscape quality.

REE2: Achieve a socially balanced city model.

REE3: Regeneration of city infrastructures under efficiency premises and energy rationalization.

REE4: Decrease in emissions of CO₂ and rationalization of mobility in the urban area

REE5: Construction of an ecosystem of innovation, as a talent pole.

REE6: Sustainability, quality and equality in employment and entrepreneurship.

REE7: Integrated service offering to citizenship.

REE3 and REE4 are directly connected to actions in relation to climate resilience. In REE3 it is specifically detailed that green infrastructures are part of the Valladolid strategy to seek greater resilience to Climate Change, the description of the expected results to be achieved within this strategic key includes:

- Rehabilitation of services and infrastructures under principles of environmental sustainability and efficiency,
- Betting on green infrastructures to make Valladolid more sustainable and, at the same time, more resilient to climate change,
- Recovery of green areas, part of natural heritage to make them available to citizens and tourists.
- The development of several Nature Based Solutions within URBAN GreenUP framework is already specifically included in the expected results in REE3.

As mentioned before, REE4 is also referred to actions for enhancement the climate resilience in Valladolid its description includes:

- Consolidate the commitment to sustainable mobility,
- Adapt the conditions of security, mobility and accessibility in specific itineraries.

Strengthening the cycling network is specifically included as line of action in this REE4.

The strategy's efforts have been oriented taking into account the priorities of Europe 2020 mainly in its Thematic Objectives (OTs) 2, 4, 6 and 9, although not exclusively. The OT and lines of action of the INNOLID strategy are referred to Information and Communication Technologies (OT2), Low Carbon Economy (OT4), Environment and Heritage (OT6) and Social inclusion (OT9). OT4 and OT6 lines of action fit perfectly with URBAN GreenUP concept because they include activities such as:

- Mapping of green corridors and their itineraries networks: rehabilitation and enhancement of the natural heritage.
- Improvement of the efficiency in the consumption of water in the zones of action.
- Pollution reduction: actions to reduce urban noise.
- Pedestrianization programme.
- Strengthening of the bicycle lane network.
- Programme of improvements in the lighting of the urban area oriented to the energy efficiency.





 Application of renewable energy (photovoltaic, cogeneration) in areas of high energy demand.

But besides this SEAP and EDUSI strategies, Valladolid has several urban plans related to different aspects of the City, all of them include climate change resilience:

- Green Vehicle Programme.
- Plan for integral urban mobility
- Valladolid by 2016
- Strategic proposals.
- Local Agenda 21.

In the Smart City framework, Valladolid is continually working to achieve the objectives of sustainability, health and innovation. In addition, the city is a founding member of the Spanish Network of Intelligent Cities (RECI) establishing strategic actions for the protection of the urban environment and to improve the quality of life of citizens of the adaptation of the urban landscape for these purposes.

Regarding to the sustainable mobility strategy of Valladolid, the latest addition has been the **"Clean Vehicles Programme"** in 2015, which is the culmination of the strategy to promote electric mobility in the city. The essential actions of the "Clean Vehicles Programme" has been among others the substitution of conventional fuel vehicles by alternative fuel vehicles, the improvement of the charging infrastructures and the reduction of the mobility impact, in terms of energy consumption and CO₂ emissions. Clean Vehicles Programme is one of the most important pillars that underpin the actions related to mobility, thanks to REMOURBAN [9] project, which is currently being developed in Valladolid. Most important initiatives in this regard have been the creation of the electric vehicles office placed in the Agency for Innovation and Economic Development of Valladolid or the approval of tax incentives for activities related to electric vehicle (free parking, free recharge bonuses in municipal taxes, economic incentive, etc.).

Related to this, it is important to note that Valladolid City Council was awarded during 2015 with the "Best Public Strategy for Sustainable Mobility 2015" granted by the Spanish Renault Foundation for Sustainable Mobility and The Sustainability Excellence Club with the support of the Biodiversity Foundation. The award recognizes the global sustainable mobility strategy since the "Recarga VyP" pilot project was launched in 2010. The city has 34 public charging stations for electric vehicles, with plans to reach 63 points in 2020, which will draw a large network of public use that will support recharging in homes and car fleet.

Currently, there is a firm commitment to continue working along these lines with the deployment of 45 new electric vehicles with preference for public transport and professional fleets (taxi, commercial vehicles "green last mile" and business vehicles). Municipal fleet of electric vehicles has been launched in 2017, with 5 new electric public buses, 6 VELID vehicles (Renault Twizy model) and other 7 electric vehicles.

The environment and health with the increase of pollution are two of the City Council's priorities. This is why the development of Local Agenda 21 orientated towards 2020 is a key project within the environmental objectives of the city. Last year, on the 21st of December of 2016, the Governing Board of the City Council of Valladolid approved the Fifth Action Plan of this





Local Agenda 21 and all the institutions and groups that make up the Council of the Agenda together with working groups participated in the preparation, as well as those associations and individuals who took part in the Participatory Day, held on 18th of June.

But this approval does not make it a static plan, on the contrary, it is intended to be a dynamic tool that can be improved throughout its implementation. Therefore, any suggestions or contributions will be considered and discussed for possible inclusion in the Plan. It proposes a plan for coordination of actions in municipal plans where hydro-geological risks are included. Valladolid has a firm commitment to becoming a sustainable city. Both the City Council and the civil society have reached an agreement that this city should respect the environment and this is outlined in Agenda 21. Agenda 21 shows the municipal commitment to fighting climate change, specifically by reducing the impact on the environment and including environmental considerations in public contracts. Innovative experiments are also being carried out to develop ecological awareness and to preserve and improve the environment by promoting sustainable behaviour in all daily activities.

3.2.4 Summary of Challenges

- To enhance carbon savings per unit area and to carry out a comparison with calculations of carbon consumption of equivalent non-NBS actions (e.g. through Life Cycle Assessment).
- Calculation of CO_{2eq} emissions avoided (tCO_{2eq} p/year) considering a life cycle approach and modeling the environmental impacts regard to indirect savings.
- Enhance carbon storage and sequestration in vegetation and soil using allometric forest models of carbon sequestration.
- To evaluate carbon savings per unit area (economic) through measurements of gross and net carbon sequestration of urban trees based on calculation of the biomass of each measured tree (i-Tree Eco model), translated into avoided social costs of CO₂ emissions.
- Achieve temperatures reduction.
- Calculation of energy and carbon savings from reduced building energy consumption.

3.2.5 Potential Actions to be Taken

- Installation of an urban woodland with appropriate species adapted to temporary flood condition and with high capacity of carbon sequestration. The trees of this forest will be allocated in specific arboreal series. This area will be a new urban carbon sink.
- Deployment a new green cycle lane and re-naturing of existing bike lane which will allow the development of a real green corridor into the city. It will include innovative cyclepedestrian paths and trees plantation.
- Several rain gardens will be installed to complete the managing and treating surface water. This kind of gardens contributes to preserve the habitat value and diversity for local ecological communities. Native and adapted plants, more tolerant to local conditions will be used.





- Through the plantation of new trees in City Centre, it is foreseen to increase the urban tree population with shade and cooling purposes.
- Installation of a green filter in the floodable park in order to complete the activity of this NBS. More than 1,000 trees of specific species for green filter activity will be used to foster carbon sequestration.
- Natural wastewater treatment Plant installation. It will allow irrigate surrounding green areas. It includes the creation of a surrounding green with trees and the park will include a Surface Flow Wetland which will be managed as a self-sufficient ecosystem useful for recreational and social activities.
- Natural pollinator's modules. Each pollinator module will be installed in several places of the city with Smart Soil and it will include a water fountain, housing facility for pollinators and birds, bushes and aromatics species to allow carbon sequestration.





3.3 Water Management

3.3.1 Introduction

Water is essential for life, it is an indispensable resource for the economy, and also plays a fundamental role in the climate regulation cycle. The management and protection of water resources, of fresh and salt water ecosystems, and of the water we drink and bathe in is therefore one of the cornerstones of environmental protection. This is why the EU's water policy over the past 30 years is focused on the protection of water resources. A recent policy overview is provided in a document titled the 'Blueprint to safeguard Europe's water resources' (COM/2012/0673) which aims at ensuring that good quality water, of sufficient quantity, is available for all legitimate uses.

Eurostat. Water Statistics (August 2017)

The Water Framework Directive (WFD, directive 2000/60/EC) "constitutes the most important (European Union) initiative in the water field for decades" [10]. In order to achieve its ambitious goals, it calls for changes not only in the water sector, but also in many other areas, such as urban planning and industrial design.

Europe is a Union of cities and towns; around 75% of population of the EU has chosen urban and industrial areas as their place to live and work. But impacts of urbanisation and industrialization extend, beyond city borders. Europeans have adopted urban lifestyles and they use city amenities such as cultural, educational or health services. While cities are the motors of Europe's economy and creators of European wealth, they depend heavily on resources of outside regions to meet their demand for resources like energy, water, food, and to accommodate waste and emissions.

Environmental challenges and urbanisation and industrialization opportunities are closely connected. Many cities struggle to cope with social, economic and environmental problems resulting from pressures such as overcrowding or decline, social inequity, pollution and traffic. On the other hand, the proximity of people, businesses and services provides opportunities to build a more resource-efficient Europe. Therefore, it is vital the creation and maintenance of sustainable urban and industrial environments.

Water is a vital resource that is too often taken for granted. Individuals, infrastructure and industry all have a range of fundamental water-related requirements that encompass supply, wastewater treatment and drainage services. Meeting these direct needs – while ensuring resilience against extreme climate-related and other events – is a major challenge facing the cities of the future. When planning for future cities, an authentically holistic approach is essential if our dependency on water and the need to protect the wider environment and vital natural assets are all to be accommodated effectively [11].

Water shortages, flooding and watercourse pollution are all signs of stress where developed areas have a troubled interaction with the natural water cycle and where, conversely, water has become a risk or a nuisance rather than an asset or an opportunity.





Under the current urban model, neither the supply of the required resources to the inhabitants of the city nor their conservation can be assured for such a high population concentration. The number of large cities prone to insufficient water supplies could increase over the next 25 years — even without accounting for climate change [12].

New water sources, such as reclaimed water or rainfall reuse, are then of extreme importance to guarantee the proper water demand of cities. The reuse of water for different purposes depending on its purity and type is essential to maximising this valuable and limited resource.

Traditional urban water management relies on central organised infrastructure, the most important being the drainage network and the water distribution network. To meet new challenges, such as climate change and changes in the population and land use (growth as well as shrinkage in the cities), it is commonly agreed that water infrastructure needs be more flexible, to adaptable and sustainable [13], [14]. These efforts towards increased



Figure 20: Approach to Water Sensitive Urban Design (WSUD)

sustainability are denoted sustainable urban drainage systems, SUDS; water sensitive urban design, WSUD (Figure 20); low impact development, LID; and best management practice, BMP [15].

Nature Based Solutions (NBS) is an emerging concept. It covers a range of approaches and technologies, which use natural processes to address societal challenges. Of particular relevance are applications in the field of water management, such as in coastal/river flood protection, water resources management, stormwater management, water supply, wastewater treatment and pollution prevention.

For example, policies to reduce floods and other natural hazards relied mostly on grey infrastructure, such as flood protection barriers and water run-off basins, in the past. Increasingly, natural wetlands, networks of city parks, green roofs and other nature-based solutions are used to reduce risk, while improving the quality of life in cities.

NBS' success is related to good performance on primary objectives, co-benefits for other objectives and (in many cases) low operation and maintenance costs. NBS, when well designed, will result in multiple benefits for the environment, society and economy. They can also promote





a green and circular economy because they close the loop of water management and make connections between healthy ecosystems and social/economic development challenges.

Sustainable water management is a major challenge. This is probably also the reason why the World Economic Forum (2014) ranked the water crisis and water-related risks as major global risks in terms of both probability and impact. Water is also high on the agenda of many other international organizations, such as the Organisation for Economic Cooperation and Development (2011) [16], the UN, the World Health Organization (WHO) and the Food and Agriculture Organization (2011) [17].

The OECD estimates that water will soon make up the lion's share of infrastructure investment. For just OECD countries and Russia, China, India and Brazil, water spending in 2025 will top \$1 trillion - nearly triple the amounts needed for investments in electricity or transport (World Bank 2012) [18]. The scale of these figures underlines the critical relationship between water and cities, and the pivotal role that water plays in cities' success. Moreover, in view of the development of new technologies, on the one hand, and the emerging challenges posed by climate change and population growth, on the other, this relationship will inevitably continue to evolve as the 21st century unfolds.

3.3.2 EU legislation and Strategies on Water Management

EU Strategies: A Water Blueprint - taking stock, moving forward

The "Blueprint" outlines actions that concentrate on better implementation of current water legislation, integration of water policy objectives into other policies, and filling the gaps in particular as regards water quantity and efficiency. The objective is to **ensure** that a sufficient quantity of **good quality water is available for people's needs**, the **economy** and the **environment** throughout the EU.

The Water Blueprint's time horizon is closely related to the EU's 2020 Strategy and, in particular, to the 2011 Resource Efficiency Roadmap, of which the Blueprint is the water milestone. However, the analysis underpinning the Blueprint covers a longer time span, up to 2050, and is expected to drive EU water policy over the long term.

The Commission proposes the Blueprint to Safeguard Europe's Water Resources. Its long-term aim is to ensure the sustainability of all activities that impact on water, thereby securing the availability of good-quality water for sustainable and equitable water use. This goal is already enshrined in the WFD in various ways. The Blueprint will help to achieve the goal by identifying obstacles and ways to overcome them.

The success of the approach proposed by the Blueprint will depend on Member States' willingness and action to involve stakeholders and follow up to the Commission's proposals to improve implementation of existing legislation. In this respect, the WFD Common Implementation Strategy (CIS), involving all Member States and relevant stakeholders, should continue to play a positive role in WFD implementation. The Blueprint tries to build on the CIS, where possible, to create ownership and facilitate implementation of the Commission's proposals. However, relying on the CIS does not imply that the Commission will give up its





enforcement role with respect to water legislation. Depending on the progress made by the Member States to address their implementation shortcomings, infringement cases may become necessary. Legislative initiatives may need to be considered.

The Blueprint focuses the problem areas and suggests ways forward in relation to:

- land use/ecological status,
- chemical status and water pollution,
- water efficiency,
- vulnerability and
- cross-cutting issues.

These areas are all inter-connected aspects of water management and the proposed measures in the Blueprint will contribute to multiple goals.

The Urban Wastewater Treatment Directive (91/271/CEE) and the Water Framework Directive (2000/60/EC).

The **Council Directive 91/271/EEC concerning urban waste-water treatment** (Figure 21) was adopted on 21 May 1991. Its objective is to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors (see Annex III of the Directive) and concerns the collection, treatment and discharge of:

- Domestic waste water
- Mixture of waste water
- Waste water from certain industrial sectors (see Annex III of the Directive)



Figure 21. The framework of the UWTD 91/271/EEC





The Urban Waste Water Treatment Directive of 1991:

- provides for an obligation to collect and treat waste water from all settlements and agglomerations but the very small ones.
- sets the treatment objective as a rule as secondary treatment (biological carbon removal), plus – in the catchment of all areas being either eutrophic or potentially eutrophic – for nutrients removal.
- defines eutrophication and the catchment of waters suffering from (potential) eutrophication (called sensitive areas) giving clear guidance for technical, financial and political decision, and indeed was upheld and interpreted by a range of judgments by the European Court of Justice promoting water protection.
- sets staged deadlines of 1998, 2000 and 2005, depending on the size of the waste water discharge and the characteristics of the affected water.

The UWWT Directive sets a series of provisions, general and specific for sensitive areas.

Parameter	Value (concentration)	Value (% reduction)	
Biological Oxygen Demand BOD ₅	25 mg/l	70 - 90 %	
Chemical Oxygen Demand COD	125 mg/l	75 %	

a) Standard provisions (Table 4)

(24 hour average; either concentration or percentage of reduction shall apply)

Table 4: Standard provisions for BOD₅ and COD

The Directive provides for mandatory minimum design rules for sewerage systems as well as treatment plants (minimum design requirement = highest maximum weekly average load throughout the year).

b) additional provisions for sensitive areas Table 5)

Parameter	Value (concentration)	Value (% reduction)	
Total nitrogen Plants of 10 000 - 100 000 p.e. Plants >100 000 p.e.	15 mg/l 10 mg/l	70 - 80 %	
Total phosphorus Plants of 10 000 - 100 000 p.e. Plants >100 000 p.e.	2 mg/l 1 mg/l	80 %	

(annual averages, either concentration or percentage of reduction shall apply)

Table 5: Additional provisions for sensitive areas

The Urban Waste Water Treatment Directive has already contributed to an improvement of the quality of European big rivers. However, there are delays, in some cases even scandalous delays, with still prevailing discharges of untreated or insufficiently treated waste water. Consequently, legal enforcement measures including applications to the European Court of Justice had to be applied.





Water problems throughout Europe have a lot in common, e.g. pollution from waste water and agricultural sources. However, local and regional water problems can present a quite diverse pattern, both as regards quality and quantity, in the North and in the South of the EU, in the present Member States and in countries in Central and Eastern Europe and the Mediterranean soon to join the EU. This is true for the quality of our groundwaters, lakes and rivers, for flood events in some regions, for local and regional scarcity in water in others, and for the protection of our waters as a resource, fresh waters as well as marine waters.

Based on experience gained but also gaps identified, mid-1995 saw pressure for a fundamental rethink of EU water policy coming to a head, and agreement achieved between the Commission, the European Parliament's Environment Committee and the Council of Environment Ministers on the need for a fundamental reform.

The **Water Framework Directive (2000/60/EC)** presents a breakthrough in European Water Policy, not only as regards the scope of water protection, but also as regards its development and its implementation. Main pillars are:

- all waters to be protected, groundwaters and surface waters including coastal waters;
- all waters to achieve good quality ('good status'), as a rule by 2015;
- 'good status' comprehensively defined for surface waters by biological, physico-chemical and hydromorphological elements, for groundwaters by balance between available recharge and abstractions, and chemical elements;
- water management based on river basins;
- "combined approach" of emission limit values and quality standards, plus phasing out particularly hazardous substances; provides for an obligation to collect and treat waste water from all settlements and agglomerations but the very small ones.
- economic instruments underpinning environmental objectives, in particular water pricing reflecting cost recovering;
- mandatory participation by citizens, stakeholders and NGOs;
- streamlining legislation, and ensuring one coherent managerial frame.

One of the major innovations of the Water Framework Directive is its environmental objective of 'good status' being derived from 'high status' (the latter being largely pristine). 'Good status' will allow for only a limited deviation from high status, at the same time:

- taking into account regional diversity (e.g. Scandinavian lakes vs. Mediterranean lakes in terms of temperature, turbidity etc).
- allowing for comparability of waters for citizens, policy makers and the scientific community. Comparability of biological monitoring results will be ensured by an intercalibration exercise jointly done by European Commission and 25 Member States, plus on a voluntary basis Bulgaria, Romania and Norway.

To that end, the Directive provides for comprehensive verbal definitions of high, good and moderate status, inter alia in terms of nutrients and their impacts on biological quality elements (annex V.1.2 of the Directive).



Drinking Water Legislation

High quality, safe and sufficient drinking water is essential for our daily life, for drinking and food preparation. We also use it for many other purposes, such as washing, cleaning, hygiene or watering our plants.

The European Union has a history of over 30 years of drinking water policy. This policy ensures that water intended for human consumption can be consumed safely on a life-long basis, and this represents a high level of health protection. The main pillars of the policy are to:

- Ensure that drinking water quality is controlled through standards based on the latest scientific evidence;
- Secure an efficient and effective monitoring, assessment and enforcement of drinking water quality;
- Provide the consumers with adequate, timely and appropriately information;
- Contribute to the broader EU water and health policy;
- taking into account regional diversity (e.g. Scandinavian lakes vs. Mediterranean lakes in terms of temperature, turbidity etc).

The Drinking Water Directive (Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption) concerns the quality of water intended for human consumption. Its objective is to protect human health from adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean. The Drinking Water Directive applies to:

- all distribution systems serving more than 50 people or supplying more than 10 cubic meter per day, but also distribution systems serving less than 50 people/supplying less than 10 cubic meter per day if the water is supplied as part of an economic activity;
- drinking water from tankers;
- drinking water in bottles or containers;
- water used in the food-processing industry, unless the competent national authorities are satisfied that the quality of the water cannot affect the wholesomeness of the foodstuff in its finished form.

The Directive laid down the essential quality standards at EU level. A total of 48 microbiological, chemical and indicator parameters must be monitored and tested regularly. In general, World Health Organization's guidelines for drinking water and the opinion of the Commission's Scientific Advisory Committee are used as the scientific basis for the quality standards in the drinking water. When translating the Drinking Water Directive into their own national legislation, Member States of the European Union can include additional requirements.

The Directive also requires providing regular information to consumers. In addition, drinking water quality has to be reported to the European Commission every three years.





Water Reuse

Water over-abstraction is a major cause of water stress. Main pressures from water consumption are concentrated on irrigation and domestic demand, including tourism. The 2007 Communication on Water scarcity and Droughts made clear that water scarcity and drought events are likely to be more severe and more frequent in the future due to climate change and increasing population. Over the past thirty years, droughts have dramatically increased in number and intensity in the EU and at least 11% of the European population and 17% of its territory have been affected by water scarcity to date.

The potential role of treated wastewater reuse as an alternative source of water supply is now well acknowledged and embedded within international, European and national strategies. UN Sustainable Development Goal on Water (SDG 6) specifically targets a substantial increase in recycling and safe reuse globally by 2030. Water reuse is a top priority area in the Strategic Implementation Plan of the European Innovation Partnership on Water, and maximisation of water reuse is a specific objective in the Communication "Blueprint to safeguard Europe's water resources".

EU Policy Development

Water reuse encounters numerous barriers in the EU, although this practice is commonly and successfully used in, for example, Israel, California, Australia, and Singapore. Limited awareness of potential benefits among stakeholders and the general public, and lack of a supportive and coherent framework for water reuse are 2 major barriers currently preventing a wider spreading of this practice in the EU. For these reasons the Commission is working on legislative or other instruments to boost water reuse when it is cost-efficient and safe for health and the environment.

The Communication "Blueprint to safeguard Europe's water resources" highlighted water reuse **as a concrete and valid alternative supply option to address water scarcity issues**. With maximisation of water reuse as a specific objective, the Commission identified the **opportunity to develop a legislative instrument for water reuse**.

To support this policy development, an impact assessment study was prepared and published in 2015. In line with Commission guidelines for the development of impact assessment studies, the report includes a description of the problem definition and of the baseline situation regarding water reuse in the EU, and elaborates on policy options to be developed in an initiative by the Commission. It also includes detailed annexes about the existing policy measures in Member States. A second study was developed and published in 2016 to refine these initial findings and support the **impact assessment of the more detailed policy options** for setting minimum quality requirements for water reuse for agricultural irrigation and water recharge.

To inform this impact assessment, the European Commission has engaged into intense consultation activities, according to a stakeholder consultation strategy.

A first Internet-based Public Consultation on Policy Options to optimise Water Reuse in the EU was organised in autumn 2014. The aim of the public consultation was to evaluate the most suitable EU-level instrument/s to foster water reuse, whilst ensuring the protection of environmental and human health, and the free trade of food products. A second Internet-based





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Public Consultation on policy options to optimise water reuse in the EU was organised in winter 2016-2017 and focused on the more detailed policy options to set minimum requirements for reused water for irrigation and groundwater recharge. Both consultations gave both private citizens and stakeholders the opportunity to actively contribute to the design of this initiative. In addition to the on-line consultations, stakeholder meetings were organised in December 2014 and March 2017 in Brussels. The public consultations led to a **general agreement in support of the water reuse initiative**, in particular concerning the development of **EU-level common minimum quality requirements for water reuse for agricultural irrigation and water recharge**.

The EU Floods Directive

Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007. This Directive now requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. With this Directive also reinforces the rights of the public to access this information and to have a say in the planning process.

Its aim is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Directive requires Member States to first carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas at risk of flooding. For such zones they would then need to draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU.

The Directive shall be carried out in coordination with the Water Framework Directive, notably by flood risk management plans and river basin management plans being coordinated, and through coordination of the public participation procedures in the preparation of these plans. All assessments, maps and plans prepared shall be made available to the public.

Water Scarcity and Droughts

While Europe is by large considered as having adequate water resources, water scarcity and drought is an increasingly frequent and widespread phenomenon in the European Union. The long term imbalance resulting from water demand exceeding available water resources is no longer uncommon.

It was estimated that by 2007, at least 11 % of Europe's population and 17 % of its territory had been affected by water scarcity, putting the cost of droughts in Europe over the past thirty years at EUR 100 billion. The Commission expects further deterioration of the water situation in Europe if temperatures keep rising as a result of climate change. Water is no longer the problem of a few regions, but now concerns all 500 million Europeans.

The main overall objective of EU water policy is to ensure access to good quality water in sufficient quantity for all Europeans, and to ensure the good status of all water bodies across Europe. Therefore, policies and actions are set up in order to prevent and to mitigate water scarcity and drought situations, with the priority to move towards a water-efficient and water-saving economy.





The major challenge from water scarcity and droughts has been recognised in the Communication "Addressing the challenge of water scarcity and droughts" from the European Commission adopted in 2007 [COM(2007)414]. Implementation of the Communication is periodically assessed through annual Follow-up Reports.

National Regulations

About water management:

- Real Decreto Legislativo 1/2001, de 20 de julio, por el que se aprueba el texto refundido de la Ley de Aguas.
- Real Decreto 849/1986, de 11 de abril, por el que se aprueba el Reglamento del Dominio Público Hidráulico, que desarrolla los títulos preliminar I, IV, V, VI y VII de la Ley 29/1985, de 2 de agosto, de Aguas.
- Real Decreto 817/2015, de 11 de septiembre, por el que se establecen los criterios de seguimiento y evaluación del estado de las aguas superficiales y las normas de calidad ambiental.

About wastewater treatment and reuse:

- Real Decreto-ley 11/1995, de 28 de diciembre, por el que se establecen las normas aplicables al tratamiento de las aguas residuales urbanas.
- Real Decreto 509/1996, de 15 de marzo, de desarrollo del Real Decreto-ley 11/1995, de 28 de diciembre, por el que se establecen las normas aplicables al tratamiento de las aguas residuales urbanas.
- Resolución de 25 de mayo de 1998, de la Secretaría de Estado de Aguas y Costas, por la que se declaran las «zonas sensibles» en las cuencas hidrográficas intercomunitarias.
- Resolución de 10 de julio de 2006, de la Secretaría General para el Territorio y la Biodiversidad, por la que se declaran las Zonas Sensibles en las Cuencas Hidrográficas Intercomunitarias.
- Resolución de 30 de junio de 2011, de la Secretaría de Estado de Medio Rural y Agua, por la que se declaran las zonas sensibles en las cuencas intercomunitarias.
- Real Decreto 1620/2007, de 7 de diciembre, por el que se establece el régimen jurídico de la reutilización de las aguas depuradas

Valladolid Legislation

Regulation of the municipal service of water supply and sanitation (14/3/2006). The purpose of this rule is to regulate the provision of tap water supply and sanitation services in the municipality of Valladolid, as well as the discharge of wastewater into the sewage network, laying down rules governing user relations with the service provider and the owner of the service, establishing both the rights and obligations of each party, and the technical, environmental, health, economic and contractual aspects of the service.





3.3.3 The Case of Valladolid

Since 30th December 2016, the urban water management in Valladolid falls to the Public Enterprise "Agua de Valladolid E.P.E" (AQUAVALL [19]) which depends directly from the local government of Valladolid Municipality. This company is in charge of the direct management of water services in Valladolid including water supply and sanitation and wastewater treatment according to the art. 85.2 of the Spanish Law 7/1985, regulating the basis of the local government. Concretely, water services provided by Agua de Valladolid E.P.E. include:

- Water collection, purification and drinking water supply;
- Wastewater and rain water collection, sewerage, depuration (treatment) and discharge
- Sewage sludge treatment and final disposal.

It is also in charge of the water pricing (both fixing and collecting taxes for water services). Its main aim is guaranteeing a sustainable water supply socially affordable and reducing the impacts of wastewater discharge to the environment.

AQUAVALL will make the necessary investments for the maintenance, replacement or expansion of the network and facilities. Finally, it will facilitate to the public all information relating to water quality and management in an easily accessible and comprehensible manner.

The total population served by Agua de Valladolid reaches 350.000 inhabitants (including also water supply in Alfoz) and gives service to industries. The main infrastructure consists of: two water purification plants for drinking water supply (ETAP ERAS and San Isidro), one wastewater treatment plant (Camino Viejo de Simancas) and one laboratory for the analytical control of drinking water and water discharge.

The volume of fresh water supplied annually is **29 millions of m**³ which comes from two channels "Canal del Duero" and "Canal de Castilla" (there are also direct collection points in Duero River and Pisuerga River). This volume is distributed through a **670-km- length water supply network**. Wastewater in the city is channeled to the Wastewater Treatment plant through an **800-km-length sewerage network**. The features of the main infrastructures are described in the following lines.

Drinking Water Supply: Purification Plants.

Both existing purification plants for drinking water production (ERAS and SAN ISIDRO) are based on physic-chemical treatments (coagulation and settling) and sand filtration.

Built up in 1955, the ERAS ETAP (Figure 22) produces around 70% of the drinking water consumed in Valladolid. The water comes from the "Canal Castilla". In ERAS ETAP the treatment train is complemented by an activated carbon filter for providing high organoleptic properties to the final drinking water. Sodium hypochlorite is employed for disinfection. The overall water production is 4,500 m³/h.

The purified water is then stored in a 1,500 m³ deposit and then pumped to the network. Besides, water is pumped to several deposits: Cerro de las Contiendas, Girón, Fuente Berrocal y cárcel-RSU.







Figure 22: General view of ERAS ETAP

San Isidro ETAP (Figure 23) is currently upgrading with an ozone disinfection unit and activated carbon filtering system. The treatment capacity reaches 4,200 m³/h. The water comes from the "Canal del Duero" (and punctually from Pisuerga River). There are two final deposits of 24,000 m³ and 50,000 m³ each. Then drinking water is pumped directly to the network and to the deposit located in Cerro San Cristobal. San Isidro ETAP provides 30% of the consumed water in Valladolid.



Figure 23: Aerial view of San Isidro ETAP.

Drinking water quality of Valladolid can be checked on line through the SINAC tool in a specific link [20].





Water consumption per inhabitant in Valladolid city has decreased along the last decade [5] (Figure 24).



Figure 24: Daily water consumption per capita in Valladolid city

An average European citizen uses 134 m3/year of water from renewable freshwater resources. This corresponds to approximately 370 L of water/capita per day. These figures exclude recycled, reused and desalinated water, as well as water used in other economic sectors covered by self-supply [21].

The highest estimated water use per capita occurs in the Mediterranean region, with a use level of 707 L/capita per day. This is followed by the Alpine and Continental regions, with use values of 380 and 275 L/capita per day, respectively.

Wastewater treatment plant of Valladolid

Inaugurated in 1999, the wastewater treatment plant (WWTP) of Valladolid has a treatment capacity for 570,000 population equivalent (future extension up to 750,000 pe) and a maximum flow rate 3 m^3/d . Before its construction, the wastewater generated in Valladolid was directly discharged to the Pisuerga River. The wastewater treatment plant is designed for organic matter and nutrients removal in order to avoid the eutrophication of the receiving water bodies (Pisuerga River).

The water line consists of the following units (Figure 25):

- Pumping station and storm water tank
- Pre-treatment, based on coarse screening and grit & grease channels.
- Primary settlers (lamellar settlers). Production of primary sewage sludge.
- Secondary biological treatment, based on the activated sludge system including anoxic and aerobic zones for nutrients removal.
- Secondary settlers. Production of secondary sewage sludge.







Figure 25: Flow-diagram of the water line in WWTP of Valladolid (Source: Aguas de Valladolid)

Sewage sludge (both primary and secondary) is firstly thickened through centrifugation and then stabilised in an anaerobic digester (35°C). Digested sludge is, then, dewatered by centrifugation (22% dryness). Finally, the sludge is submitted to thermal drying, reaching 93% dryness. The final product is stored and later applied for agricultural purposes.

The biogas obtained in the anaerobic digester is stored in two gasometers (2,150 m³ each, double membrane). Composed mainly by methane, it is employed as fuel, together with natural gas (1:4 proportion), in three gas motors (1,358 kW unitary power). The energy produced (33,000 kWh per year) is sufficient for covering 100% of the energy demand of the WWTP. Besides, heat from exhausted gases is recovered for heating the air necessary in the thermal drying process; meanwhile the calorific energy of the refrigeration circuits in the gas motors is employed for the preheating of sewage sludge prior to the anaerobic digestion. The WWTP includes also eco-innovative solutions for a better integration and environmental sustainability:

- Soundproofing: noisy motors and other electromechanical elements are installed indoor or inside soundproof cabins.
- Deodorization: sources of bad odors have been constructed indoor.
- Designing: main and auxiliary buildings have been built in harmony to the surrounded environment.
- Green areas with aromatic plants.

Table 6 summarises the performance of the WWTP Valladolid during 2016, including the legal limits imposed by the EU Directive 91/271.

Parameter	Unit	Inlet	Effluent	% requested by EU Directive 91/271
Alkalinity	mg/l	305	203	Not defined
KTN	mg N/I	36	4	> 70%
Conductivity	μS/cm	973	842	Not defined
BOD₅	mg/l	253	6	25 mg/l or > 90%
COD	mg/l	399	28	125 mg/l or > 75%
рН	ud pH	7.6	7.6	Not defined
TSS	mg/l	235	5	35 mg/l or > 90%

Table 6: Wastewater and final effluent composition in WWTP of Valladolid in 2016 (Source: AQUAVALL).





Flooding risk in Valladolid

Valladolid is located in the *Confederación Hidrográfica del Duero*-CHD- (river basin organism) which is in charge of the control of the flooding risk in the city (Figure 26). In fact, the CHD has developed a flood risk map in the entire river basin which can be consulted on line in the website of CHD [22].



Figure 26: Flooding risk map: population affected (Returning period 100 years)

One of the last major flood events in Valladolid occurred on March 7th, 2001 (Figure 27).



Figure 27: Images of the flood event in Valladolid on March 2001

The Pisuerga River reached a flow rate of 2,340m³/s.

Droughts in Valladolid: restrictions in the use of water

In June 30^{th,} 2017, the *Confederación Hidrográfica del Duero* has released the "Real Decreto 684/2017, de 30 de junio, por el que se declara la situación de sequía prolongada en la parte española de la demarcación hidrográfica del Duero y se adoptan medidas excepcionales para la gestión de los recursos hídricos" (declaration of the prolonged drought in the Duero River Basin Distric and adoption of exceptional measures for the management of water resources). One of those measures is the prohibition to irrigate the green areas with water from the Pisuerga River and the Canal del Duero. That means that approximately 72% of the green areas (216 Ha) in Valladolid city will not be irrigated.



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3.3.4 Summary of Challenges

- Some areas of the city present a high risk of flooding during heavy rain events.
- High flooding risk in some areas of the city.
- Prolonged water droughts limit the use of water in the city (i.e, for the irrigation of green areas).
- Low rate of treated water reuse for urban uses or irrigation of green areas in Valladolid city.
- Water infrastructures have a limited lifespan, thus, they require high investments for upgrading.
- Climate change projections show it is likely that heavy rainfall and flooding will become more frequent. Continuing to provide new sewer capacity to cope with these growing risks is unaffordable. The current management of water run-off (drainage to a combined sewerage) prevents from its reuse.

3.3.5 Potential Actions to be Taken

- Implementation of SUDs for water run-off management (including measures for flooding prevention and water reuse).
- Introduction of decentralised wastewater treatment plants based on nature solutions (such as wetlands or green filters) to promote local water reuse.
- Awareness campaigns addressed to the citizens for reducing water consumption at home.





3.4 Coastal Resilience

This section has been included for the Valladolid demo only to follow the scheme of urban challenges defined for the URBAN GreenUP project. However, Valladolid has no coast and therefore does not have to face challenges related to the coastal resilience.





3.5 Green Space Management

3.5.1 Introduction

"Most people on the planet live in dense aggregations, and policy directives emphasize green areas within cities to ameliorate some of the problems of urban living. Benefits of urban green spaces range from physical and psychological health to social cohesion, ecosystem service provision and biodiversity conservation. Green space coverage differs enormously among cities, yet little is known about the correlates or geography of this variation. This is important because urbanization is accelerating and the consequences for green space are unclear. Here, we use standardized major axis regression to explore the relationships between urban green space coverage, city area and population size across 386 European cities. We show that green space coverage increases more rapidly than city area, yet declines only weakly as human population density increases. Thus, green space provision within a city is primarily related to city area rather than the number of inhabitants that it serves, or a simple space-filling effect. Thus, compact cities (small size and high density) show very low per capita green space allocation. However, at high levels of urbanicity, the green space network is robust to further city compaction. As cities grow, interactions between people and nature depend increasingly on landscape quality outside formal green space networks, such as street plantings, or the size, composition and management of backyards and gardens."

> The scaling of green space coverage in European cities Richard A. Fuller, Kevin J. Gaston February 2009.DOI: 10.1098/rsbl.2009.0010

Green infrastructure refers to an interconnected and multi-functional network of green (terrestrial areas) and blue spaces (coastal and marine areas) that help to stop the loss of biodiversity and enable ecosystems to deliver their many services to [23], nature and economy [24]. Green and blue spaces can be natural and semi-natural elements and are strategically planned and designed for preserving urban biodiversity and providing the required resources and habitats for species of interest [25], [26], improving functional and structural connectivity at the urban level [27], increasing public support for conservation [28] and, finally, supporting human health and wellbeing [29].

Cities can strategically implement a combination of different existing, restored and new NBS using green space management plans [28],[30]. These have to take into account the policies present in European and national strategies and frameworks as well as local governance plans and the subsequent adaptation to local conditions and practices, including the manner in which local dwellers access the benefits of green and blue spaces [31].

A large variety of green and blue spaces exists and, in cities, it may include any kind of green interventions at different levels, such as parks, forest, public green spaces, private gardens, and roof gardens [29]. All of them provide, to a greater or lesser extent, ecosystem services required for the resilience and sustainability of urban areas from an ecological point of view [32].

In practice, one of the most effective ways of building a Green Infrastructure is by means of urban planning. This process enables interactions between different land uses to be investigated over a large geographical area and adjust them with social and industrial needs. Urban planners have tools for achieving a sustainable urban structure taking into account cultural, social and





environmental dimensions. They can provide elements for characterizing the heritage and aesthetics of the area [33], [25], as well as being valued for recreation [34], social interaction [35], education and supporting healthy living [36]. At a strategic level spatial planning will help to: I.) locate the best places for habitat enhancement projects to help reconnect healthy ecosystems, improving connectivity between protected areas [29]; II.) guide infrastructure developments away from particularly sensitive nature areas and instead towards more robust areas where they might, additionally, contribute to restoring or recreating green infrastructures features as part of the development proposal [32]; and III.) identify multi-functional zones where compatible land uses that support healthy ecosystems are favoured over other more destructive single-focus developments [37].

At the same time, green space management is thought to be a tool for ending up with an unequal social-spatial distribution reflected with differences among neighborhoods in terms of quantity and size of green spaces as well as the structure and quality of the vegetation [29].

Various examples of initiatives can be found across Europe in Berlin, Malmö, Utrecht, Linz, Ljubljana, Edinburgh, Viena, Liverpool, London, Hamburg, Bristol, Amsterdam, Copenhagen, Madrid and Barcelona [38]. A brief description of specific examples of implemented NBS is described in Table 7:

NBS: image and location	NBS: description
Green roof in Stuttgart's town hall	Since 1986, Stuttgart has a roof expansion strategy that comprises over two million square meters of vegetated roofs which absorb pollutants and reduce heat excess. Moreover, green ventilation corridors have been created to enable fresh air to sweep down from the city's surrounding hill [39].
Stuttgart (Germany)	
Frupp park	 Hundreds of hectares of green space have been created over the past decades through the conversion of factory buildings and mining facilities [39]: Krupp steel factory was transformed into 230 hectares of green spaces. An industrial wetland was turned into 11 hectares add-on the Krupp park. Restoration of Emscher River into a
Essen (Germany)	green belt recreational area.





NBS: image and location	NBS: description
Augustenborg is a sustainable quarter Malmö (Sweden)	A sustainable drainage system is designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharge and entails a sequence of practices and facilities. According to "Rainwater" run- off have decreased by half [40].
With the second seco	Sustainable urbanisation for Calle 30 and Madrid Rio. (1) <u>Calle 30</u> : the project buried 43km of its M-30 multilane motorway; (2) <u>Madrid Rio</u> : restoring the Manzares River and forming accompanying areas of open parkland, gardens and promenades [40].
<image/>	The goal of this project was to "green" the façade of a building of the Vienna Magistrate ("MA 48"), an area of 850m ² within four months, thereby creating ecological niches and habitats for many kinds of insects and birds, and having positive effects on the surrounding indoor and outdoor climates [40]. This façade is an innovative solution and easy to maintain approach to generate highly cost-effective, multi-beneficial and resilient to all weather events or technical failures in irrigation and the possibility of grey water use supporting Living Walls.





NBS: image and location	NBS: description
Restored river Nijmegen (Netherlands)	The project involved two main measures for reducing risk and resilience in the city via (1) the relocation of the dike 350 meters inland, (2) the digging of an ancillary channel in the floodplain enabling the creation of a new island. Both actions will make more space for the river and for nature [40].
Restored river Vitoria-Gasteiz (Spain)	Planners restored a river ecosystem along one of the city's main urban arteries, improving the city's sewage system and enhancing the city's ecological resilience. This river restoration will both slow storm water flows and prevent clean rainwater from entering the sewage system [41].
"Urban Canopi" project Barcelona (Spain)	The Barcelona City Council in Spain recently initiated the transformation of a very important traffic node of the city into a large (13 ha) urban park. The project is going beyond traditional park design by incorporating micro-climate regulation and biodiversity as key design aspects. The new park will feature a dense tree canopy cover in some areas in order to provide substantially cooler conditions inside the park, especially during summer time. The project, also, aims to boost urban biodiversity by creating specific habitat conditions [41].





NBS: image and location	NBS: description
Sava Recreational and Educational Centre Ljubljana (Slovenia)	Biking and sustainable mobility have been promoted, in line with providing new green areas for social and sporting activities on former degraded areas. Finally, the river Ljubljanica has been the focus of an ecological restoration project [42].
Cloudburst management projects in Østerbro Copenhague (Denmark)	NBS for flood risk reduction. Integration of urban design and wastewater management contributed to the restoration of the harbour, now suitable for swimming. Property values increased up to 100 % in the harbour area, in addition to other environmental and social benefits. [42]

Table 7: Examples of initiatives for green space management implemented in European cities

3.5.2 EU Legislation and Initiatives

The EU has set itself an ambitious target for connecting spaces and avoiding the loss of biodiversity in Europe by 2020 [43]. Currently, there is no specific legislation for green infrastructure management but there exists a Europe Strategy on Green Infrastructure that aims to **promote investments in green infrastructure**, to restore the health of ecosystems, ensure that natural areas remain connected together, and allow species to thrive across their entire natural habitat, **so that nature keeps on delivering its many benefits to us**. The strategy promotes the deployment of green infrastructure across Europe as well as the **development of a Trans-European Network for Green Infrastructure** in Europe, whose action can also help enhance the health and wellbeing of EU citizens, provide jobs, and boost our economy.

The Green Infrastructure Strategy is supported by the Biodiversity Strategy, such as work underway to establish a Restoration Prioritization Framework (RPF) (action 6a) or on biodiversity-proofing the EU budget (action 7a). MAES, the Mapping and Assessment of Ecosystems and their Services (Action 5) will also help giving an accurate valuation of the benefits that nature provides to human society, so that investments in green infrastructure can be measured. Moreover, the NNL, or No-Net-Loss (Action 7b), develops an initiative to ensure that there is no net loss of ecosystems and their services e.g. through compensation or offsetting





schemes. Finally, Horizon 2020 (2014 - 2020) is the European funding directly supporting the European Network for Green Infrastructure with €80 billion budget for excellent science, industrial competitiveness and solutions to societal challenges, some of them boosting the application of NBS at urban scale.

Besides, a wide network of protected areas spanning all 28 EU countries – called the Natura 2000 network act as an important reservoir for biodiversity and healthy ecosystems, which can be drawn upon to revitalise degraded environments across the broader landscape but also delivers many ecosystem services to society [37]. Natura 2000 is supported by Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive) of 1992. It also includes areas declared under Directive 79/409 / EEC on the conservation of wild birds, (Birds Directive) of 1979.Natura 2000 sites provide a strategic focus for improving our natural environment and enhancing the quality of our lives. By reconnecting existing fragmented natural areas and restoring degraded habitats, green infrastructure can provide substantial added value ensuring the ecological coherence of the Natura 2000 network so that Natura 2000 sites do not become isolated 'islands of nature' without connection with people [44].

Even though there is no specific regulation on green space management, there exist different ways for introducing NBS into urban planning [41] such as the use of specific regulations. For example by 1.) applying a green norm of 10 m²/person within 400 m of green roofs in local building codes; 2.) planning and design multifunctional areas; 3.) investing in information and awareness raising about NBS benefits and co-benefits; 4.) Requiring more research on quantitative effects of NBS; 5.) Demonstrating scenarios to inspire discussion at local levels.

3.5.3 The Case of Valladolid

Valladolid, as a front runner city in URBAN GreenUP project, will foster to develop their RUPs (Re-naturing Urban Plans) and to implement these ambitious interventions in their cities. However, several actions plans based on "city's intelligent growing blueprint" have been already turned up over the past years for implementing a balanced model in which rationality, compactness, diversity of uses of the soil, collective transport and meeting spaces prevail.

Valladolid joined in 1992 the initiative **Local Agenda 21** originating from the United Nations Conference for the environment and development. The initiative aims to start up local action plans led by cities' town halls but incorporating citizen participation with the following objectives: fight against poverty, protection and promotion of human health, protection of the atmosphere, conservation and rational use of natural resources, protection of ecosystems and the conservation of biodiversity, integration of the environment and development in decision making, etc. Since then, different local, autonomic and national initiatives have been engaged that have been marking Valladolid's action plan guidelines.

Valladolid City Council thinks that this model of city contributes to a wealthy social and cultural development, and has less need for mobility and consumption of energy resources. A consolidated strategy of sustainability for Valladolid would be the creation of an important





network of free public spaces of all kinds - tree-lined streets, squares, roads - whose heart is an ambitious integrated system of urban parks. The aim is to promote an overall strategy of value creation not only creating recreational spaces for the enjoyment of citizens but also to construct a safeguarding local environmental, beginning with a collective recognition of how the nature manifests itself in Valladolid for deploying urban life.

The green public zones in Valladolid stablished in 2012 within the **General Urban Planning Plan** [45] are seen in Figure 28. The Urban Management Section, inside Valladolid's government, deals with the design of urbanization projects in planning development, processing of urban agreements and the management of Municipal Land Patrimony [46].



Figure 28: Green public zones in Valladolid [5]

According with the different initiatives engaged, since 2002 Valladolid has increased its budget for sustainable development increasing this way sustainability of green areas (Table 8).

	2002	2004	2006	2008	2010	2012	2014
Resources intended for							
sustainable development over	37.11	37.78	41.91	43.36	41.32	42.58	42.77
total budget (%)							

Table 8: Resources intended for sustainable development over total budget (%) [5]





Consequence of that, Valladolid City Council has been working in different space management plans [46]. The revitalization of large areas of the city, with more public spaces, green areas and equipment: for an optimal accessibility, Valladolid is applying European indicators for sustainability, and aims to increase the percentage of citizens living less than five hundred meters from a public green zone [5]. Currently, Valladolid dispose of between 20 -25 m² of public green zone per capita already qualified in the municipality, with a horizon that can reach 35 - 40 m² accessible park per capita [45]. In terms of citizen accessibility to green public areas, between 2008 and 2014 most of city's inhabitants lived within 500m from the nearest green area (Table 9) which is in accordance with the increasing in square meters of public green zone per inhabitant (Figure 29), promoting this way the quality and the quantity of public green zones.



Figure 29: Green public spaces area (hectares) and square meters of green public spaces per inhabitant in Valladolid [47]

Moreover, for obtaining city's revitalization, Valladolid town's hall has a tree species richness catalogue [48] where any citizen can be informed about the most used trees in the city, differentiating trees employed in green areas such as parks, gardens and squares, and others being part of the tree-lined streets of streets. There are also maps for tree localization and a section of questions about the pruning of trees as well as a suggestion board.

	2008	2010	2012	2014
Percentage of citizens that live within 500 m of	95 29	95.60	96.07	96.06
a green area (%)	55.25	55.00	50.07	50.00

Table 9: Percentage of citizens that have accessibility to public green spaces (living within 500 m fromthe green area) [5]

Space management in city's union without barriers dealing with the emergence of new neighbourhoods: according with the Valladolid's General Urban Planning Plan and the law 5/1999 from 8 of April from Castilla y León autonomous community, urban development has to reach a balanced application with the integration in the municipal term improving urban quality, through that favour the continuity and harmony of the urban space and prevent an inappropriate concentration of uses or activities, or the abusive repetition of urbanistic solutions. This means that changes in the pattern of structural and functional connectivity can be introduced in order to achieve an improvement of citizen's life quality. The urban planning distribution of Valladolid established in 2012 is seen in Figure 30 [45].



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Figure 30: Urban planning distribution map of Valladolid. Structural and functional connectivity of the city can be achieved using a specific urban planning introducing green space management into current social life.

The creation of a large modal interchange with enhancement public transport restructuring of the railway arterial network, which will offer the possibility of creating a modern passenger transport network and adapting, these way, green space for public transport. Today's Valladolid connectivity and mobility is seen as one of the principal problems identified in the city (10.2 % of citizen thinks that public transport network is improvable).

Moreover, apart from the cities' management on green spaces, Valladolid province has a network of natural areas of high ecological value at the level of the European Union Natura 2000 initiative. Along Valladolid's province, there are a total of 21,500 hectares of protected areas by Natura 2000 consequence of the high biodiversity of the region (Table 10).

Protected area	EUR CODE	На
El Carrascal	ES4180130	5,410.56
Humedales de los Arenales	ES4180147	3,328.28
Lagunas de Coca y Olmedo	ES4160062	1,232.69
Riberas de Castronuño	ES4180017	8,421.08
Riberas del río Adaja y afluentes	ES4180081	1,390.68
Riberas del río Cega	ES4180070	455.55
Salgüeros de Aldeamayor	ES4180124	1,185.65

Table 10: Protected area by Natura 2000 in Valladolid's province [49]

It is worth saying that in 2017 public consultation period for the publication of the New General Plan for Urban Planning of Valladolid (PGOU 2017) is opened. This Urban Planning update contains information about a systemic project for urban parks and green corridors, like a dual strategy for the protection of local environmental resources and their sustainable recovery. As





it is said before in the general description, it has been developing a new double green ring around the city; the Inner Green Ring inside the urban area, and the Outside Green Ring that will connect the city and nearby villages.

3.5.4 Summary of Challenges

- Lack of updated data to conduct a detailed and quantifiable diagnosis of the city.
- No description of the utilization of green areas as recreational, cultural and sports-based activities location.
- No guarantee about the accessibility of elderly people, people with reduced mobility and children to green public areas.
- Scarcity of green travel routes defined.
- Scarcity of green related social services provided to population.
- Scarcity of Natura 2000 within the city.

3.5.1 Potential Actions to be Taken

- Update environmental and socioeconomic indicators to be able to make a current diagnosis of the city challenges.
- Generation of nature based recreation, cultural and sports-based opportunities for improving quality of life.
- City's mobility and connectivity improvement adding nature based solution services in order to solve the problem.
- Creation of new green infrastructures and travel routes to guarantee the accessibility of all the citizens regardless their mobility condition.
- Creation of green related social services.
- Foster the inclusion of urban green spaces in Natura 2000 by fulfilling the required environmental indicators.





3.6 Air Quality

3.6.1 Introduction

"The human toll for poor air quality is worse than for road traffic accidents, making it the number one environmental cause of premature death in the EU. It also affects the quality of life due to asthma or respiratory problems. The EU Commission is responding with new measures to reduce air pollution, adopted today. The clean air policy package updates existing legislation and further reduces harmful emissions from industry, traffic, energy plants and agriculture, with a view to reducing their impact on human health and the environment. Air pollution causes also lost working days, and high healthcare costs, with vulnerable groups such as children, asthmatics and the elderly the worst affected. It also damages ecosystems through excess nitrogen pollution (eutrophication) and acid rain. The direct costs to society from air pollution, including damage to crops and buildings, amount to about €23 billion per year. The benefits to people's health from implementing the package are around €40 billion a year, over 12 times the costs of pollution abatement, which are estimated to reach € 3.4 billion per year in 2030.

Many EU Member States are still falling short of agreed EU air quality standards, and the air pollution guidelines of the UN World Health Organization are generally not being met.

While EU air quality policy has brought significant reductions in concentrations of harmful pollutants such as particulate matter, sulphur dioxide (the main cause of acid rain), lead, nitrogen oxides, carbon monoxide and benzene, major problems remain. Fine particulates and ozone, in particular, continue to present significant health risks and safe limits for health are regularly exceeded. EU air quality standards and targets are breached in many regions and cities, and public health suffers accordingly, with rising costs to health care and the economy. The total external health-related costs to society from air pollution are estimated to be in the range of €330-940 billion per year. The situation is especially severe in urban areas, which are now home to a majority of Europeans."

Extracted from EU Commission press release about new policy package to clean up Europe's air, 2013.

Air quality is also a major concern worldwide, particularly in urban areas, due to its direct consequences on human health, plants, animals, infrastructure and historical buildings (among others). In the political agenda, air quality issues can be coupled with climate change mitigation policies as described in Challenge 1, since many actions aimed at air quality improvement (such as reducing fossil fuel combustion because emissions contains both CO₂ and other GHG gases and pollutants directly affecting health and other issues mention before) involve a concurrent reduction of GHG emissions.

NBS based on the creation, enhancement, or restoration of ecosystems in human-dominated environments also exploit the synergy between ecosystem processes that regulate pollutants and CO₂ in the atmosphere. Vegetation affects air quality mainly through the removal of air pollutants (PM10, NO₂, O₃, CO, SO₂) through dry deposition, although certain species can also emit biogenic volatile organic compounds (BVOC), which are ozone precursors. However, vegetation can also reduce the air temperature, which reduces the emission of BVOCs and slows down the creation of secondary pollutants such as ozone [50], [51]. Despite their limited





contribution compared to the overall production of pollutants and GHG emissions at the city level, measures to tackle air quality by enhancing green infrastructure can be considered a good investment due to the number of co-benefits that they produce and their contribution to amenity value over time [52].

Most of the existing NBS (they does not cover very large surfaces) do not have a major local impact on the reduction of atmospheric pollutants, including GHG gases, compared to the overall emissions in urban environments. Therefore, it is not easy to establish monitoring schemes that can significantly detect the impact of their installation at local level.

First of all we would like to make a clarification. For issues related to air quality, CO2 or other GHG will not be considered. These gases do not reach the limit values that mark the legislation in urban environments to be consider as an urban pollutant.

On the other hand, we should keep in mind that trying to reduce the concentration of a pollutant once it is already diluted is much more inefficient than when acting directly on the source. Therefore, the measures that may have a greater impact on air quality are those that are directly applied to emission sources, mainly motor vehicles and, to a lesser extent, heating systems.

Compared with emissions source control, reducing emissions once diluted in the atmosphere is challenging. It is much more difficult to remove pollutants from the atmosphere because of the large volume of the atmosphere compared to the surface area of any potential abatement technology.

However, some NBS can be applied to certain sources of pollutants in the city. One of these sources is the exhaust duct of the underground car parks. URBAN GreenUP will carry out a demonstration of a system (**NBS VA30 Urban Garden Bio-Filter**) to capture pollutants from the output of an underground car park in Valladolid by evaluating its efficiency by measuring the air quality at the entrance and exit of the NBS.

Another type of air pollution is noise. Noise pollution is linked to a range of health problems, yet the number of Europeans exposed to high levels of noise is on the rise. Noise also has harmful impacts on wildlife. EU Member States are required to map noise levels in large towns and cities, roads, railways and airports, and to come up with plans to tackle the problem.

Noise from traffic, industry and recreational activities is a growing problem. Road traffic is a leading source in towns and cities – each day nearly 70 million Europeans in towns and cities are exposed to noise levels in excess of 55 decibels just from traffic. According to the World Health Organisation, long-term exposure to such levels can trigger elevated blood pressure and heart attacks. Around 50 million people living in urban areas suffer from excessively high levels of traffic noise at night, and for 20 million of them night-time traffic noise actually has a damaging effect on health.

The biggest problem is loss of sleep. The World Health Organisation recommends that for a good night's sleep, continuous background noise should stay below 30 decibels and individual noises should not exceed 45 decibels. Other issues include hearing problems such as tinnitus, mental health problems and stress. It can also affect performance at work and cause children problems with schoolwork.





Birds and animals also suffer. While some creatures are able to adapt to an urban existence, there is concern that noise pollution may drive some away from their usual breeding and feeding sites.

EU laws oblige authorities to inform the public about the impacts of noise pollution and consult them on the measures they are planning to tackle noise pollution. That way, citizens can see how noise management measures are bringing real improvements, and approach their elected representatives if necessary.

Some NBS have the capacity to attenuate the noise levels or to isolate zones of others with higher levels. URBAN GreenUP will carry out a demonstration of a NBS specifically design to reduce noise levels and to isolate some pedestrian or cycle areas of traffic noise (NBS VA22 and VA23 Green noise barriers).

3.6.2 EU Legislation on Air Quality

The **Directive 2008/50/EC** of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe entered into force on 11 June 2008. This Directive includes the following key elements:

- The merging of most of existing legislation into a single directive (except for the fourth daughter directive) with no change to existing air quality objectives (Framework Directive 96/62/EC, 1-3 daughter Directives 1999/30/EC, 2000/69/EC, 2002/3/EC, and Decision on Exchange of Information 97/101/EC).
- New air quality objectives for PM2.5 (fine particles) including the limit value and exposure related objectives – exposure concentration obligation and exposure reduction target
- The possibility to discount natural sources of pollution when assessing compliance against limit values

Table 11 shows limit values for the protection of human health (annex XI of the Directive 2008/50/EC [53]).





Averaging Period	Limit value	Margin of tolerance	Application date
Sulphur diox	kide		
One hour	350 μg/m ³ , not to be exceeded more than 24 times a calendar year	150 μg/m³ (43 %)	1 January 2005
One day	125 μg/m ³ , not to be exceeded more than 3 times a calendar year	None	1 January 2005
Nitrogen die	oxide		
One hour	200 µg/m ³ , not to be exceeded more than 18 times a calendar year	50 % on 19 July 1999, decreasing on 1 January 2001 and every 12 months thereafter by equal annual percentages to reach 0 % by 1 January 2010	1 January 2010
Calendar year	40 μg/m³	50 % on 19 July 1999, decreasing on 1 January 2001 and every 12 months thereafter by equal annual percentages to reach 0 % by 1 January 2010	1 January 2010
Benzene			
Calendar year	5 μg/m³	5 μg/m ³ (100 %) on 13 December 2000, decreasing on 1 January 2006 and every 12 months thereafter by 1 μg/m3 to reach 0 % by 1 January 2010	1 January 2010
Carbon mon	oxide		
maximum daily eight hour mean (2)	10 mg/m ³	60 %	1 January 2005
Lead			
Calendar year	0.5 μg/m ³ (3)	100 %	— (3)
PM10			
One day	50 μg/m ³ , not to be exceeded more than 35 times a calendar year	50 %	1 January 2005
Calendar vear	40 μg/m³	20 %	1 January 2005

(1) The requirements for the calculation of annual mean do not include losses of data due to the regular calibration or the normal maintenance of the instrumentation.

(2) The maximum daily eight hour mean concentration will be selected by examining eight hour running averages, calculated from hourly data and updated each hour. Each eighthour average so calculated will be assigned to the day on which it ends i.e. the first calculation period for any one day will be the period from 17:00 on the previous day to 01:00 on that day; the last calculation period for any one day will be the period from 16:00 to 24:00 on that day.





m from such specific sources.

Averaging Period	Limit value	Margin of tolerance	Application date
(3) Already i	n force since 1 Januar	ry 2005. Limit value to be met only by 1 Jan	uary 2010 in the
immedia	te vicinity of the spe	cific industrial sources situated on sites c	contaminated by
decades	of industrial activities	s. In such cases, the limit value until 1 Janu	ary 2010 will be
1.0 ug/m	³ . The area in which h	igher limit values apply must not extend fu	rther than 1,000

Table 11: Limit values for the protection of human health. (annex XI of the Directive 2008/50/EC)

Other Legislation

1. Council Directive 96/62/EC on ambient air quality assessment and management is commonly referred to as the Air Quality Framework Directive. It describes the basic principles as to how air quality should be assessed and managed in the Member States. It lists the pollutants for which air quality standards and objectives will be developed and specified in legislation.

2. Council Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air. The directive was is the so-called "First Daughter Directive". The directive describes the numerical limits and thresholds required to assess and manage air quality for the pollutants mentioned. It addresses both PM10 and PM2.5 but only establishes monitoring requirements for fine particles.

3. Directive 2000/69/EC of the European Parliament and of the Council relating to limit values for C_6H_6 and CO in ambient air. This was the Second Daughter Directive and established the numerical criteria relating to the assessment and management of C_6H_6 and CO in air.

4. Directive 2002/3/EC of the European Parliament and of the Council relating to ozone in ambient air. This was the Third Daughter Directive and established target values and long-term objectives for the concentration of ozone in air. Ozone is a secondary pollutant formed in the atmosphere by the chemical reaction of hydrocarbons and nitrogen oxides ion the presence of sunlight. As such, the directive also describes certain monitoring requirements relating to volatile organic compounds and nitrogen oxides in air.

5. Directive 2004/107/EC of the European Parliament and of the Council relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air. This is the Fourth Daughter Directive and completes the list of pollutants initially described in the Framework Directive. Target values for all pollutants except mercury are defined for the listed substances, though for PAHs, the target is defined in terms of concentration of benzo(a)pyrene which is used as a marker substance for PAHs generally.

6. Council Decision 97/101/EC establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States. This "Exchange of Information Decision" describes the procedures for the dissemination of air quality monitoring information by the Member States to the Commission and to the public.




7. Commission Decision 2004/461/EC laying down a questionnaire for annual reporting on ambient air quality assessment under Council Directives 96/62/EC and 1999/30/EC and under Directives 2000/69/EC and 2002/3/EC of the European Parliament and of the Council. This decision specifies the format and content of Member States' Annual Report on ambient air quality in their territories.

8. Directive 2002/49/EC relating to the assessment and management of environmental noise (the Environmental Noise Directive – END) is the main EU instrument to identify noise pollution levels and to trigger the necessary action both at Member State and at EU level.

Legislation in Valladolid

Royal Decree 102/2011 in Spain about the improvement of air quality establishes the air quality objectives set by the European directives, for pollutants with more impact on human health and the environment. This Royal Decree (RD) is mandatory in Spain. The structure of the Atmospheric Pollution Control Network of the City of Valladolid (RCCAVA), its implementation and the evaluation of air quality, are based on the principles of that RD This information is available for all the citizens in the Valladolid City Council webpage [54].

3.6.3 The case of Valladolid

The Atmospheric Pollution Control Network of the City of Valladolid (RCCAVA) complies with the implementation conditions that describe both the European Management Directives and RD 102/2011, of 28 January, on air quality, which transposes all EU Directives on this field.

The deployment of the RCCAVA in 2017 is shown in the Figure 31. The RCCAVA is formed by five stations which main characteristics are shown in Table 12. More information about RCCAVA can be found in Valladolid City Council webpage [55].

Station	Address	SO2	PM10 / PM2,5	NO∕ NO₂	со	O ₃	ВТХ
Arco Ladrillo II	Arco Ladrillo, 3		Х	Х	Х		Х
Rubia II	Daniel del Olmo s/n	Х	Х	Х			
Vega Sicilia	Paseo de Zorrilla, 191		Х	Х		Х	Х
Puente del Poniente	Juana de Castilla, 6		Х	Х		Х	Х
Valladolid Sur	Olimpiadas, 40			Х		Х	

Table 12: Main characteristics of the stations of the RCCAVA.





Figure 31: The deployment of the RCCAVA in 2017

On the other hand, Valladolid has been working in the development of an Action Plan for Alert Situations in Urban Air Pollution in Valladolid, framed in the Plan Pollution Action against (Department of Environment, 2017). This plan was definitely approved in the ordinary session of the Governing Board of February 1, 2017, in the Official Bulletin of the Province of Valladolid April 4, 2017. A poster with the main information about this plan is shown in the Figure 32. All the information about this plan is available in the Valladolid City Council webpage [56].

Table 13 shows the limits established in the "Action Plan for Alert Situations in Urban Air Pollution in Valladolid" for each situation: preventive, warning and alert.



Figure 32: Poster with the main information the Action Plan (Spanish document)



URBAN GreenUP GA nº 730426



Units µg/m³	Situati	tuation 1. Prevention.		tuation 2. Warning.		uation 3. Alert.
SO2	20 ²	Daily average value	125 ¹	Daily average value	350 ¹	Hourly average value in 3 consecutive hours
PM10	40	Daily average value in two stations	50 ^{1,2}	Daily average value in two stations	80	Daily average value in two stations
PM2,5	25²	Daily average value in two stations	25 ²	Daily average value in two stations	50	Daily average value in two stations
NO2	170	Hourly average value	200 ^{1,2}	Hourly average value	400 ¹	Hourly average value in 3 consecutive hours
03	100 ²	Daily maximum in 3 consecutive days	180 ¹	Hourly average value	240 ¹	Hourly average value
со	5	Hourly average value	10 ¹	Hourly average value	15	Hourly average value
¹ RD 102/202	11.	·		·		·
² World Health Organization (WHO) air quality guide.						

Table 13: Limit values establish in Action Plan for Alert Situations in Urban Air Pollution in Valladolid.

The 37/2003 Noise Law of 17 November, which incorporates into the Spanish Legal System the 2002/49/EC Directive of 25 June, relating to the assessment and management of environmental noise, has come to fill an important national regulatory gap with reference to compliance with the health and environmental protection constitutional mandate. Then, the noise Directive 2002/49/EC was transposed into the Castilla y León Noise Law 5/2009 and it is applied in Valladolid.

Previously, regulations had focused on the sources of noise, limiting emissions. Reality has demonstrated that, despite constant technological improvement, the benefits of these environmental noise measures have been reduced due to a combination of other factors which have not yet been confronted.

One of the noteworthy objectives of the new legal framework is the creation of a common structure for the assessment and management of exposure to environmental noise, as a step prior to the establishment of action plans for noise reduction.





The Law established, as a tool for environmental noise exposure recognition, the so-called Strategic Noise Map, which is defined as "a map designed for the global assessment of noise exposure in a given area due to different noise sources or for overall predictions for such an area"

The Law demanded the development of Strategic Noise Maps for each of the major roads, major railways, major airports and agglomerations. In terms of the road network, for this first round, the need to draw these maps has been restricted to roads with traffic levels above six million vehicles a year.

Regarding to air quality in the city of Valladolid, air quality is characterized by the importance of emissions of atmospheric chemical pollutants from urban traffic and the group formed by highways, roads and bypasses, given the potential pollutant of more than 250,000 vehicles that on average travel daily through these routes. To a lesser extent, industrial areas also affect to air quality. The following comments can be made in a general way according to each of the pollutants analysed:

Sulphur dioxide, SO₂

An acid gas formed when fuels containing sulphur impurities are burned. SO₂ irritates the airways of the lung.

This pollutant does not pose problems in the city of Valladolid. The maximum value registered in the city during 2016 (Rubia II station) was 34 μ g/m³. This value is below the limit values marked by the legislation. On the other hand, the daily median of the recorded data was 7 μ g/m³. Values collected previous years, from 2013 to 2015 are even lower.

EU generally speaking, substantial SO_x emission reductions have been made across a number of sectors including: 'Road transport' (a 98 % reduction between 1990 and 2009), 'Energy use in industry' (80 %), 'Commercial, institutional and households ' (76 %) and 'Waste' (72 %) [57].

A combination of measures has led to the reductions in SO_x emissions. This includes fuelswitching from high-sulphur solid (e.g. coal) and liquid (e.g. heavy fuel oil) fuels to low sulphur fuels (such as natural gas) for power and heat production purposes within the energy, industry and domestic sectors, improvements in energy efficiency, and the installation of flue gas desulphurisation equipment in new and existing industrial facilities. The implementation of several directives within the EU limiting the sulphur content of fuel quality has also contributed to the decrease.

The newer Member States of the European Union have in a number of cases also undergone significant economic structural changes since the early 1990s, which has led to a general decline in certain activities which previously contributed significantly to high levels of sulphur emissions (e.g. heavy industry) and the closure of older inefficient power plants.

Particle Matter, PM10

Particulate Matter (PM). Small airborne particles. PM may contain many different materials such as soot, wind-blown dust or secondary components, which are formed within the atmosphere because of chemical reactions. Some PM is natural and some is man-made. PM can be harmful





to human health when inhaled, and research shows a range of health effects associated with PM. In general, the smaller the particle the deeper it can be inhaled into the lung.

PM10. Particles which pass through a size-selective inlet with a 50 % efficiency cut-off at 10 μ m aerodynamic diameter, as defined in ISO 7708:1995, Clause 6. This size fraction is important in the context of human health, as these particles are small enough to be inhaled into the airways of the lung – described as the 'thoracic convention' in the above ISO standard. PM10 is often described as 'particles of less than 10 micrometres in diameter' though this is not strictly correct.

As explained in RD 102/2011, the first of the objectives is defined by the daily limit value and the number of annual exceedances of this value. The limit value (50 μ g/m³ by 2016) cannot be exceeded by more than 35 times in the year. None of the stations in the Valladolid Network exceeded by more than 35 times during last years the daily limit value. Table 14 shows the number of exceedances (50 μ g/m³) during the last years.

Exceedances (number)	2016	2015	2014	2013
Arco Ladrillo II	3	7	0	0
Rubia II	4	5	2	0
Vega Sicilia	2	4	4	2
Puente del Poniente	2	5	2	0

Table 14: Exceedances in Valladolid in limit daily values for PM10

The second of the air quality objectives is defined by the limit value for the annual average for the protection of health, in 2016 cannot exceed the value of 40 μ g/m³. None of the stations in the Valladolid Network exceeded during last years this average limit value (Table 15).

Average value (μg/m³)	2016	2015	2014	2013
Arco Ladrillo II	17	18	14	14
Rubia II	17	18	15	14
Vega Sicilia	14	17	18	16
Puente del Poniente	16	19	15	13

Table 15: PM10 average values in Valladolid. (Source: Valladolid City Council website [55])

Particle Matter, PM2.5

Particles which pass through a size-selective inlet with a 50 % efficiency cut-off at 2.5 μ m aerodynamic diameter, as defined in ISO 7708:1995, Clause 7.1. This size fraction is important in the context of human health, as these particles are small enough to be inhaled **very deep** into the lung – described as the 'high risk respirable convention' in the above ISO standard.

The air quality objective is defined by the limit value for the annual average for the protection of health, in 2016 cannot exceed the value of 25 μ g/m³. None of the stations in the Valladolid Network exceeded during last years this average limit value (Table 16).





Average value (μg/m³)	2016	2015	2014	2013
Arco Ladrillo II	11	11	9	9
Rubia II	15	15	12	11
Vega Sicilia	9	10	11	10
Puente del Poniente	8	10	8	8

Table 16: PM2.5 average values in Valladolid (Source: Valladolid City Council website [55])

However, in accordance with the World Health Organization (WHO) air quality guide, the maximum average value for 24h is 25 μ g/m³. This value has been overpassed several times during las years (Table 17). Values recorded for the year 2016 are certainly worrying. We must follow the evolution during the year 2017 to see if they follow the same upward trend.

Exceedances (number)	2016	2015	2014	2013
Arco Ladrillo II	150	23	11	13
Rubia II	211	32	19	13
Vega Sicilia	98	16	15	6
Puente del Poniente	108	16	8	11

Table 17: Exceedances in Valladolid according WHO recommendations

Nitrogen Oxides, NO/NO₂, NO_x

Nitric oxide (NO). One of the oxides of nitrogen formed in combustion processes. NO is not harmful to human health but combines with oxygen to form nitrogen dioxide.

Nitrogen Dioxide (NO₂). One of the oxides of nitrogen formed in combustion processes. At high concentrations NO₂ is an irritant to the airways. NO₂ can also make people more likely to catch respiratory infections (such as flu), and to react to allergens.

Nitrogen Oxides. Compounds formed when nitrogen and oxygen combine. NO_x , which comprises nitric oxide (NO) and nitrogen dioxide (NO₂), is emitted from combustion processes. Main sources include power generation, industrial combustion and road transport.

According RD 102/2011, first of the objectives for the human health protection is not to exceed more than 18 times a year the value of 200 μ g/m³ (average hourly). All stations have met the target. Only one exceedance is found in 2015 and another in 2013. Table 18 shows maximum and median values for all the stations during last years.

Average value	2	016	2015		2014		2013	
(µg/m³)	Max.	Median	Max.	Median	Max.	Median	Max.	Median
Arco Ladrillo II	191	27	207	28	197	24	230	27
Rubia II	132	20	135	20	123	21	146	16
Vega Sicilia	136	17	157	19	145	15	151	13
Puente del Poniente	160	16	139	20	117	15	137	14
Valladolid Sur	104	14	109	14	104	11	103	12

Table 18: NO₂ Maximum and median hourly values in Valladolid (Source: Valladolid City Council website [54])





The second objective of air quality is not to exceed the limit value of the annual average for health protection. This limit value of 40 μ g/m³. None of the stations has exceeded this average annual limit value as (see Table 19).

Average value (µg/m³)	2016	2015	2014	2013
Arco Ladrillo II	32	33	29	32
Rubia II	20	24	25	20
Vega Sicilia	22	24	20	18
Puente del Poniente	20	24	20	19
Valladolid Sur	19	19	16	16

Table 19: NO2 average values in Valladolid. (Source: Valladolid City Council website [55])

Ozone, O₃

A pollutant gas, which is not emitted directly from any source in significant quantities, but it is produced by reactions between other pollutants in the presence of sunlight. (This is what is known as a 'secondary pollutant'.) Ozone concentrations are greatest in the summer. O_3 can travel long distances and reach high concentrations far away from the original pollutant sources. O_3 appears as a byproduct of the reaction in the atmosphere of other pollutants, not only nitrogen oxides, but also complex hydrocarbons from both combustion and Of biogenic emissions of the forest masses and of the decomposing plant mass on the soil. It is also influenced the greater or lesser presence of sulphur oxides in the atmosphere and the level of relative humidity. Ozone is an irritant to the airways of the lungs, throat and eyes: it can also harm vegetation.

The value corresponding to the information threshold is 180 μ g/m³ as an hourly average. The ozone alert threshold value is 240 μ g/m³ as an hourly average. Surpassing the threshold should be measured or predicted for three consecutive hours.

Exceedances (number)	2016	2015	2014	2013
Vega Sicilia	8	14	10	11
Puente del Poniente	6	13	7	7
Valladolid Sur	11	21	7	4

Table 20: Exceedances in Valladolid according RD 102/2011criteria

According to the WHO air quality guide, the maximum recommended value for an eight-hour measurement at the stations is 100 μ g/m³. Table 20 and Table 21 show the number of exceedances for this value in the last 4 years.

Exceedances (number)	2016	2015	2014	2013
Vega Sicilia	47	55	37	53
Puente del Poniente	47	51	47	30
Valladolid Sur	62	74	59	58

Table 21: Exceedances in Valladolid according WHO recommendations





WHO notes in its guidance that ozone concentrations can have significant variations in time and space and these variations come not only from anthropogenic emissions but also from biogenic precursor emissions and even downstream intrusions of tropospheric ozone. It recognizes that the proposed guide value can sometimes be overcome due to natural causes and very hot

weather events.

For more than ten years, Valladolid City Council has been maintaining a tropospheric ozone preventive surveillance programme in which, through Mathematical models. it analyses the behaviour of concentrations of this pollutant making predictions for the next day if necessary. Furthermore, Valladolid City Council has different the information channel and procedure to inform the population if needed. Tropospheric ozone is the pollutant in which the mayor attention of the municipality is focused.

Carbon monoxide, CO

A pollutant gas found released in road vehicle exhausts. When breathed in, carbon monoxide affects the blood's ability to carry oxygen around the body.

Ambient concentrations of CO throughout Valladolid have been well within the limit value for many years (see Table 22 for the las 4 years). Because concentrations of CO are well within the limit value (10 mg/m³ as daily average value), only one monitoring site is required for next years.

Maximum Average value (mg/m³)	2016	2015	2014	2013
Arco Ladrillo II	2.0	2.0	3.0	2.0
La Rubia	-	-	-	2.0

Table 22: CO average values in Valladolid. (Source: Valladolid City Council webstite) [55]

Benzene, C₆H₆

A chemical compound that is harmful to human health. As an air pollutant, benzene can be emitted from domestic and industrial combustion processes, and road vehicles.

Regarding this parameter, it is measured in Arco Ladrillo II, Puente del Poniente and in Vega Sicilia stations and collected data never have overpassed limit value (5 μ g/m³ as yearly average value) (Table 23).

Average value (μg/m³)	2016	2015	2014	2013
Arco Ladrillo II	0.3	0.4	-	-
Vega Sicilia	0.1	0.1	0.1	0.1
Puente del Poniente	-	0.1	0.1	0.1

Table 23: C₆H₆ average values in Valladolid. (Source: Valladolid City Council website [55]).

Benze(a)pyrene, B(a)P

One of a group of compounds called polycyclic aromatic hydrocarbons (PAHs) that can be air pollutants. The main sources of B[a]P in Valladolid are wood burning, fires, biogenic sources and industrial processes.





Regarding this parameter, it is only measured in Arco Ladrillo II station and collected data never have overpassed limit value (1 ng/m³ as yearly average value) (Table 24).

Average value (ng/m³)	2016	2015	2014	2013
Arco Ladrillo II	0.53	0.20	0.18	0.18

Table 24: B(a)P average values in Valladolid. (Source: Valladolid City Council website [5]).

Noise

Valladolid City Council, as the responsible authority, has developed an **Action Plan against Noise** in the city (2010). This Action Plan is configured as an instrument that can be both preventive and corrective tool and has as its objective to deal globally with aspects related to noise pollution. Furthermore, it can set priority actions in case of non-compliance with quality objectives acoustics.

According to the results obtained by each of the sources of noise, it has been seen that people exposed by traffic noise account for more than 99 % of the total number of exposed people, so it can be considered that the noise of the railway and industries is virtually residual. Figure 33 shows a graphical representation of the main zones affected by noise in Valladolid.







Figure 33: Graphical representation of the main zones affected by noise in Valladolid (Source: Valladolid City Council website) [58]

The Valladolid Road Noise Maps show that 119,900 people, 76,800 homes, 7 hospitals and 97 schools in the Valladolid Metropolitan area during the 24-hour integrated period (L_{den}) are exposed to disturbing noise levels, which is the worst of the scenarios considered.

In the case of the municipality of Valladolid, the percentage of population affected by levels above 55 dB (A) was in 2008 higher than 40 percent, although the updated map of 2012 reduces this condition to 37 percent of the population on that date. It is a very significant proportion in any case.

One of the main results of this plan is that the zones of Valladolid with greater affectation by noise have been identified. This plan also identifies possible measures to be taken and prioritizes the actions for the effectiveness of the measure.





3.6.4 Summary of Challenges

- Ozone and its precursors are the air pollutants that generate more problems in Valladolid.
- Air pollution episodes due to ozone commonly occur in the Valladolid during late spring and summer.
- In wintertime, some weather conditions, especially thermal inversion episodes, also cause some problems with NO₂ and PM.
- Reduction of noise levels in areas identified by the **Action Plan against Noise** in the city.

3.6.1 Potential Actions to be Taken

- Monitoring the amount of atmospheric air pollutants in wider areas to find out more vulnerable zones in the city.
- Calculating and mapping air purification service provided by existing green areas.
- Increasing the amount of urban trees and canopy cover in the city: in private domestic gardens, along the streets and urban parks etc. but pollution-sensitive species should be avoided in heavily polluted areas or used only as bio-indicators for citizen awareness.
- Maintain the canopy cover by avoiding unnecessary pruning.
- Increasing existing green infrastructure elements such as building green roof and green walls.
- Planting low maintenance and long-lived trees for long-term pollution reduction.
- Planting trees to shade parked cars to reduce vehicular VOC (volatile organic compounds) emissions but avoiding species with high production of biogenic VOC.
- Control fires of organic wastes and other origins especially at designated seasons.
- Installing green noise barriers in specific points in the city.
- Clean transport, the City of Valladolid is promoting the replacement of diesel engines in buses and trash trucks by gas-powered equipment. Apart from the obvious improvements in the consumption and emissions of particles, these modern engines will be quieter.
- Reduction of speed limits as long as it is feasible from the point of view of mobility. This
 action also converges with the action of promoting the use of the bicycle.
- Promotion of Pedestrianisation Plans in the City. Current Municipality Government has pedestrianised a street in the City Center and it has a plan to promote new actions.





3.7 Urban Regeneration

3.7.1 Introduction

"Urban Regeneration Council.

Cities exist in a competitive global market place vying for investment against established world cities across Europe and the United States as well as the rapidly urbanising emerging markets in Asia, South America and Africa.

There is a pressing need to make Europe's cities more competitive, resilient and sustainable and this challenge is at the heart of the urban regeneration process. However, the successful reuse of brownfield land and the reinvention of redundant or forgotten parts of a city, is a highly complex process and requires insight and cooperation from a diverse range of disciplines.

Urban Land Institute's Urban Regeneration Council fosters stronger interaction between city governments, real estate developers and practitioners and major institutional investors. It looks to share ideas and experiences from around the world to help provide insights into best practice in city development and urban regeneration."

Extracted from European Urban Regeneration Council site web. European Products Councils.

The cities occupying only the 2% of the planet, [59] represent about 70% of the energy consumption and 70% of the GHG consumption [60], but at the same time, more than 50% percent of the humans live in them [61] and generate a huge concentration of ideas, commerce, culture, science, productivity, social development and much more [62], so, when this kind of information is related to urban sustainable development, one of the tools to get it, is the Urban regeneration.

The urban regeneration has been a concept used since decades in order to solve some problems generated in the cities by different reasons: cities inhabitants growth, relocation of factories, environmental impacts, economics factors, social inequalities, etc.

However, regeneration has not always been used in the same way, implicated the same stakeholders, and take into account the same kind of financial investment, social or environmental approach. Indeed, Roberts shows in the <u>Definition and purpose of Urban</u> <u>Regeneration [63]</u> the evolution of the concept, since 50's, when it was about <u>"Reconstruction and extension of older areas of cities, often based on a masterplan"</u> with and implication of national with local impact emphasis, focus on housing improvement and with limited environmental impact, to 90's when *"It moves towards a more comprehensive form of policy and practice; more emphasis on integrated treatments" with focus on regional level, the engagement of different stakeholders that take part on it whit emphasis on role community and with a different way of financial framework and a sustainability orientation".*

Although today there are different approaches of the urban regeneration concept, since more general until specific definition (for instance, as when we talk about *Sustainable Urban Regeneration*), these different approaches have in common the intention of a transversal impact and the engagement of different stakeholders.





A general vision of the urban regeneration could be defined as *a way to reorganize and upgrade existing places rather than planning new urbanization* [64], but furthermore, it could be possible add some topics which complement the definition such as Roberts and Hykes include in the concepts -*a comprehensive and integrated vision and action to address urban problems through a lasting improvement in the economic, physical, social and environmental condition of an* area [65].

The concept "Sustainable Urban Regeneration" defined by URBACT [66], explain that taking into account that the Urban regeneration could be defined as *an aggregate of four basic pillars: economic, environmental, social and institutional [67]*. When they talk about "*Sustainable*" they are supporting its concept on the environmental pillar, but having integration with the others. This kind of definition is the most common concept used today when is talked about Urban Regeneration, and this happen for the influence that the cities have in the current health of the planet. In this sense, both United Nations and European Commission have been working to develop tools that help the cities in the process of urban regeneration.

By the UN part, in December of 2015, it was defined the goals of the planet, and some of them have a close relation to the cities, the environmental topic, and in consequence to the cities regeneration processes. The goal is "Sustainable cities and communities" and talk about make cities inclusive, safe, resilient and sustainable. Close related to the achievement of this goal, in October 2016, it was carried out the United Nations Conference on Housing and Sustainable Urban Development [62] where was defined a New Urban Agenda, assuming the commitment of "promote planned urban extensions and infill, prioritizing renewal, regeneration and retrofitting of urban areas [68]"

Table 25 and Table 26 show the efforts that institutions at European level have done in topics related to urban sustainability, where one important part of it, is the urban regeneration.





Main European programmes, strategies and initiatives in the field of sustainable urban development				
7th Environment Action Programme (EAP)	Launched by the European Commission in 2013, the 7th Environment Action Programme (EAP) sets out a strategic agenda for environmental policy-making with nine priority objectives to be achieved by 2020. It aims to help establish a common understanding of the main environmental challenges Europe faces and what needs to be done to tackle them effectively. Protecting and enhancing natural capital, encouraging more resource efficiency and accelerating the transition to the low-carbon economy are key features of the programme, which also seeks to tackle new and emerging environmental risks and to help safe guard health and welfare of EU citizens. The outputs should help foster sustainable growth and job creation to set the European Union on a path to becoming a better and healthier place to live. In order to enhance the sustainability of EU cities, the 7th EAP set the target that by 2020 a majority of cities in the EU will be implementing policies for sustainable urban planning and design. [69]			
Thematic Strategy on Urban Environment	The Thematic Strategy on the Urban Environment, adopted by the European Commission in 2006, followed on from the Commission's Sixth Environmental Action Programme. It aims to promote a more integrated approach to urban management and to support cities in their efforts to this end. A dedicated area on the Commission's website provides guidance and information about integrated environmental management. [70]			
Reference Framework for Sustainable European Cities (RFSC)	In 2008 in Marseille (France) Ministers responsible for urban development decided to create the RFS as a tool to translate into practice the common sustainability goals and the Leipzig Charter objectives. The RFSC aims to provide a common framework for sustainable urban development, promoting the benefits of integrated urban development policy approaches. The tool seeks to allow for communication within and between cities on the basis of a common format that can also be adapted to the cities' individual needs. It also encourages dialogue and exchange within and best practices. Signed-up cities can use the RFSC to develop and improve current strategies and projects and to learn from other European cities. The tool can be used by politicians, planners, project managers, stakeholders and citizens. It is built around the four key pillars of sustainability ('Economy, Social, Environment and Governance') and covers a wide range of topics including housing, green space, transport and youth unemployment. To make the most of the benefits offered by the RFSC, cities and municipalities can also apply for the RFSC City or Ambassador City status. [71]			
Roadmap for a resource efficient Europe	The European Commission has set out a roadmap aimed at transforming Europe's economy into a sustainable one by 2050 and to help achieve a resource-efficient Europe. It proposes increasing resource productivity and decoupling economic growth from resource use and its environmental impact. [72]			





Main Europe	Main European programmes, strategies and initiatives in the field of sustainable urban development				
EU Sustainable Development Strategy	In July 2009 the Commission adopted the 2009 Review of EU Sustainable Development Strategy. While it stresses that in recent years the EU has mainstreamed sustainable development into a broad range of its policies (particularly in the fight against climate change and the promotion of a low- carbon economy), it also recognizes that unsustainable trends persist in many areas and the efforts need to be intensified. The review takes stock of EU policy measures in the areas covered by the EU SDS and launches a reflection on the future of the EU SDS and its relationship to the Lisbon strategy.[73]				
Europe 2020 Strategy (Resource efficiency)	The resource-efficient Europe flagship initiative is part of the Europe 2020 Strategy, the EU's growth strategy for a smart, inclusive and sustainable economy. It supports the shift towards sustainable growth via a resource-efficient, low-carbon economy. [74]				
INTERREG IV (2007–2013) and INTERREG EUROPE (2014–2020)	INTERREG IVC provides funding for interregional co-operation across Europe. It was implemented under the European Community's territorial co-operation objective and financed through the European Regional Development Fund (ERDF). The Operational Programme was approved in September 2007 and the period for INTERREG IVC lasted from 2007–2013. This programme followed on from the INTERREG IIIC programme, which ran from 2002–2006. Interregional co-operation continues in the 2014 to 2020 period under the name INTERREG EUROPE. The first call for projects will be in March 2015. [75]				
The URBACT programme	URBACT is the European exchange and learning programme promoting integrated sustainable urban development. It enables cities to work together to develop solutions to major urban challenges, reaffirming the key role they play in facing increasingly complex societal changes. It also seeks to help cites to develop pragmatic solutions that are new and sustainable, and that integrate economic, social and environmental dimensions. URBACT is active in 550 cities, 29 countries and has 7,000 active local stakeholders. URBACT is jointly financed by the European Union (ERDF) and the Member States. The first call for networks will be in March 2015. [76]				
LIFE+ – Funding for sustainable cities	LIFE+ is the European Union's financial instrument supporting environmental and nature conservation projects throughout the Union and in some candidate and neighbouring countries. Since 1992 LIFE has co-financed some 2,750 projects with a total of €1.35 billion. DG Environment proposes to fund up to 15 large-scale projects (€10 million) each involving two or more cities in the next phase (2014 to 2020) of the environmental financing programme, LIFE+. The LIFE (the Financial Instrument for the Environment) Regulation, which was published on 20 December 2013, sets a budget for the next funding period, 2014–2020, of €3.4 billion in current prices. The 2015 Call for proposals for LIFE Action Grants will open in June 2015. [77]				

Table 25: Efforts at European level in topics related to urban sustainability (Source: Sustainable regeneration in urban areas - urbact ii capitalisation, April 2015 - Published by URBACT)





A selection of actors and networks working on urban sustainability at European and international level				
Organisation	Geographical scope	Type of entity / thematic fields		
CECODHAS Housing Europe	EU	Network of providers of public, social and co- operative housing. - Social and affordable housing - Social inclusion - Energy-efficiency [78]		
CEMR (Council of European Municipalities and Regions) Brings together the national associations of local and regional authorities from 41 European countries and represents, through them, all levels of territories – local, intermediate and regional.	EU	Related areas of work: - Resource efficiency and environment - Waste - Water - Air quality CEMR is also part of the Covenant of Mayors' Office, where it is primarily responsible for relations with Supporters of the Covenant, which are associations of local and regional authorities committing to provide political, administrative or technical support to signatories. Around 20 CEMR members are now Covenant Supporters. [79]		
Energy Cities The European association of local authorities in energy transition	EU	 Main objectives: To strengthen cities' role and skills in the field of sustainable energy. To represent cities' interests and influence the policies and proposals made by European Union institutions in the fields of energy, environmental protection and urban policy. To develop and promote cities' initiatives through exchange of experiences, transfer of know-how and the implementation of joint projects. In 2012, Energy Cities initiated a process aimed at making and debating proposals for accelerating the energy transition of European cities and towns. These proposals are based on innovative approaches, new ideas and ground-breaking practices. They provide practical answers and link today's action to the long-term vision of a low energy city with a high quality of life for all. [80] 		





A selection of actors and networks working on urban sustainability at European and international level				
Organisation	Geographical scope	Type of entity / thematic fields		
EUROCITIES The network of major European cities. Its members are the elected local and municipal governments of major European cities	EU	EUROCITIES Environment forum supports cities in their efforts to bring about a better environment and work towards achieving sustainable development by sharing knowledge and expertise. Led currently by the city of Birmingham, the forum has set itself the following 2014 priorities [81]: - Sustainable, resource efficient economy - Healthy environment - Climate change		
ICLEI Europe Association representing local governments in all relevant policy processes for Sustainability in Europe	EU	 In Europe ICLEI works on the following topics [82]: Biodiversity Climate Change Adaptation Climate Change Mitigation Sustainability Management Urban Governance Sustainable Procurement Energy Water Mobility Sustainable Events Capacity building through online training platform for local authorities and stakeholders involved in sustainable urban development. 'Green climate cities': attempt to integrate resource efficiency, mitigation and adaptation. Recognize different levels amongst cities: 'start-up cities' and 'advanced cities' 		
Covenant of Mayors	EU	Voluntary commitment by municipalities to reach, or even exceed the European Union's objective to reduce CO ₂ emissions by 20% by 2020. In particular, the signatories of the Covenant commit to setting up plans of action in this domain and to tracking the results. More than 5,000 local and regional authorities have signed the Covenant. The Covenant of Mayors' Office is made up of five European networks: CEMR, Energy-Cities, Climate- Alliance, EUROCITIES, and Fedarene. [6]		

Table 26: A selection of actors and networks working on urban sustainability at European and international level (Source - Sustainable regeneration in urban areas - urbact ii capitalisation, april 2015 - Published by URBACT)



URBAN GreenUP



GA nº 730426

According to EKLIPSE [1] (a project requested by The European *Commission to help building up an evidence and knowledge base on the benefits and challenges of applying NBS)* the urban regeneration should take into account:

- business development,
- housing growth and improvement,
- community building
- environmental improvement
- ecological restoration across scales
- Control fires of organic wastes and other origins especially at designated seasons.
- social justice

In this framework, the implementation of NBS in this regeneration process, have to consider, in a holistic way, different factors that can influence in the actors and its relations with buildings and infrastructures.

A general conclusion could be, that today, any urban regeneration process has to take into account topics related to sustainability – considering the impact of the cities- but at the same time, work in a holistic vision including social, economic, technologic, and institutional topics. Consequently, the implication of all stakeholders that take or could take part in any part of the process is so relevant to the achievements of the goals, mainly, by topics related to new financing ways, social engagement, synergies, etc.

3.7.2 Urban Regeneration Integrated Strategy in City of Valladolid

According to the definition found on the official city web page "The term Smart City, without having a universally accepted definition, has three essential characteristics: not to harm the environment, to use information and communication technologies as tools for intelligent management and the ultimate goal of sustainable development. In short, a city that improves the quality of life and the local economy in the context of a resource-efficient Europe seeking to develop an economy based on knowledge and innovation (smart growth) and promote a more efficient economy in the use of resources, more ecological and competitive (sustainable growth)." [83]

Valladolid works in three different scenarios:

- At the municipal level, genuine scope of the initiative, in the initiative SMART CITY VALLADOLID AND PALENCIA (Smart City VYP).
- At the supramunicipal level through the SPANISH NETWORK OF INTELLIGENT CITIES (RECI), this involves different state agencies such as the Spanish Federation of Municipalities and Provinces, Red.es or the Secretary of State for Telecommunications and Information Society of the Ministry of Industry, Energy and Tourism, among others.
- At the national level, with a clear transnational object through the Technical Committee of Normalization number 178 "Intelligent Cities" promoted by the aforementioned MINETUR in collaboration with AENOR and through the INNPULSO Network.





During the last years, Valladolid has promoted numerous local plans and has participated in national and European platforms, giving a new dimension to the city. Now, once all the changes have been made, Valladolid is ready to make a leap of magnitude and aspire to become one of the cities of reference in Spain and in the world for certain sectors related to the economic impulse.

On the other hand, the need to align the city with the Europe 2020 strategy, as well as the indispensable requirement to have a Roadmap that sets the way for Valladolid to converge with the objectives of Horizon 2020, both European and national (collected in the Association Agreement of Spain 2014-2020), leads to the need to design a programme that serves as a common basis for all the actions that are being launched.

Types of eligible action have been selected by local govern by thematic objective (OT): [84]

- OT2 administration electronica local and smart cities (15 %).
- OT4 energy efficiency and renewable (25 %).
- OT6 cultural heritage/ urban environment, waste, water ... (11 %/ 21 %).
- OT9 economic and social regeneration of disadvantaged urban areas (28 %).

The network urban initiative (Spanish RIU) have identified those thematic objectives as investment priorities to apply for, and the estimated founds has been established in 1.013M, in % division as indicated above.

Some more details description to the types of eligible action are included in Table 27:

OT2:	ICT to promote ICT in integrated urban development strategies through actions in
OT4:	EBC Promoting sustainable urban mobility: clean urban transport, collective transport, urban-rural connection, improvements in the road network, cycling, pedestrian transport, electric mobility promotion including the installation of charging infrastructure and development of clean energy supply systems.
OT4:	EBC Improvement of energy efficiency and increase of renewable energies in urban areas (comprehensive energy rehabilitation public buildings, demonstration projects among them, solar thermal in infrastructures and public buildings, urban heat and cooling networks)
OT6:	Environment and Heritage: To promote the protection, promotion and development of the cultural and natural heritage of urban areas, in particular those of tourist interest / Integrated actions to rehabilitate cities, to improve the urban environment and its environment public ownership, sanitation, water and waste, rehabilitation of natural heritage, reduction of pollution, particularly of atmospheric and acoustic origin)
ОТ9:	Social inclusion: Physical, economic and social regeneration of the urban environment in disadvantaged urban areas through integrated urban strategies (disadvantaged districts and their shops, cultural and care centers, public space to promote sports activities, vocational training, reactivation of spaces abandoned for new business)

Table 27: Types of eligible costs within OTs





For each specific objective, the rationale for the intervention is discussed, as part of the SWAT [85] analysis, (alternatively SWOT matrix) is an acronym for strengths, weaknesses, opportunities, and threats and is a structured planning method that evaluates those four elements of an organization, project or business venture, defining the challenges to be addressed, identifying the expected results and evaluating them through the defined outcome indicators. Finally, the lines of action with their product and financial indicators are proposed.

In this area, INNOLID 2020 [86], the Sustainable and Integrated Urban Development Strategy (EDUSI) of the city of Valladolid is born. It addresses economic, environmental, climatic, demographic and social challenges through an operative, practical and intelligent urban planning, opening of spaces, improved communication and greater territorial interrelationships.

Wednesday, 01/13/2016 [87]. The Local Government Board has approved the Integrated Urban Sustainable Development Strategy (EDUSI) of the city (Figure 34), which presents the call published in the BOE on 17 November to be co-financed through the operational programme FEDER of sustainable growth 2014-2020.



Figure 34: Logic to the interventions, "Strategy DUSI" Sustainable and integrated urban development (Soruce EDUSI_presentación.pdf [84])

The interventions should present the specific contents to be evaluated:

- a) Identification of the urban problems or challenges of the area.
- b) An analysis of the integrated urban area.
- c) A diagnosis of the situation of the urban area (SWOT), as well as the definition of the results expected on the basis of outcome indicators.
- d) The definition of the scope of action.
- e) The implementation plan that will include the lines of action.
- f) Citizen participation and social agents
- g) Ensure the administrative capacity for its implementation
- h) Reference to the horizontal principles and transversal objectives.

The summary of the INNOLID 2020 main concept as below: [86]





An integrative strategy

This Strategy integrates different lines of action that must be designed according to a series of transversal principles that mark the regulatory rules of European funds, which are equality and non-discrimination, sustainable development, accessibility, and mitigation and adaptation to climate change.

In addition, there are a number of thematic objectives that are mandatory, such as social inclusion and low carbon economy, and other optional objectives, such as environment and heritage, and information and communication technologies (ICT). Although only the first two objectives are mandatory, the City Council has opted for an ambitious strategy that integrates the 4 stated objectives, in order to make a global and integrated approach to its city philosophy. This was pointed out by the Councilor for Finance, Public Function and Economic Promotion, Antonio Gato: "We want to achieve a city that is sustainable from all points of view: social, economic and environmental, and that is able to provide the services demanded by The strategy is not a mere juxtaposition of projects, but a whole plan that contemplates actions in an integrated way, so that their effects multiply, create synergies and allow more efficient use of resources. "

In short, INNOLID 2020 is an Integrated Strategy for Urban Development in the city of Valladolid that addresses economic, environmental, climatic, demographic and social challenges through an operative, practical and intelligent urban planning, also betting on the opening of spaces, improvement of communication and greater territorial interrelations.

The objectives are to improve the habitability of the city, to integrate groups at risk of exclusion by offering greater socio-labor and training opportunities, to rationalize mobility by enabling alternative routes and means of transport, to improve the morphology of the city towards a more sustainable model regeneration of spaces, and creating more open, green and accessible areas. The presented strategy creates a balance of functional areas, with the intervention zones being interrelated and obtaining a multiplier effect.

A participatory strategy

Discussion tables, on-line surveys, days, etc. have served to design the Strategy, integrating diverse participatory actions that channel the citizens' concerns regarding mobility, innovation, urban regeneration or the environment. The City Council aims to maintain this participatory spirit in the implementation and evaluation of INNOLID 2020, and for that reason its proposal includes the creation of a monitoring committee that includes representatives not only of the Municipal Administration but also of the agents and social groups.

Lines of action of the Strategy

To define the lines of action, the Strategy includes a previous analysis of different aspects of the city: physical, social, environmental, economic, etc. which has allowed him to identify the main challenges and problems facing the city, such as aging and population decline, the existence of certain groups at risk of social exclusion, high density of vehicles or the existence of some infrastructures aging. It has also allowed him to identify the potentialities and opportunities that Valladolid can profit from.

To give just a few examples, among the projects or initiatives that can be financed with this Strategy, if selected, are the pedestrianization programme - which includes, among others, the





network of safe school roads recently launched by the municipal team - or expansion and enhancement of the cycle lanes network, within a philosophy that is committed to sustainable urban mobility and, with other projects to improve energy efficiency and use of renewable energy in municipal facilities, aims to achieve that low carbon economy that is part of the objectives set by the European Commission for 2020. For the improvement of the environment and the rehabilitation and enhancement of the natural heritage, the City Council proposes a network of green corridors and actions aimed at improving efficiency in the consumption of water and reduce noise pollution.

Budget

The budget for the actions of this Strategy has been valued at just over 29 million euros, of which 50% can be co-financed with ERDF funds if the strategy presented by the City Council is among those selected, something that will not be known until in a few months and for which it will be necessary to overcome a tough competition, since many cities have presented their urban development strategies to this call that will distribute 70% of the funds available for all Castile and Leon.

INNOLID 2020 strategic keys

INNOLID 2020 focuses on the functional restructuring of the city by focusing on achieving the results described in Table 28:

R1.	Achieve better management and urban and landscape quality		
R2.	Reach a city model socially balanced		
R3.	Regenerate urban infrastructure under premises of energy efficiency and rationalization		
R4.	Decrease CO ₂ emissions and rationalize urban mobility.		
R5.	Building an ecosystem of innovation to attract and fix the "talent"		
R6.	Structure a comprehensive offer of services to citizens		

Table 28: INNOLID 2020 results

The strategy's efforts have been guided by the priorities of Europe 2020, framework of the distribution of ERDF funds intended to finance INNOLID 2020, mainly in the Thematic Objectives (OT) 2, 4, 6 and 9, although not exclusively.

- OT2. Improve the use and quality of information and communication and access to them.
- OT4. Favor the transition to a low economy in all sectors
- OT6. Conserve and protect the environment and promote resource efficiency.
- OT9. Promoting social inclusion and fighting poverty and any form of discrimination.

Other thematic objectives have also been considered:

- OT1. To promote research, technological development and innovation.
- OT3. Improving the competitiveness of SMEs
- OT8. Promote sustainability and quality in employment.

The area of actions for INNOLID 2020

In response to the needs detected in the city based on previous studies and the priorities expressed by the neighbors through the processes of participation carried out by the City Council





of Valladolid, INNOLID 2020 establishes a scope of defined action in order to focus the actions of the strategy and convinced of the multiplier effect of these interventions for the whole city. Initially, the INNOLID 2020 strategy encompasses a field of action covering the entire urban area of Valladolid, that is to say the 12 census districts in which the city is divided.

Given the morphological and growth characteristics that the city has experienced, it seems It is necessary to differentiate between two areas within the city itself, taking as refers to the physical division of the Pisuerga River:

- Area of marked residential character combined with an important administrative and institutional activity.
- The historical and growing area of the city where residential, service and service uses converge with innovation and industry, which the strategy defines as Activity Zone.

INNOLID 2020 in turn subdivides the so-called Activity Zone into 5 strategic development subareas on which the specific actions of the strategy will be focused.

The selection of the Activity Zone is due to the need to focus the actions of the strategy and prioritize the efforts with the aim of carrying out the functional restructuring of the city of Valladolid and achieve the expected and already cited results of urban quality, balanced social model, energy efficiency and rationalization, low carbon economy, innovation and fixation of talent and comprehensive offer of services to the citizen.

A complex plan of action may be found on the local govern web page, below INNOLID 2020. "INNOLID2020" Sustainable and integrated urban development strategy in Valladolid. [86]

The final budget required for the implementation, implementation and management of this Implementation Plan is around 28 million euros. It must be taken into account that EDER funds finance a maximum of 50% of the actions included in the implementation plan and that in this second call the budget allocated to Castilla y León is just over 14 million euros.

Then the city has bet and actively participates in innovative projects launched by the European Commission in various fields such as energy and environment, mobility, citizen and administration. The detailed information is on the website of the City Council. [84]





3.8 Planning and Governance

3.8.1 Introduction

"Governance" means rules, processes and behavior that affect the way in which powers are exercised at European level, particularly as regards openness, participation, accountability, effectiveness and coherence. [...]

PRINCIPLES OF GOOD GOVERNANCE

Five principles underpin good governance and the changes proposed in this White Paper: openness, participation, accountability, effectiveness and coherence. Each principle is important for establishing more democratic governance. They underpin democracy and the rule of law in the Member States, but they apply to all levels of government – global, European, national, regional and local. [...]

Openness: The Institutions should work in a more open manner. Together with the Member States, they should actively communicate about what the EU does and the decisions it takes. They should use language that is accessible and understandable for the general public. This is of particular importance in order to improve the confidence in complex institutions.

Participation: The quality, relevance and effectiveness of EU policies depend on ensuring wide participation throughout the policy chain – from conception to implementation. Improved participation is likely create more confidence in the end result and in the Institutions which deliver policies. Participation crucially depends on central governments following an inclusive approach when developing and implementing EU policies.

Accountability: Roles in the legislative and executive processes need to be clearer. Each of the EU Institutions must explain and take responsibility for what it does in Europe. But there is also a need for greater clarity and responsibility from Member States and all those involved in developing and implementing EU policy at whatever level.

Effectiveness: Policies must be effective and timely, delivering what is needed on the basis of clear objectives, an evaluation of future impact and, where available, of past experience. Effectiveness also depends on implementing EU policies in a proportionate manner and on taking decisions at the most appropriate level.

Coherence: Policies and action must be coherent and easily understood. The need for coherence in the Union is increasing: the range of tasks has grown; enlargement will increase diversity; challenges such as climate and demographic change cross the boundaries of the sectoral policies on which the Union has been built; regional and local authorities are increasingly involved in EU policies. Coherence requires political leadership and a strong responsibility on the part of the Institutions to ensure a consistent approach within a complex system.

EUROPEAN GOVERNANCE - A WHITE PAPER Brussels, 25.7.2001.

Following the principles of the EU on good governance, we can conclude that one of the most important points is the citizen participation based on clear and direct communication with institutions in both directions. The citizen must be able to intervene in the decisions about the management of his / her environment and in the evaluation of this management.





3.8.2 The Government of Valladolid

The government and administration of the City of Valladolid correspond to the City Council, made up of the Mayor and Councilors, elected by citizens in municipal elections every four years.

The Mayor is the maximum representation of the City, directs the politics, the government and the municipal administration.

Municipal decisions, such as controlling and supervising governing bodies, as well as approving and modifying municipal ordinances and regulations, are approved at meetings of the Mayor and Councilors. These meetings are called plenary meetings.

In Valladolid, the plenary meetings are public, citizens can participate to present their arguments, but they cannot vote.

3.8.3 Citizen Participation in Valladolid

Citizen participation is a set of mechanisms for the citizens to access government decisions without needing to be part of the public administration or a political party. Citizen participation includes the access to municipal information and the possibility of participating in municipal management.

On the one hand, in Valladolid, all citizens have the right to submit suggestions and complaints to the Municipal Administration, according to the municipal law <u>Organic Rules Valladolid City</u> <u>Council art. 56.1.</u>

The suggestions and complaints are processed by the Citizen Information and Service. It sends a monthly list of complaints or suggestions to the Special Suggestions and Complaints Commission.

The Special Suggestions and Claims Commission defends the rights of the neighbours in their relations with the Municipal Administration, supervises the actions of the Municipality and proposes improvement actions.

The Valladolid's citizens can contact to the City Council in this channels:

- In person: in the Citizen Services Office.
- By web [88].
- By e-mail: 010@ava.es.
- By telephone: from Valladolid telephone number 010.

On the other hand, citizens from Valladolid have the right of access to public information according to the municipal ordinance, <u>Ordinance of Transparency, access Information and Reutilisation</u>.

The main information channel is the City Council website [89]. In this website you can find information like: municipal budgets, regulations and ordinances, some reports about the city, results of surveys etc.





If citizens look for some information and it does not appear, they could request this information in the Citizen Services Office.

3.8.4 Openness of Participatory Processes in Valladolid

An Openness of participatory processes is the set of public actions in which different social groups or representative people can participate. The aim of these actions is to contribute with different perspectives or visions in relation to a subject of public interest.

Currently there are some participatory processes opened in Valladolid. In these processes the citizen can make suggestions about important urban aspects.

General Urban Planning Plan (PGOU)

The General Plan of Urban Planning (PGOU) is a basic regulation of the territory of a municipality. In this regulation the system of equipment of the city is defined and the land is classified, each classification implies different characteristics of urban development. This is the most important regulation for urban development.

The actual General Plan of Urban Planning of Valladolid proposes a compact, complex, diverse, environmentally friendly and well-designed urban model. The city must consume little soil, little water and little energy, and it must produce few residues and giving priority to the involvement of citizens.

This document is the result of a participatory process. At the initiative of the City Council some meetings took place to discuss concerns regarding the scope, characteristics and criteria of the new PGOU.

25 meetings took place between the September 30th and the December 30th, 2015: 14 thematic and 11 by neighbourhoods, ending with a synthesis on January 13th, 2016, to stimulate citizen participation in the process of preparing the review of the General Plan.

In the thematic meetings, with the tittle *Thinking and living Valladolid*, the participants addressed issues such as:

- The city model for the new General Urban Planning Plan (PGOU).
- The Housing Plan.
- The Rehabilitation Programme.
- The burial of the railway.
- The Mobility Plan (PIMUSSVA).
- Agenda 21.
- Actions in the Urban Community (CUVA).

In the neighborhood meetings, the attendees were able to know and assess the urban planning concerns from the perspective of the neighborhood.

All discussions took place in different social public facilities of the city, with free admission.

After this period of meetings, the conclusions obtained were compiled into a several documents. One of these documents was the General Urban Planning Plan.





Currently the city of Valladolid has opened a new participatory process to review the final version of the new PGOU. This process was initiated on September 1st and ends on November 30th (2017).

Participatory Budgets

In the participatory budgets the citizens can decide the use of a part of public money.

Valladolid City Council will set aside 4 million euros to Participatory budgets for the year 2018, distributed in 500,000 euros for each of the geographical areas in which the city has been divided.

All the citizens over the age of 16 can participate in the process.

The phases of the process are:

- Convocation of Information Assemblies and constitution of zone table.
- Collection of proposals.
- Evaluation.
- Debate on proposals.
- Final vote.

Proposals must achieve these criteria:

- Be under municipal jurisdiction.
- Be technically feasible.
- The cost cannot exceed the amount of € 500,000 per zone.
- Address the basic needs of the population.
- Benefit the largest number of people and groups.
- Attend to groups at risk of exclusion.
- Promoting territorial balance between areas and neighborhoods.
- To have an ecological or sustainable content in favor of the environment.
- Promote gender equality between women and men.

Proposals should be for investment. An investment proposal is one that creates new facilities or improves existing ones. That is, it is something tangible that will be beneficial in the future.

<u>Citizen Questionnaires – Agenda Local 21</u>

Agenda Local 21 is is a set of programmes and activities whose objectives are intended to guide local policies towards the sustainable development of cities.

The origin of Agenda Local 21 dates back to the United Nations Conference on Environment and Development held in Rio de Janeiro. One of the agreements adopted at this summit was the implementation of local action plans, incorporating citizen participation, with the following objectives (among others): fight against poverty, protection and promotion of human health, conservation and rational use of natural resources, combating desertification, protection of ecosystems and conservation of biodiversity, integration of the environment and development in decision-making, etc.

One of the activities which is organized by *Agenda Local 21*, is the citizen questionnaires. These questionnaires are carried out with the objective of knowing the opinion of the citizens of





Valladolid about urban aspects as environment, health, municipal services, mobility, etc. They are filled every three years.

If you want to fill one of these questionnaires you have to use the City Council website [90] and if you want to consult the results, you can find them on Local Agenda 21 [5].

3.8.5 Summary of Challenges

- Complexity in administrative management at the local level of City Council, with long lead times that in some cases could delay the planned development of the projects.
- Perceptions of citizens on urban nature
- Social learning concerning NBS, urban ecosystems and their functions/services.
- Openness of participatory processes, later than citizen's awareness and learning, for collecting citizen's opinion regarding future NBS implementation after URBAN GreenUP demonstrations.
- Know the social values for urban ecosystems and biodiversity.
- Transmit the communication messages of the URBAN GreenUP project to the entire population; especially the citizens directly affected by the location of the actions in the Demo-sites A, B, C.

3.8.6 Potential Actions to be Taken

- Compile all the suggestions related to the implementation of the NBS in Valladolid through the permanently administration channels. As we can see, the citizens of Valladolid can be in touch with the administration permanently, using several channels (Citizen Services Office, website, telephone and e-mail). Through these channels they can make suggestions and complaints about the city. We propose to take advantage of this existing system.
- Create new open participatory processes in which citizens can discuss the implementation
 of BSS in their city. There are few participatory process opened at this moment, and none
 of them is useful for URBAN GreenUP, because they are very specific. For these reason we
 have to create new one.
- Disseminating through different channels the functions and services of the BSS. If we want citizens to participate, they will know all the characteristics of the project. This information could be provided in person (meetings) or on the web.
- Know the social values for urban ecosystems and biodiversity. Take advantage of citizen questionnaires to get the information we want.





3.9 Social Justice and Social Cohesion

3.9.1 Introduction

"While it would not be uncontroversial to argue that there are fundamental links between cities and the environment, the relationship between urban change, the environment and social cohesion may be more contentious. What, you may ask, has social cohesion, the theme of this Special Issue, got to do with the environment? If we take social cohesion to incorporate issues of social (in)justice and (in)equality, we can begin to see that the environment, just as the other 'arenas' examined in this Special Issue, is wrapped up in fundamentally uneven, unequal and often downright unjust social relations.

There a distinctive lack of social cohesiveness in societal relations with the urban environment in terms of access to healthy environments and environmental decision-making structures, for instance, but socio-environmental inequalities are also a fundamental part of the urbanisation process. If the tension between the apparently opposite aspirations of belonging and differentiation galvanises the urban cohesion debate, socio-environmental processes are inextricably related in this dialectical dynamic. From this perspective, the nexus between social cohesion, the environment and cities is a vitally important issue. More importantly perhaps, as the introductory paper to this Special Issue explores, 'social cohesion' should be thought of as a political problem of which ecological concerns are an integral part.

We shall focus here on the dialectic between socio-ecological transformation as a necessary process that undergirds urbanisation on the one hand and the socio-ecological condition of cities on the other. In other words, the problematic of social cohesion for us is one of socio-ecological cohesion whereby the urbanisation of nature and its socio-environmentally enabling and disabling conditions are key processes. Rather than considering the role of nature in the city, we are concerned with analysing how the urbanisation of nature shapes socio-ecological relations. By doing so, the terrain of social cohesion is shifted both epistemologically and politically from considering the domains of nature and the city as separate, yet intertwined, to viewing the contradictions of the urbanisation process as intrinsically socio-ecological ones."

Extracted from "Cities, social cohesion and the environment: Towards a future research agenda" Ian R. Cook et Erik Swyngedouw 2012 in Urban Studies 49 (9).

NBS use the features and complex system processes of nature in order to achieve desired outcomes, such socially inclusive green justice [40]. Natural surroundings can contribute to mental and physical health. Green spaces therefore provide multiple benefits to children, adults and senior citizens. They are also important for bringing communities together and creating a sense of identity, particularly in socially deprived areas [91].

Social justice recognises that society comprises of a diverse set of social groups, with varying requirements, rights and duties that need mutual support, co-operation and acceptance [92]. In green infrastructure planning, most attention has been devoted to environmental justice considering elements of **distribution**, **procedure and recognition** [93], as listed in EKLIPSE [124]:

• **Distributional justice** relates the equal distribution, in both social and spatial terms, of environmental qualities. When there is not equal distribution of environmental spaces





qualities like inequity, privilege, gentrification, and exclusion dominate, appear and promote social inequalities [94] [95]. Actually, greening strategies can support or contribute to the displacement of lower income households and foster the transformation of a residential environment into higher cost or luxury environments, resulting in the increase of unequally i terms of social justice. Many important variables are at play when considering the potential impacts and trade-offs of NBS strategies in social justice and cohesion: the respective local urban and institutional context in which they are implemented, including the areas affected, the type of green or urban nature that is developed, the actors who realise this strategy, and the urban dwellers who are winners or losers of a strategy or a project.Perceptions of citizens on urban nature.

- Procedural justice relates to inclusiveness and fairness in processes and in rule enforcement [96]. Analyses of procedural justice would entail assessments of governance processes, with a critical perspective in relation to differentiated power relations. These assessments, in many countries, entail explicitly democratic processes. Amongst others, Northern European cities are putting forth models for participation and/or citizen involvement in various urban regeneration actions including urban green spaces [97].
- **Recognition-based justice** focuses on the acknowledgement of the elderly and typically excluded social groups (e.g. migrants, women, persons with disabilities) [98].

Support for environmental justice can also support social cohesion in urban areas. For example, supporting processes which enable immigrants to feel comfortable in their living environment supports intercultural understanding [99], [100]. Social cohesion is also a multi-dimensional concept, taking into account of structural and cognitive aspects.

Shared green public spaces can increase social cohesion and reduce social tension. Green spaces in urban areas can be an important factor in community identity, and can strengthen people's attachment to their communities by acting as "green hubs" for social interaction. Engagement through volunteering e.g. in community gardens or conservation projects, is shown to improve social networks and improve one's sense of efficacy and well-being [91].

Challenges to be tackled in order to promote the social benefits of green infrastructure and natural areas include [91]:

- Unequal access to green spaces, which adds to social exclusion Perceptions of citizens on urban nature.
- The role of other social factors e.g. gender, age, relative income, and education, reduce access to green space as proximity is not the only limiting factor for use.
- Design and quality of green spaces affects use and access poor quality environments can become no-go areas.

3.9.2 European and Spanish Legislation

Reducing poverty and social exclusion is one of the targets of Europe 2020. Therefore, several initiatives supporting social cohesion and social justice are promoted. Regarding the Spanish legislation, in the *Ley 5/1999, de 8 de abril, de Urbanismo de Castilla y León* [101] (article 4) the





principles for the public urban development are defined. The following principles concern social justice and cohesion, indicating the willingness of the regional authorities to promote:

- Equilibrated urban and land development.
- Social and economic progress by means of equipment and infrastructures modernization.
- The urban planning must foster the social cohesion by means of the equilibrated mix of land uses, activities and social uses.

3.9.3 The Case of Valladolid

The city of Valladolid participates in several initiatives to promote the social justice and the social cohesion. Although there is no specific legislation to promote the social justice and cohesion within the city, some of the strategies followed for the urban planning include some social considerations. The document stablishing the General Urban Planning (GUP) of 2004 specified the criteria followed during the planning process. The concept of sustainability in its wide meaning is introduced as one of the criteria and takes into account social and ecological aspects among others. Later, within the revision of the GUP made in 2012, it was stablished that the reasons behind urban planning must guarantee infrastructures and services for the city, but also stablish an order space to develop the urban life with environmental, habitability, social equity and functional efficiency criteria [45].

Valladolid has developed several Action Plans in social matters such as the following:

- Municipal Accessibility Plan.
- Municipal Plan on Drugs.
- Municipal Children Plan.
- Plan against Gender Violence.
- Equilibrated urban and land development.
- Municipal Plan for Equal Opportunities between men and women.
- Municipal plan on Immigration intercultural coexistence.

Valladolid also participates in the Plan of the United Nations *Agenda21*. In the latest available Action Plan (2012-2015) there is a Programme of the social dimension of sustainability which demonstrates the engagement of the city government with environmental and social issues. The Action Plan defines different objectives such as: 1.) Promote the implication of the citizens in the decision process to solve environmental problems and the environmental sustainability concept awareness; 2.) Extend the use of sustainability criteria within the municipal administration decision processes among others. Furthermore, some specific measures were defined to achieve the above mentioned objectives. Some of them also concern social cohesion and justice: a) Foster citizen's initiatives regarding the environmental awareness diffusion (such as artistic activities); b) Promote local commerce as a factor of social cohesion; c) Promote handmade activities as a factor of social, cultural and economic development. Also in the context of *Agenda21* some social indicators are defined and analyzed.

Several indicators can be defined to evaluate the social cohesion and justice within a city. The opinion of the city in terms of the quality of life is one of them. The year 2014, a 56.1 % and a 3





- 5 % of Valladolid citizens considered that Valladolid was good and acceptable city to live in regarding its quality of live, respectively. Furthermore, while only a 3% considered it a bad or very bad place to live, the 5.9 % of the surveyed considered that the quality of life in the city was excellent. These figures demonstrate certain attachment to the city and therefore, to the neighborhoods. However, when citizens were questioned about the evolution of the quality of life, only the 40.3 % of the surveyed considered Valladolid had improved while the majority of them (58.7 %) either considered it had worsened or remained stable, 28.8 % and 29.3 % respectively. From these data it could be suggested that Valladolid needs to develop policies to engage its dwellers by providing improvements in the quality of life.

However, within the same survey (made in 2014), citizens were questioned about the grade of satisfaction with their neighborhood and their neighbors. The result was significantly better. Actually, both parameters were graded "satisfactory" or "very satisfactory" by the majority of the surveyed citizens (the 84% and the 83 %, respectively) [5]. These values show great social cohesion within the neighborhoods. However, although citizens consulted showed a great attachment to their closer environment, the whole city was worse evaluated.

Regarding the city security, the total number of felonies and offences committed in 2014 was 11,355 resulting in a ratio of 0.037 felonies/person and year. Types of felonies are shown in Figure 35 [5]. When focusing on the opinion of Valladolid citizens, in 2012 and 2014, most of them were at least satisfied with the grade of city security (71 %). Accordingly, most of the city journeys were made walking (51.3 %) and by bus (18 %) showing that Valladolid citizens felt comfortable walking, biking and taking buses to move around the city (Table 29).



Figure 35: Distribution of felonies per type (2014) [5]

Walking	Bicicle	Motorcicle	Car	Bus	Taxi	NR/DK
51.3	1.4	1.6	26.6	18	1	0.1

Table 29: Distribution of city journeys as function of the transport used [47]





Regarding the traffic security, both the number of accidents with victims and the number of victims decreased significantly from 2002 to 2014 (Figure 36) promoting a more secure city environment.



Figure 36: Evolution of accidents with victims (circles) and number of victims (triangles) from 2002-2014 [5]

Social cohesion is highly related to the participation of citizens in the community life. This can be quantified by the participation of people in organized local associations. The number of associations in the city followed a clear increasing trend from 2003 to 2012, period in which it grew from 750 to 1,123. However, in 2013 the number of association was reduced to 719 [47]. In Table 30, they are classified in 27 categories as function of the association aim. Although not updated figures can be discussed, the engagement of dwellers with the city (including the participation in local associations) is a key parameter to guarantee social cohesion.

Type of association	Number	Type of association	Number
Cultural	232	Young people	66
Student	8	Drug addicts	7
Self-help	51	Religious	3
Consumers and users	6	Cultural and sports	14
Taxpayers	0	Culture and education	17
Disabled people	12	Free time	0
Women	15	Life defendants	1
Elderly people	13	Students parents	
Workers	6	Social services	23
Neighbors	45	Administrative	1
Voluntary service	97	Socio-cultural animation	17
Sports	26	Civil protection	
Ecology 5		Animal protection	3
Business and professionals	15		

Table 30: Distribution local associations per type in 2013 [47]





To evaluate the integration into the local and the wider community, election figures can be discussed. As it is shown in Table 31, 77 % of the registered voters in Valladolid went to the State Elections, while only the 68 % voted for the local elections [47]. When analyzing data from each neighborhood, the same trend is found for the majority of them (Table 31). Although the participation in Valladolid local elections was slightly higher than the Spanish average participation in local elections (64.9 %) [102], it still shows that there is room for improvement in terms of engagement with the local life and decisions. Accordingly, in 2014, only the 27 % of the surveyed citizens considered that their participation opportunities were at least satisfactory [47].

Neighborhood	Local elections: % of votes (with respect to the list of registered voters)	Autonomous community elections: % of votes (with respect to the list of registered voters) 2011	State elections: % of votes (with respect to the list of registered voters) 2011	European parliament elections: % of votes (with respect to the list of registered voters) 2009
Valladolid	67.8	67.79	77.09	54.33
Arturo Eyries (Alto)	68.02	68.27	76.1	53.07
Arturo Eyries (Bajo)	59.22	52.99	64.19	38.45
Arturo León	64.84	66.04	78.02	50.85
Barriada Guardia Civil	66.29	67.96	76.3	53.44
Barrio España	56.46	56.27	65.52	41.07
Batallas	66.15	66.48	75.82	53.85
Belén	65	63.36	73.81	48.54
Caamaño-Las Viudas-Polígono San Cristobal	62.9	61.27	71.75	46.46
Camino de la Esperanza	69.73	69.37	81.01	56.7
Campo Grande-Arco de Ladrillo	70.55	71.2	79.41	59.01
Caño Argales	69.51	70.25	78.59	59.23
Centro	71.14	72.32	80.14	61.77
Circular	66	68.83	77.08	56.82
Cuatro de Marzo	66.26	67.82	75.33	57.54
Delicias	66.53	67.08	76.81	52.44
El Pinar de Antequera	70.31	68.77	77.38	52.96
Girón-Villa del Prado	72.17	69.56	79.23	54.03
Hospital	67.66	68.16	76.65	55.56
Huerta del Rey (Alta)	72.67	73.09	81.1	59.81
Huerta del Rey (Baja)	71.52	72.59	80.08	66.22
Huerta del Rey (Gavilla)	63.91	57.03	68.84	44.97
Huerta del Rey (Insonusa)	74.9	72.99	83.96	60.37
Huerta del Rey (Media)	60.12	60.15	69.46	43.69
La Overuela - Navabuena - El Berrocal	72.91	73.38	81.33	61.23
La Rubia	64.52	63.95	74.7	51.21





Neighborhood	Local elections: % of votes (with respect to the list of registered voters)	Autonomous community elections: % of votes (with respect to the list of registered voters) 2011	State elections: % of votes (with respect to the list of registered voters) 2011	European parliament elections: % of votes (with respect to the list of registered voters) 2009
Avenida de Burgos-Canal de Castilla	67.71	66.59	76.46	52.9
Las Flores	63.01	62.23	71.37	42.02
Las Villas-Cañada Puente Duero-Covaresa- Parque Alameda-Paula López	70.91	70.47	80.28	55.57
Pajarillos Altos	64.88	61.57	73.7	45.97
Pajarillos Bajos	64.12	63.35	73.57	49.47
Páramo San Isidro-Campo de Tiro	62.51	56.16	71.52	39.71
Parquesol	70.61	70.76	80.2	55.4
Paseo Zorrilla (Alto)	68.82	71.11	79.31	58.8
Paseo Zorrilla (Bajo)	69.53	73.14	80.94	62.43
Pilarica	67.38	65.54	75.58	51.57
Polígono de Argales	62.19	62.87	75.1	53.04
Puente Duero	57	55.97	70.2	42.86
Rondilla	65.61	65.06	74.39	51.42
San Juan	73.35	75.16	82.24	61.18
San Juan II	68.88	70.84	79.73	59.04
San Miguel	73.64	74.04	81.4	63.65
San Nicolás	68.18	68.31	77.9	58.01
San Pablo	72.7	72.61	79.2	60.62
San Pedro Regalado	65.92	62.36	71.4	50.62
Santa Clara	67.61	68.94	77.24	55.8
Universidad	71.66	72.67	80.06	60.18
Vadillos	65.43	65.38	74.58	50.82

Table 31: Percentage of participation in local, autonomous community, national and European electionsof the last year with available data [47].

Beyond local elections, to promote peoples' effective participation in political choices, Valladolid's local government has started a process called *Presupuestos Participativos 2018* (Participative Budget 2018) (Figure 37). During this decision process, citizens from Valladolid can submit suggestions to decide the topic of investment for a budged of 4,000,000 euros. The investment will be distributed to 8 zones (500,000 euros each) (Figure 37). At the moment this diagnosis was made, 1,519 suggestions were made (equally distributed between zones – in average, 155±33 suggestions per zone) [103]. More into detail, suggestions are divided in topics as function of the investment area. In Table 32 it is shown that "Urban planning" and "Environment and Cleanliness" are the two top topics in which citizens consider investments are a priority. Therefore, this participation initiative will include people into the decision processes about environmental management and green space investment. However, at the moment this





diagnosis was conducted, less than 1 % of the population participated in the initiative making proposals which shows that there is room for improvement in terms of participation to foster social cohesion.



Figure 37: Presupuestos Participativos 2018. (a) Poster of the participation initiative; (b) Zones in which the budged is distributed [103]

	TOTAL
Culture	45
Sports	172
Economy	7
Education	43
Employment	11
Equality	13
Environment and cleanliness	362
Citizen participation - associations	73
Health and consume - Animals	61
Security and emergencies	25
Social Services	19
Transparency	3
Transport and mobility	159
Tourism	22
Urban planning	504

Table 32: Presupuestos Participativos 2018. Number of suggestions made at 12/09/2017 as function of
its topic. [103]

Regarding the Environmental management, Valladolid promoted peoples' participation with two other processes. The first one is the participation of the City Council in the above mentioned United Nations Plan, Agenda 21. Apart from the objectives to follow and measures to be taken established in the agenda which are related to the environmental and social justice, the definition of them itself constitutes a participation initiative which integrates several actors of the civil society. More into detail Local Agenda21 is defined by a Municipal Council which meets at least 4 times per year and is formed by members from the: (1) Valladolids' local government; (2) government of some municipalities around Valladolid; (3) principal labor union groups; (3) business organizations; (4) neighbor's associations; (5) consumers' and users' associations; (6) University of Valladolid; (7) local environmental associations; (8) local parties; (9) NGO with




social aims working in Valladolid; (10) autonomous community government [104]. Finally, Valladolid's government participated in a LIFE Project called Quick Urban Forestation which follows the aim to reforest urban areas with deteriorated conditions [105]. This project included different participation initiatives such as the plantation of trees by primary school students or a wider decision process to find a name for the urban forest.

3.9.4 Summary of Challenges

- Scarcity of updated information about KPI prevents a detailed diagnosis of the city.
- Scarcity of indicators at neighborhood level which is necessary for any proper diagnosis.
- Scarcity of programmes focused on green intelligence awareness.
- Large number of felonies occurs within the city, especially there is a large number of thefts.
- Violent criminality and robberies, homicides and murders still happening in the city.
- Room for improvement in terms of participation of the people in the city decision processes such as elections or participative budget initiatives.
- Concentration of sale and consumption of drugs, low economic resources, gypsy ethnic minority, in Pajarillos Bajos neighborhood.
- High levels of unemployment, especially in the young people
- Scarcity of engagement of Valladolid's citizens with local policies.

3.9.5 Potential Actions to be Taken

- Generate information systems at neighborhood level to obtain data of the defined KPI.
- Foster actions to reduce the criminality within the city.
- Promote initiative to eradicate violent criminality and robberies.
- Promote initiatives to foster green intelligence awareness within population.
- Generate information systems at neighborhood level to obtain data of the defined KPI.
- Promote initiatives to engage citizens with participation processes.
- Promote initiatives to foster citizen's awareness about the importance of participating in city decisions processes about local policies.





3.10 Public Health and Well-being

3.10.1 Introduction

"Well-being and health.

The relationship between health and well-being is fundamental and reciprocal, and the wellbeing of populations has important implications for the health sector for several reasons.

- Well-being offers a more integrated model of health one that does not separate the mind from the body.
- Well-being as a concept is meaningful to the public.
- Higher levels of well-being are associated with decreased risks of disease, illness and injury, better immune functioning, speedier recovery and increased longevity
- Well-being has a predictive value. For instance, life satisfaction scores can predict behaviours such as suicide.

In addition, just as income indicators are an insufficient proxy for the progress of society, disease and mortality figures cannot provide a holistic picture of a population's health. Evidence clearly indicates that people can live well in spite of mental illness and, conversely, that their quality of life can be poor even though they may exhibit good mental health."

Extracted from WHO Regional Office for Europe "The European Health report". 2015.

The urban environment significantly affects the health and well-being of residents [106]. NBS are supposed to improve the health and well-being of urban residents through the provision of ecosystem services by access to green space [107] that may produce health benefits through various pathways some of which may have a synergistic effect [108]. Nature or green space may contribute to health through four principal and interacting pathways: improved air quality, enhanced physical activity, stress reduction and greater social cohesion [109], [110].

Studies have identified positive health associations between distance to urban green spaces and potential health benefits, suggesting that being in proximity to urban green spaces [111] and viewing greenery have positive health effects [112], [113]. Additional benefits include reduced depression [114] and improved mental health [115], [116], [117]; reduced cardiovascular morbidity and mortality [118], [119]; improved pregnancy outcomes [120]; and reduced obesity [121] and diabetes [111]. Urban green space also provides opportunities for exploratory behaviour in children and improved functioning of the immune system [122], [123], [124]. Also, many studies have related children health and wellbeing with nature. Nature areas are found to improve children's concentrations, physical activity, self-esteem and emotion regulation. Children with attention deficit disorder concentrate better after a walking in the park [125]. Also, when playing and studying environments support social and cognitive development of children [126].

A study revealed that in Europe, low physical activity level is one of the biggest health risk [91]. Almost two over three part of the adults and 8 % of young people do not reach the minimum levels of aerobic physical activity (minimum 150 minutes/week) [127]. Greatly due to physical inactivity and unhealthy diet, more than a half of the EU population is overweight or obese [128].





Proximity to nature increases the frequency and duration of physical activities [129] and activities like urban orchards can contribute to healthy habits among citizens.

For obtaining green space benefits, green space must be safe, aesthetic, equipped, accessible and close to the user's home [99]. Moreover, the presence of specific facilities for certain activities encourage sport's practise. A study in Ontario, Canada, park facilities such as a paved trail, water area, and playground were more important for physical activity than park amenities such as a drinking fountain, picnic area, and rest-spaces [130]. Another study found that people who use public open spaces are three times more likely to achieve recommended levels of physical activity than those who do not use the spaces. Users and potential users prefer nearby, attractive, and larger parks and open spaces [131].

In Alnarp (Sweden), the Alnarp rehabilitation garden offered treatment to the patients suffering from severe stress and depression a nature based rehabilitation (NBR) in their installations. The patients have been shown to reduce their reliance on conventional health care provisions when participating in NBR reducing their visits to the primary healthcare and the inpatient psychiatric care. One year after rehabilitation the costs of primary care in the dropped by 28 % for the intervention group in Alnarp (8 % reduced in controls receiving rehabilitation as usual) and, in terms of days spent in the hospital, they had fallen 64% (controls 23 %) [132]. The participants experienced improvements in their daily function, general health, as well as reduced stress symptoms and a heightened sense of coherence. In England, the benefits of urban green-spaces for physical and mental health have been estimated to reduce treatment costs by £2.1 billion [133]. In the US, an evaluation of the largest 85 cities in the country (population of 57.2 million) found the health savings from parks was an estimated \$3.08 billion [134].

Besides, one effect affecting to human health and concentrated in high-density build-up urban areas is called "Urban Heat Island" (UHI), arises due to replacement of vegetation with heatabsorbing surfaces in urban areas. It can be controlled with a low proportion of green space [135] like urban trees and vegetation that can provide climate regulation services as they reduce the UHI-effect through evapotranspiration, and shading and can thus prevent heat related morbidity, and mortality [136]. A systematic review and meta-analysis of literature on how urban parks affect the air temperature in urban areas showed an average cooling effect of approximately 1°C [137]. Moreover, while mitigating UHI effect, NBS may reduce exposure to environmental pollution reducing air pollution [137] [138] [139] and noise [140].

However, urban green spaces can also be related to negative health outcomes, such as allergic reactions because of increased exposure to allergenic pollen or increased disease vectors in urban green environments. These potential detrimental effects may be addressed through the adequate design, maintenance and management of urban green spaces and species selection [124].

3.10.2 EU Supporting Initiatives

Promoting good health is an integral part of Europe 2020 programmes. Many policies and actions have an impact on health and health systems across Europe. Broad policy approaches are therefore needed, to ensure that health is an integral part of all relevant policy areas,





including environment, social and economic policies. Two flagship initiatives, among other health programmes, are "The Innovation Union" [141] and the "Third Health programeme 2014 - 2020" [142]. The Innovation Union" aims to maximise the EU's capacity for innovation and research and channel it towards societal challenges making Europe a world-leader in developing innovative ways to promote active and healthy ageing – a challenge common to all European countries. On the other hand, Health 2020 is the new European health policy framework that aims to support action across government and society. The third EU health programme is the main instrument the European Commission uses to implement the EU health strategy. It is implemented by means of annual work plans which set out priority areas and the criteria for funding actions under the programme. The total budget for the programme is \notin 449.4 million. The programme has 4 overarching objectives. It seeks to:

- 1. Promote health, prevent diseases and foster supportive environments for healthy lifestyles taking into account the 'health in all policies' principle.
- 2. Protect Union citizens from serious cross-border health threats.
- 3. Contribute to innovative, efficient and sustainable health systems.
- 4. Facilitate access to better and safer healthcare for Union citizens.

The final objectives of theses health initiatives can be achieved, partly, by incorporating nature based solutions in the urban environment. Moreover, there are specific initiatives for fighting specific health disorders like the *Strategy for Europe on Nutrition, Overweight and Obesityrelated Health issues* [143]. Obesity is affecting 17 % of the adult population in Europe and NBS are expected to help and promote physical activity in an optimal environment.

3.10.3 The Case of Valladolid

In 2016, Valladolid municipality initiated a strategy that proposed the progressive development of interventions identified as good practices and based on scientific evidence, aimed at promoting health, preventing diseases, injuries and disability, acting in a comprehensive manner throughout the life course on factors such as physical activity, food, tobacco, alcohol and emotional well-being, taking into account the urban environments in which the population live and with a vocation of universality of interventions.

The actions that were initiated in a first phase were focused on children population, schools and elderly population. These were specifically based on:

- Comprehensive advice on healthy lifestyles: Providing quality information so that all people can develop healthy lifestyles based on recommendations and support to citizens on how to make their lifestyles healthier.
- Linking lifestyle advice to community resources: Information and collaboration will be provided on the resources (sanitary or otherwise) available in the area to promote healthier lifestyles. In this way, resources offered in the health environment are coordinated with those available in the community and in the educational environment.
- Helping vulnerable groups: For the population over the age of 70, follow-up plans will be developed to improve health and prevent frailty, understood as a situation of greater





vulnerability and risk for disability and dependence on the elderly. The aim is for the older population to maintain the highest level of autonomy for as long as possible.

The local environment was considered an essential environment for the Strategy and to gain health in the municipality.

Physical activity constitutes one of the main factors to promote health and well-being. And it is closely related to green infrastructures in which citizen can practice sport. Valladolid has several initiatives to promote sport within the population. In 2013 Valladolid had 26 sport focused associations [47]. However, the number of subscribers to local swimming pools has been steadily decreasing from 2005 to 2014 (Figure 38). Although being partial data, it shows a negative trend in terms of sportive habits of the population. If we focus on the middle age population (from 18 to 60), their participation in terms of the percentage of subscribers to local swimingpools steadily decreased from 2002 to 2014. This decrease went to the point that, although within the group there are people from the widest range of ages (18 to 60 years), they only represent the 38 % of the subscribers (Figure 38). Contrarily, when focusing on elderly people, which is a target group of population within the European 2020, the number of subscribers to physical exercise activities targeted to people older than 60 years has drastically increased from 2002 to 2014 (from 642 to 1,639 subscribers (Figure 39). Further than that, the 54±2 % of the journeys within the city were walking and biking. Finally, when consulted during the investment and participation initiative of "Presupuestos participativos 2018" [103], the number of sports-related investments suggested by citizens was sports-related, following urbanism and environment and cleanliness (Valladolid City Council, 2017c) [103]. Therefore, there are reasons to suggest that Valladolid's dwellers are interested with sport-related issues and hence, will integrate any NBS that promoted sportive lifestyle thus improving populations' health.



Figure 38: Number of subscribers to local swimming pools [103]







Figure 39: Number of subscribers to physical exercise activities targeted to people older than 60 years

Physical activity is directly related to cardiovascular morbidity. In 2015 diseases related to the circulatory system represented the 15 % of the total and were distributed between age ranges as drawn in Figure 40. As expected, the 80 % correspond to the elderly people. However, there were still 1495 and 239 hospital discharges of people between 40 and 60 years and 20 and 40 years, respectively [144].



Figure 40: Number of hospital discharges related to the circulatory system morbidity [144]

Obesity is another consequence of the lack of activity of the population and a key indicator of public health. In the autonomous community of Castilla y Leon, in which Valladolid is located, in 2011 the 20 % of children and teenagers (between 2 and 17 years old) presented overweight or obesity. Also the 57 % of the children younger than 15 years did not practice exercise regularly [145]. As a result of this diagnosis, Valladolid City Council created a Plan for the Infancy (2011-2014) which aimed to promote and defend infancy rights. Within the strategic actuation area of "Environment and Well-being", there was planned a specific activity focused on the prevention of the obesity [145].

Healthy lifestyle contributes to the overall well-being of the population which, as shown in Figure 41 was negatively evaluated from 2002 to 2014 (except for 2012). As it is seen, less than 50 % of the surveyed people continuously considered that the well-being in Valladolid was good





or excellent. The implementation of NBS in urban area should improve both health and lifestyle of the population thus contributing into their well-being.



Figure 41: Perception of the well-being in Valladolid [47]

Noise within the city is another factor negatively affecting the well-being of the citizens. Accordingly, from 2002 to 2014, around 10% of the surveyed persons considered that noise was their most important problem regarding well-being. As a consequence, Valladolid City Council, as the responsible authority, has developed an Action Plan against noise in the city (more information in section 3.6.3).

3.10.4 Summary of Challenges

- Low participation in percentage of middle-age people in sports-based activities.
- Existence of the opinion between Valladolid's citizens about the lack of sports-based infrastructures-initiatives.
- Prevalence of obesity between children and young people.

3.10.5 Potential Actions to be Taken

- Promote the creation of open-spaces based on NBS for sports practice and leisure activities.
- Foster the number of recreational and sports-based activities organized at outdoor green areas.
- Foster the participation of middle age and elderly people in sports-based activities.
- Gather Valladolids' dwellers interest in sports-activities/infrastructures and generate successful solutions to promote the physical activity.
- Reduce circulatory system morbidity and mental health problems by promoting healthy life through urban green spaces generation.
- Promote initiatives in order to reduce children and young population obesity.





3.11 Economic Opportunities and Green Jobs

3.11.1 Introduction

"EU Green Week 2017 (29 May-2 June) is on the theme: 'Green jobs for a greener future'. Green Week will focus on how EU environmental policies are creating green jobs and contributing to economic, sustainable and socially responsible growth in the EU. It will also highlight the demand for new types of green skills in many professional sectors.

EU policies, in particular the Circular Economy Package adopted in December 2015, are helping to make the transition towards a circular economy a reality. This will encourage fundamental changes across the entire EU economy, including the labour market. As companies develop new, sustainable business models, expand their markets and adapt innovative solutions to efficiently use resources, this can translate into more jobs.

The EU's developing green economy has proven itself to be resilient, and has seen sustained job growth in recent years. The European eco-industry employed around 2.2 million people in 2000. Now, it employs over 4.2 million people."

Developing green skills

"The transition to a green economy requires new skills. Such skills are needed both to 'green' existing jobs and to do new types of work. This will require adjustments to the current training and qualification frameworks for some occupations.

Skills gaps and shortages are already recognised as a major bottleneck in a number of green sectors, such as renewable energy. These gaps, which affect SMEs in particular, are challenging. At the same time, they provide an opportunity to establish new and useful occupations. Adaptation of education and training systems is therefore an essential element in enabling a successful transition towards a circular economy."

Daniel Calleja Crespo: "Green jobs for a greener future." European Commission's Director-General for Environment Extracted from EU Commission publication "LIFE greening jobs and growth", 2017.

The most widely used and authoritative green economy definition comes from UNEP.

"[A] green economy [is] one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. UNEP" [146].

Green economy can refer to sectors (e.g. water), topics (e.g. pollution), principles (e.g. polluter pays) or policies (e.g. economic instruments). It can also describe an underpinning strategy, such as the mainstreaming of environmental policies or a supportive economic structure.

Several definitions of green jobs are available in literature. A progress toward goals defined by green jobs can be measured by a wide range of indicators, such us better integration, poverty reduction or reduction in CO₂ emission. Green jobs should be understood as decent jobs that contribute to preserve or restore the environment, both in traditional sectors such as manufacturing and construction and new, emerging sectors such as renewable energy and energy efficiency.





3.11.2 EU Legislation on Green Jobs

There are different groupings in different countries about green jobs, but millions of green jobs already exist in industrialized countries, emerging economies and developing countries alike:

- Ecoturism is, according to The International Ecotourism Society, "responsible travel to natural areas which conserves the environment and improves the welfare of local people." Ecotourism-related jobs include:
 - Wildlife visitor centre educator, who hosts and informs tourists of the wildlife and ecological features in a locale with an emphasis on conservation;
 - Conservation programme manager, who oversees the development and operation of wildlife and natural lands conservation programmes,
 - Wildlife research scientist or research assistant, who conduct research into the ecology and management of threatened wildlife.
- Sustainability consulting and coordination international businesses had adopted sustainability practices, such as recycling and waste management, curtailing energy usage, preventing or reducing water, air and land pollution, and managing carbon emissions. Some green jobs in this sector include:
 - Sustainability consultant, who identifies and advises organizations on specific changes to make to reduce their ecological footprint;
 - Sustainability coordinator, tasked with overseeing the implementation of sustainable practices and methods;
 - Sustainability officer, who in a larger organization heads up all functions and staff related to sustainability efforts;
 - Carbon analyst, specializing in assessing and reporting on an organization's carbon footprint or the amount of harmful greenhouse gases it is emitting.
- Other areas of opportunity, green jobs opportunities abound in many other areas, such as:
 - Socially responsible investing,
 - Environmental Education
 - Sustainable agriculture,
 - Green business certification,
 - Water treatment and management,
 - Land use management,
 - Environmental law
 - Clean energy...
- The energy efficiency sector focuses on reducing energy waste in industrial, commercial and residential settings so existing energy resources can go further. Some green jobs in this sector include:
 - Energy auditors, who evaluate and calculate the energy efficiency of equipment and operations in a variety of settings;
 - Building performance analysts, who evaluate the construction of buildings to identify and recommend fixes for systemic energy efficiency problems;





- Weatherproofing specialists, who implement weatherproofing techniques in buildings; and
- **Renewable energies,** Focused in energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural (off-grid) energy services. Some green jobs:
 - Solar Energy Engineer who designed and tested machinery; develop ways of improving existing processes. Solar photovoltaic was the largest employer, with 3.1 million jobs, up 12% from 2015 [147].
 - Hydropower plants capture the energy of falling water to generate electricity. For example workers had to identify or address malfunctions of hydroelectric plant operational equipment, such as generators, transformers, or turbines.

In renewable energies, the fourth edition of Renewable Energy and Jobs – Annual Review from IRENA provides the latest available estimates and calculations on renewable employment. Figure 42 highlights employment trends by technology. Global renewable energy sector employed 9.8 million people in 2016 – a 1.1% increase over 2015.



RENEWABLE ENERGY EMPLOYMENT BY TECHNOLOGY

Figure 42: Renewable energy employment by technology.

In <u>Solar Photovoltaic</u>, declining costs and supportive policy frameworks in several countries around the world led to a record year for solar in 2016, leading to significant job creation. New capacity additions surpassed those in 2015 by around 50% to reach 71 gigawatts (GW), with China, the United States, Japan and India as the key markets. Employment increased by 12% to approach 3.1 million jobs in 2016.





Worldwide employment in <u>biofuels</u> is estimated at over 1.7 million, an increase of 2%. Most of these jobs are generated in the agricultural value chain – in planting and harvesting various types of feedstock. Fewer jobs, though often better-paid ones, are found in the construction of fuel processing facilities and in O&M of existing plants.



Figure 43: Renewable energy employment by technology. (Source: IRENA, Renewable Energy and Jobs, Anual review 2.017)

Figure 43 provides the latest available estimates and calculations on renewable employment for selected countries. The renewable energy sector employed 9.8 million people, directly and indirectly, in 2016. Employment in large hydropower decreased by 7% to reach 1.5 million. Most of these jobs were in China, India and Brazil. Employment in renewables, excluding large hydropower, increased by 2.8% to reach 8.3 million in 2016, with China, Brazil, the United States, India, Japan and Germany being the leading job markets.

In 2015, jobs in the European Union decreased slightly by 5,500 jobs to reach 1.16 million in 2015. While the solar industry continued to experience job losses, employment in geothermal and solid biomass increased. The wind industry remains one of the mainstays of the renewable energy sector in Europe. Employment declined slightly to 329,700 in 2015 (EurObserv'ER, 2017). Germany was the leader in wind jobs with 43% of the total in the European Union, followed by the United Kingdom, Denmark, Italy and France. However, the Global Wind Energy Council has noted that ongoing economic crises and austerity measures as well as weakened legislative frameworks may have harmful effects in 2016 (GWEC, 2016). Offshore wind drove total wind investments, with the United Kingdom, Germany and Denmark as the leaders in employment (Pialot, 2017). The European solar PV industry continued to see a fall in employment in 2015. Germany, the United Kingdom, France, and Italy are the leaders, with 67% of the European PV jobs in 2015. In solid biomass (for heat and power applications), employment rose 7.4% to 333,300 jobs, close to the peak of 2013. The biofuels sector employed close to 93,000 people, a slight decline from 2014. Another sector that added jobs is the heat-pumps industry, providing livelihood for 110,000 people. Biogas, small hydropower and CSP all saw small reductions.





While a green economy will create new jobs and open new markets, Europe's competitiveness, innovative capacity and productivity will strongly depend on the availability of skilled workers. This means fostering skills developments; and better forecasting skills needs across sectors and industries to allow the relevant authorities and stakeholders to adapt to change

In order to ensure that the green transition lead s to better jobs, the health and safety aspects also need to be considered, in particular emerging risk linked to the development of green technologies. While more sustainable technologies, products and processes are likely to decrease the risk of harmful exposure for workers, potential new hazards need to be carefully assessed and integrated in prevention strategies to anticipate, identify, evaluate and control emerging hazards and risks [147].

Supporting job creation

EU funding should be used to support the green transition. In addition, shifting taxation away from the labour towards environment taxation, green procurement and green entrepreneurship are equally important areas to support green job creation.

Shifting taxes from labour to environmental taxation

One third of the Member States have space for such a tax shift while another third have scope to improve the design of existing environmentally-related taxation [148].

Such reforms should consider the employment effects of targeted labour cost reductions, such as for low-skilled workers, in comparison to overall cuts, as well as the distributional impact of the shift to green taxes. A number of Member States have received country-specific recommendations in this field under the European Semester. In addition, Member States could use some of the auctioning revenues from emission allowances under the EU ETS to lower labour costs, which can have an overall positive impact on employment.

Making efficient use of EU funding

European Structural and Investment Funds (ESIF) are key sources of investment to promote sustainable growth and job creation. The key EU financial instruments to support skills provision, job creation and transitions in the greening of the economy include:

- The <u>European Social Fund (ESF</u>) co-finances labour market activation measures, measures to smooth the transition into work and the upgrading of knowledge and skills. The ESF can support labour force transitions towards greener jobs, help address skills shortages and improve VET systems (including through the adaptation of curricula).
- The <u>European Regional Development Fund (ERDF)</u> supports investments in energy and resource efficiency, renewable energy, waste and water management, green infrastructure, biodiversity conservation and protection, eco-innovation, education infrastructure and research, development and innovation in low-carbon technologies. Regions will have to invest a minimum share of ERDF resources in measures related to a low-carbon economy (20% for more developed regions, 15 % for transition regions and 12 % for less developed regions).





- The <u>European Agricultural Fund for Rural Development (EAFRD)</u> supports investments in agriculture, forestry, the environment, rural business and infrastructure including investments in renewable energy and energy efficiency, resource management (water, waste, land, etc.), and innovation. Member States will have to invest a minimum share of 30% of the total contribution from the EAFRD on climate change mitigation and environmental issues.
- <u>The programme for the 'Competitiveness of Enterprises and SMEs' (COSME)</u> and <u>'Horizon</u> <u>2020'</u> aim to contribute to economic growth and employment by supporting projects dealing with innovation, including renewable energies, energy efficiency ecosystem restoration and re-naturing cities.
- The <u>LIFE programme</u> supports a number of targeted innovative environmental and climaterelated projects with an impact on jobs and skills, including through the Natural Capital Financing Facility and the Private Finance for Energy Efficiency Instruments (Table 33).





Country	Nr. of Projec ts	Total cost	Jobs (FTE) 1 year before the project	Jobs (FTE) during the project*	Jobs (FTE) 5 years after the project	Jobs per project*	Jobs per €1 million invested*
Austria	3	29,059,041	12	25	18	8,3	0.9
Belgium	8	43,727,064	8.7	15.7	7.1	2.0	0.4
Bulgaria	6	13,203,388	3	102.5	63.5	17.1	7.8
Croatia	1	4,592,898	0	10	5	10.0	2.2
Cyprus	1	1,183,922	25.2	25	0	25,0	21.1
Czech Republic	1	607,879	0	6.9	0	6,9	11.4
Denmark	10	40,813,503	143.8	177.35	242.7	17.7	4.3
Estonia	6	11,098,627	0	22.9	10	3.8	2.1
Finland	3	33,603,905	15	25	0	8.3	0.7
France	9	38,837,391	51.3	71.5	2.2	7.9	1.8
Germany	14	11,098,627	5.1	16.4	1.2	1.2	1.5
Greece	2	3,005,349	20	46,2	6,4	23.1	15.4
Hungary	6	16,786,075	55	68.7	30	11.4	4.1
Ireland	6	18,904,487	6,5	31	11	5.2	1.6
Italia	52	125,915,181	45.4	621	243.2	11.9	4.9
Latvia	10	16,454,956	6	126.1	105.3	12.6	7.7
Letonia	5	5,581,382	0	70.8	37.6	14.2	12.7
Luxembourg	1	2,529,816	0,3	0	0	0	0
Malta	4	7,617,528	2	35.8	12.1	9	4.7
Netherlands	5	30,186,439	0	4	4	0.8	0.1
Poland	28	83,495,774	36	167.6	38.4	6.0	2.0
Portugal	14	33,492,003	45.4	180.4	60.4	12.9	5.4
Romania	2	7,101,316	11	58.7	2.9	29.4	8.3
Slovenia	9	27,587,589	83.9	190.7	105	21.2	6.9
Slovakia	10	28,853,292	2	120.1	20	12	4.2
Spain	43	93,249,933	32.5	483.3	390.7	11.2	5.2
Sweden	8	46,525,277	0	50	26	6.3	1.1
United Kingdom	14	58,165,046	37	151.4	16.9	10.8	2.6
Total	281	833,277,688	647	2904	1459,4	10.3	3.5

Table 33: Jobs in LIFE Nature and Biodiversity projects (2007 to 2014) Source: Natura 2000 [149]

Life's projects relating to conservation of nature and biodiversity allowed generating more than 3,000 jobs between 2007 and 2014, being Spain the second country where more green jobs have been created. Source of information "Natura2000 and jobs" developed by the Institute for European Environmental Policy (IEEP).





	Direct Jobs	Indirect Jobs	Induced Jobs
Conservation Objectives			
Natura 2000 Management	E.g. Protected area managers, wardens	E.g. In construction, capital	I.e. jobs through induced spending through income as it flows through the economy (multiplier
Restoration	Land management contractors; hydrologists	instrumentation	
Sustainable Production			enectj.
Fish	E.g. Fishers	Also jobs along the supply chain: packers, transformers (fish, furniture, food),	The level depends on: • The savings rate of different income groups that receive the money and how fast money flows
Timber	Foresters		
Agricultural crops	vicinity (pollination)	distributers, retailers, shops	
Integration into Sectors,	through the economy		
Tourism	E.g. Guides	Recreation and tourism infrastructure & services; hotels, transport, restaurants; Health centres and spas:	 How open the economy is (the more
Recreation & Health	Sports trainers; wardens		open, the more money flows out, the lower
Climate Change	Land and marine are management, contractors	Construction, capital goods	the multiplier)
Research & Innovation	Scientists & teachers	innovation	and/or multipliers

Figure 44: Types of jobs supported by Natura 2000 – direct, indirect and induced jobs (Source: Natura 2000 [149])

Figure 44 illustrates how different activities in and around Natura 2000 sites contribute to jobs. The management of sites themselves, the production of goods and services in agriculture, forestry and fisheries, and numerous other activities in tourism, recreation, research or health contribute to direct, indirect and induced jobs. Furthermore, resilient ecosystems provide a wide range of ecosystem services that are essential for the wider functioning of the economy, such as freshwater or protection against natural risks (e.g. coastal protection) [150].

The Commission encourages and supports the setting-up and implementation of financial instruments co-financed by the European Structural and Investment Funds through the Financial Instruments – Technical Advisory Platform (FI-TAP) and other joint instruments with the EIB Group. These instruments can leverage additional private investment in the greening of the economy and can help realise the related jobs potential. Synergies between programmes at national and at EU levels should be further developed.

Promoting entrepreneurship

Access to finance is a problem for any start-up and those active in the green economy are no exception. The Commission, together with the European Investment Bank, established a Natural Capital Financing Facility to support, amongst other things, natural capital-related projects and small and innovative pro-biodiversity and climate adaptation enterprises. The recent rise in microfinance activities in Europe has led to more than 30% of microcredit providers providing green microcredits and an additional 10% currently developing such credits [151].

The social economy and social enterprises have a significant potential for providing high quality employment in areas such as energy efficiency and renewable energies, organic farming and ecotourism, or the circular economy with activities related to reuse, repair or recycling. The identification of effective up-scaling strategies for green social enterprises and raising awareness about opportunities could inspire others to be entrepreneurs. According to recent estimates,





42% of SMEs have at least one full or part-time green employee – a 5% increase since in 2012 – amounting to more than 20 million jobs across the EU. The Green action plan for SMEs includes actions to support green entrepreneurship for innovative and circular business models in the companies of the future.

The shift to a green and resource efficient economy is above all an opportunity to increase European global competitiveness, to secure the well-being of future generations, and to support sustainable and high quality employment, while contributing to the recovery from the recent economic crisis.

Employment and labour markets policies at large need to play a more active role in supporting job creation and in matching labour and skills demands related to the transition to the green and resource efficient economy. To this end, the following priorities should be pursued [152]:

- Improving integration and coordination of existing European and national level policies and initiatives;
- Further developing governance structures and methodological tools to facilitate the transition towards a green and resource efficient economy, to better coordinate policies and to ensure consistent monitoring of reform measures; and establishing a closer working relationship and dialogue with social partners on the employment challenges for greening the economy;
- Further strengthening the existing Commission skills intelligence tools and networks to better anticipate and monitor developments in sectors and occupations linked to green growth, resource efficient and circular economy;
- Ensuring that EU and Member States funding programmes and policies support the job creation in the green economy;
- Monitoring progress related to green employment in the context of the Joint Employment Report;
- Working towards an international playing field in promoting green and inclusive growth;
- Building on the recommendations of EREP to develop a broad strategy for greening jobs, skills and education.

With this project, we will endorse this green employment initiative and contribute to the further development of actions to achieve an integrated approach to sustainable growth and jobs in the EU and outside the EU.

An initiative rolled out across **Spain** provided grants to projects in order to empower companies and individuals to exploit opportunities in the environmental sector.

The Green Jobs programme mobilised EUR 45 million to create or grow existing environmental companies and to help thousands of workers acquire 'green' skills. The focus on growth paid dividends as more than 1,800 new jobs were created thanks in part to the programme's range of interventions.

The programme promoted sustainability, eco-innovation and the modernisation of businesses through the implementation of environmental management systems. Special attention was paid to helping workers in declining economic sectors re-skill for the green jobs market.





More than 60,000 people acquired new skills through around 2,000 training courses. The programme also helped to create or grow more than 2,500 green businesses.

Moreover, the 270 projects implemented through this initiative involved about 1.3 million people. Generally, projects ran for one to two years and had budgets ranging from EUR 40.000 to EUR 400,000. Activities included training courses, conferences, information campaigns, studies, guides and professional advice.

One such project focused on creating the Green Business Network, which promotes SME startups and channels investment into environmentally sustainable ventures. Currently, the Network has more than 7,000 members, mainly entrepreneurs and eco-investors. The Biodiversity Foundation will launch a new Employee Programme in the future programming period through the Operational Programme for Employment, Training and Education (POEFE, according to its initials in Spanish), for the improvement of employment and the environment [153].

The Biodiversity Foundation's main objective is boosting Green economy and Green jobs and encouraging the company's potential to become the actors of change. To this end, The Biodiversity Foundation has developed several initiatives [154]:

- project "Empleaverde" (employ green): with projects that tackling green and blue economy
- <u>network "Emprendeverde" (undertake green)</u>: is different as a network entrepreneur, specializing in sustainable economy, integrator and multiplier seeks to integrate the existing business support initiatives, create synergies with them and put them at the service of green entrepreneurs.
- <u>Spanish Initiative Enterprise and Biodiversity</u>: It provides a solid framework for cooperation between large companies, associations, NGOs and the Administration combining efforts for the improvement and maintenance of Spanish natural capital and biodiversity conservation.

According to the Natura2000 review, some EU countries have estimated the number of **green jobs**, which usually include jobs in natural protected areas, forest management and forestry, organic farming and other environmental sectors (waste, water, etc.). For instance **in Spain**, **green jobs linked to forest management were estimated at 32,400**, 6% of total green jobs estimated in the country, which amount to 530,947 jobs (FB and OSE 2010). According to this study, green jobs in the forest sector in Spain have increased from 22,980 in 1998 to 32,400 in 2009 (41%) and the potential for creating green jobs in Spain are good/excellent for forestation/reforestation, agro-forestry and sustainable forest planning.





	Core	Related activities	Total		
Waste management					
and processing	108,335	1,692	110,027		
Renewable energies	11,327	83,410	94,737		
Environment consultancy auditing and technical					
assistance 1 (multi-area)	60,887		60,887	Other	
Government bodies	53,072		53,072	sectors 16%	Waste collection
Ecological agriculture and animal breeding	24,485		24,485	Ecological agriculture	and processing 27
Environmental education and training (regulated				and Lyestock 6%	
and continuos)	15,175		15,175	Goverment	
Forest management	12,715		12,715	bodies 13%	
Research and Development	11,975		11,975		
Waste water collection					
and processing	7,931	1,322	9,253		Renewable
Building cleaning				Environment consultancy	energies 23%
(air pollution)	6,907		6,907	auditing and technical	
Natural area management	4,301		4,301	assistance 15%	
Associated activities	2,832		2,832		
Total	319,942	91,342	407,191		

Note: The totals have been rounded up and may not tally. Source: Based on EOI, 2010.

Figure 45: Distribution of green jobs by sector. Source: Based on School for Industrial Organisation (EOI according to its initials in Spanish), 2010

The distribution of green jobs by employment sector in Spain is shown in Figure 45.

When core and related or connected activities are added together, the sector generating the most employment is waste collection and treatment, with 110,000 jobs (27% of the total). This is followed by the renewable energy sector, with 95,000 jobs (23%) and the consultancy, auditing and environmental technical assistance sectors, with 61,000 jobs (15%).

Nowadays, the Ministry of Environmental, through the Biodiversity Foundation, has published a call for the promotion of environmental information in media. Call for proposals seeks to increase the presence of environmental information in the media as way of increase the potential economic opportunities and education and awareness of citizenship.

Furthermore, the actions of this project will be able to promote promoting a science-policybusiness-civil society interaction. In this respect, cities have an important role as stewards of multiple value creation by encouraging the adoption of new and inclusive business models in line with nature and by attracting more private funding through Public-Private Initiatives on nature-based solutions.





3.11.3 The Case of Valladolid

Valladolid City Council supports the development of sustainable projects to promote the green economy opportunities and the generation of quality employment [155] in the city through various actions such as:

GREENWEEKEND [156]. This event took place from 31 March to 2 April 2017 (Figure 46). It was a meeting for entrepreneurs of the environmental sector and it is framed within the **Employment Plan, from Valladolid City** Council, that encourages entrepreneurship with actions that underscore the importance of the green economy as employment niche for its contribution to innovation and sustainability. The GREENWEEKEND helped attendees wanting undertake to carry out their own projects in the environmental sector.



The <u>rate of activity</u> in the province of Valladolid is located at 56.4% in the

Figure 46: Poster of the GREENWEEKEND in Valladolid. Boosting green entrepeneurs

first quarter of 2017, above the regional (54.5%) and below the national (58.8%). The number of unemployed according to the Survey of Active Population (EPA according to its initials in Spanish) has decreased to 33,400 people (1,700 unemployed less than in the previous quarter and 7,700 less than a year ago). In gender equality, the male unemployment rate 0.4 percentage points above the female rate.

The number of <u>unemployed</u> registered, according to the Public State Employment Service (SEPE according to its initials in Spanish), in Valladolid remains the same during the first quarter of the year 2017. In March, there were 22,823 unemployed people. The difference by gender has increased slightly. In March, there were 12,800 women, compared to 10,023 men, 2,777 women were unemployed more than men.

The population <u>employed</u> (Table 34) in the province of Valladolid has decreased to 215,100 persons employed during the first quarter of 2017 (700 men less, and 500 women less). In comparison with the same quarter in 2016, the employees have increases 1,200 person more, overall women.

The <u>labor contracts</u> registered by the SEPE have raised 11.8 % (8.8 % in men and 15.2 % in women). The majority have been temporary, 27,855 compared with the 2,041 permanent contracts, with predominance in men contracts.





The number of companies registered in the Social Security, which has increased over the previous quarter in 16 companies, which means that 15,399 companies registered in December 2016 in the province of Valladolid, 197 more companies than a year ago, an increase of 1.3 %.

in Vall on in fa ic acti ates	adolid mily dwelling (it includes unemployment pers vity, unemployment and employment rat	sons) es, by province	
			47 Valladolid
		2017011	57.03
		201701	56.40
		2016QIV	57.00
		2016QIII	56.26
		2016011	57.24
	Activity rate	201601	57.76
		2015QIV	58.00
		2015011	57 15
		2015QII	57.19
		2015QI	56.71
		2017QII	13.80
		2017QI	13.44
		2016QIV	13.96
		2016QIII	12.50
	University of the second sector	2016QII	13,84
	Unemployment rate	2016QI	16,10
		2015QIV	15,62
		2015QIII	16,04
		2015QII	16,41
		2015QI	16,28
		2017QII	49,16
		2017QI	48,82
		2016QIV	49,04
		2016QIII	49,23
	Employment rate	2016QII	49,32
	Linployment late	2016QI	48,46
		2015QIV	48,94
		2015QIII	47,99
		2015QII	47,80
		2015QI	47,48

Source: National Statistics Institute

Table 34: Economic activity, unemployment and employment rates in Valladolid

Employment Plan 2016-2019 (Plan de empleo)

The different actions included in the Employment Plan of the City of Valladolid have achieved good results year after year, introducing improvements, above all referring to the quality of employment, for example: full-time contracts will be subsidized, special emphasis will be given to indefinite contracts and temporary contracts will be restricted to the most vulnerable groups; in addition new projects are launched as a line aimed at promoting the return of the Valladolid to their city, recovering the talent that has come in the last years

The line of subsidies for the promotion of employment in the municipality of Valladolid in 2017 with a budget of \in 1,500,000, aims to promote quality employment and support SMEs in the hiring of unemployed, as well as promote stability in the employment of registered people and residents in the municipality of Valladolid.

Improvement of employability and labor insertion

It is a priority objective, for its fulfillment, several actions have been developed in solitary or in collaboration with entities of our city:





- Scholarships for internships for university graduates.
- Launches of Employment and Solidarity Entrepreneurship.
- Re-Innovate yourself Programme.

Entrepreneurship and support to SMEs

The promotion of innovative entrepreneurial spirit, technical and economic support to entrepreneurs and the consolidation of the city's business fabric is considered essential for the economic development of Valladolid and, therefore, for improving the quantity and quality of employment.

The development of innovative ideas generating new business opportunities has been materialized through the <u>Vallacreactivos Programme</u> and <u>Business Initiatives Award</u> he developed in collaboration with the Chamber of Commerce.

Technical support and training for the creation of companies and their consolidation is a basic pillar to develop a strong and solid economic fabric. For this reason, the <u>CREA programme</u> offers the necessary training in the creation, management and management of companies while at the same time protecting the viability of business projects and their consolidation.

On the other hand, the economic support in the first stages of operation of the companies is articulated through an annual call for:

Grants to start-ups

Entrepreneurship training scholarships CREA

Another of the economic support actions for entrepreneurship is to facilitate access to microcredit for those most vulnerable and disadvantaged groups who have difficulty accessing finance. To this end, Valladolid City Council has signed an agreement with FIARECyL (Association of initiatives for the articulation of economic responsibility of Castilla y León) to form the <u>Fund</u> for Social Entrepreneurship in Valladolid (FONDESVA), with an initial fund of \notin 100,000.

The support for the transmission of businesses and viable companies is the object of the collaboration agreement signed by the Valladolid City Council and the Valladolid Confederation of Employers (CVE) to launch <u>CVETraspasa</u>, a project that aims to prevent the loss of business fabric in the city for not having successor and facilitate to continue with an existing and viable business project.

Return of Talent

Valladolid City Council considers as a strategic objective to support the return of people who had to leave our city due to the absence of work opportunities. To achieve this strategic objective, the <u>Talent Return Plan</u> was born, framed in the Municipal Employment Plan 2017 and with a budget of € 500,000, as a fourth line of it. In its design, social and economic agents of the city and, especially, those who are the beneficiaries of the Plan have participated, the people from Valladolid who reside and work abroad.

Valladolid city is a largest regional capital. It is very attractive to unemployment people because of its economic potential (Table 35). Valladolid's productive structure is closely linked to the





automotive industry; it is one of the major motors of the city's economy, which is currently investing in electric vehicle development.

Besides the automotive and automotive auxiliary industries, other important industrial sectors are food processing (with important local companies which process sugar, cheese and facilities of multinationals of milk, chocolates and yeast), metallurgy, chemical and printing. The tertiary industry is very strong, emphasising commercial activities, tourism and service sector with their implication in education and health.

The main economic sector of Valladolid in terms of employment is however, the service sector, which employs, representing 72.5 % of Valladolid workers affiliated to Social Security in 2016 and the 85% of industries.

The construction sector employed 4.85% of total workers.

Finally, agriculture is a tiny sector in the city which only employs 4.11 % of the total. The predominant crops are wheat, barley and sugar beet [157].

Medium-sized enterprises (SME) are predominant. The commercial surface area total in the city is: 828,689m [158]. It is distributed in the following types of business:

Types of business	Number of industries by economic sector	%
Metallurgy	439	1.08
Footwear, textile and clothing.	110	0.27
Wood, paper and plastic products industry	111	0.27
Manufacture of food products and beverages	99	0.24
Construction sector	3,831	9.42
Wholesale trade and commercial intermediation	2,077	5.10
Service sector	9,878	24.28
The transportation and communications sector	1,803	4.43
Financial institutions, insurance companies Rentals and Services provided to companies	339	0.83
Rental of housing and offices	3,607	8.86
Financial auxiliary and insurances	263	0.65
Real estate development	848	2.08
Professionals	6,604	16.23
Other activities	10,680	26.25
Total	40,689	100

Table 35: Types of business

(Source: IAE 2012. PGOU and the trade at the crossroads. Space for offices)



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Start-up of new activities:

As it can be seen in Table 36, new activities are overall linked to commerce and hotel industry. But industry is a vital sector for the city, because of bigger and multinational industries are very important. Activities in connection with wholesale trade and commercial intermediation, and recovery products and repair facilities supported the status of the city as distribution centre. Commerce and hotel industry are the 43 % of the new activities. They are the base of the urban economic activity. That activity is largely dominated by self-employed.

Type of entrepreneurial activity	Number of licences	%	
Industry	1,379	6.99	
Construction	2,950	14.95	
Wholesale trade and commercial	2 214	11 22	
intermediation	2,214	11.22	
Commerce and hotel industry	8,571	43.44	
Other tertiary activity	4,618	23.40	
Total	19,732	100.00	

Table 36: Start-up of new activities (Source: Land-use planning)

Valladolid Real Estate Market

The real estate market Valladolid is raised by 24 % (population growth was 7 %).

Real estate transaction made from 2004 to 2011 has decreased as result of the economic crisis, high levels of unemployment and job insecurity (Table 37).

Year	Number of Real estate transaction
2004	8,490
2005 - 2007	10,000
2008 and 2009	5,000
2010	6,748
2011	1,334

Table 37: Number of real state transactions from 2004 to 2011 (Source: Land-use planning)

Change in mean or median land and property prices

The price development of land and housing in Spain has decreased as same as the real state transaction (Table 38). This trend is due to the combined factors of a growing number of new houses and a decline in the number of buyers. It was a result of a high rate of unemployment (25 %).

Price development for housing ϵ/m^2 (Table 38).





D2.: Report on the diagnosis of Valladolid

Year	Less than two years old	More than two years old
2005	1,960.52	1,755.17
2006	2,091.00	1,968.32
2007	2,388.10	2,103.78
2008	2,281.57	1,970.55
2009	2,086.42	1,824.25
2010	2,124.27	1,729.25
2011	1,941.40	1,556.10
2012	1,761.90	1,559.77
2013	n.r.	1,395.92

Table 38: Price development for housing €/m² (Source: Ministry of Public Works and Transport)

Price development of land €/m² (Table 39):

Year	€/m²
2005	417.3
2006	473.3
2007	538.22
2008	516.9
2009	549.55
2010	180.45
2011	306.8
2012	295.7
2013	83.6
2014	164.3

Table 39: Price development of land €/m² (Source: Ministry of Public Works and Transport)

NBS represent an improvement in the city, buildings, etc. NBS are a tool that enhances the city, creating new green jobs and economic opportunities.

3.11.4 Summary of Challenges

- The absence of private companies which generate employment and economic development.
- Small traders go bankrupt due to the economic crisis and to the reduction of pedestrians in some streets.





- Spain's unemployment rate is the second largest in Europe with 19.5% and the economic crisis are a problem in the city and in the country.
- Bike rental service's opening hours cannot fit workers.
- It is time for a shift to resource efficiency in all sectors of industry. The current economic model produces with a waste of energy.
- Air pollution episodes due to heating and road traffic make the City Council to close the city centre negatively affecting to the shopkeepers.
- The drought is affecting the crop production of the region and the gardens of the city.
- The real estate values and the price of urban land have fallen in the last years.
- GDP (Gross Domestic Product) measures monetary values, but it doesn't measure things that aren't traded, like a clean environment. We need a way to understand the value of natural systems, and real cost of environmental impacts like air pollution, climate change, biodiversity loss, and the way we are using up natural resources. We need indicators that show our use of resources as well.

3.11.1 Potential Actions to be Taken

- Reduction tax will be considered in less polluting vehicles and in actions focused in the reduction of environmental problems particularly with NBS.
- New green transport systems and green route be developed.
- New renewable sources will be installed in the city. E.g.: Electro wetland roof, an innovative wetland surface which can provide electricity through microbial fuel cell technology.
- The aim is to create more value while using fewer resources, and substituting them with more environmentally favourable choices wherever possible.
- Green infrastructures will be created making more comfortable and attractive the streets.
 New businesses will be attracted and additional business rates.
- New green jobs and new skills will be created particularly in NBS measures.
- Increased competitive advantage for cities applying NBS measures.
- Research shows that increasing the green areas in the urban environment has considerable co-benefits through, for example, positive health effects [1], minimizing worker absenteeism and improving the liveability of cities. A good opportunity for green jobs and green economy.
- Clean transport, the City of Valladolid is promoting the replacement of diesel engines in buses and trash trucks by gas-powered equipment. Promoting the car factory installed in the city which is developing electric cars.
- Planting low maintenance and long-lived trees for long-term pollution reduction. Installing
 water savers and storage systems to effective use of water. These two actions are able to
 create new green skills and new economic opportunities.





4 Conclusions

Valladolid, as an open and socially cohesive city has as main objectives to contribute to improve citizens' quality of life; to direct the collective construction of Valladolid and its metropolitan area, and to promote a common framework to promote effective management relations between citizens, institutions and businesses. In the last few years, the city of Valladolid has taken a proactive role for smart, sustainable and urban growth.

Work at city level on **climate change adaption** has intensified in the last period. Climate policy in cities has been supported by the Paris Agreement recognition of cities as key actors in implementation and has been one of the priorities when implementing the EU Adaptation Strategy.

Within the **Covenant of Mayors for Climate and Energy**, adaptation has been merged with mitigation efforts in a European initiative involving over 7,000 cities around the world. Valladolid signed the Covenant of Mayors in 2011 and introduced its **Action Plan for Sustainable Energy (SEAP)** to achieve several environmental objectives in direct relation with the improvement of Valladolid's climate resilience. Among the actions required when the Pact was signed, the city of Valladolid was committed to reducing its CO₂ emissions by at least 20 % by 2020.

In January 2016, the **Integrated Sustainable Urban Development Strategy** (EDUSI) was approved by Valladolid City Council under the name of INNOLID 2020 and it has been promoted, updated and improved since then. Its objective is to serve as a frame of reference for achieving a sustainable and inclusive growth, promoting innovation and having the citizenship as essential protagonist of the city.

But besides this SEAP and EDUSI strategies, Valladolid has **other urban plans** (Green Vehicle Programme, Plan for integral urban mobility, Valladolid by 2016, Strategic proposals and Local Agenda 21) related to different aspects of the city, all of them include climate change resilience.

Coastal resilience challenge does not apply to Valladolid because it is a city without coast.

The **green space management** in Valladolid stablished in 2012 inside Valladolid's government, deals with the design of urbanization projects in planning development, processing of urban agreements and the management of Municipal Land Patrimony. Consequence of that, Valladolid's City Council has been working in different space management plans. The revitalization of large areas of the city, with more public spaces, green areas and equipment: for an optimal accessibility, Valladolid is applying European indicators for sustainability, and aims to increase the percentage of citizens living less than five hundred meters from a public green zone. Currently, Valladolid dispose of between 20 -25 m² of public green zone per capita already qualified in the municipality, with a horizon that can reach 35 - 40 m² accessible park per capita. In terms of citizen accessibility to green public areas, between 2008 and 2014 most of city's inhabitants lived within 500m from the nearest green area which is in accordance with the increasing in square meters of public green zone per inhabitant, promoting this way the quality and the quantity of public green zones.

Moreover, for obtaining city's revitalization, Valladolid town's hall has a **tree species richness catalogue** where any citizen can be informed about the most used trees in the city,





differentiating trees employed in green areas such as parks, gardens and squares, and others being part of the tree-lined streets of streets.

Main problems regarding **Air quality** in Valladolid are caused by episodes of high concentration of ozone. The **Atmospheric Pollution Control Network of the City of Valladolid** (RCCAVA) complies with the European Management Directives and RD 102/2011, of 28 January, on air quality (which transposes all EU Directives on this field) and is formed by five stations.

On the other hand, Valladolid has been working in the development of an **Action Plan for Alert Situations** in Urban Air Pollution in Valladolid, framed in the Action Plan against Pollution (Department of Environment, 2017). With the application of the new Action Plan, traffic restrictions have been imposed in the city center during several days.

On the other hand, the **Action Plan against Noise of Valladolid** reveals the places in the city that suffer the highest noise levels and where it is more urgent to act. This plan also identifies possible measures to be taken and prioritizes the actions for the effectiveness of the measure.

The **Urban Regeneration** strategy is carried out by INNOLID 2020 which to detected the need of the city is based on previous studies and the priorities expressed by the neighbors through the processes of participation carried out by the City Council of Valladolid. A complex plan of action because the city is divided in 12 census districts.

"Governance" means rules, processes and behavior that affect the way in which powers are exercised at European level, particularly as regards openness, participation, accountability, effectiveness and coherence. According to the Commission of the European Communities of EU, principles of good governance are openness, participation, accountability, effectiveness and coherence.

In Valladolid, the plenary meetings are public, citizens can participate to present their arguments, but they cannot vote.

Citizen participation is a set of mechanisms for the citizens to access government decisions without needing to be part of the public administration or a political party. Citizen participation includes the access to municipal information and the possibility of participating in municipal management using different ways. As an example, in the **participatory budgets** the citizens can decide directly the use of a part of public money. Valladolid City Council will set aside 4 million euros to Participatory budgets for the year 2018, distributed in 500.000 euros for each of the geographical areas in which the city has been divided according the proposal received from an open citizen consultation in 2017. All the citizens over the age of 16 can participate in this kind of processes.

Social justice recognises that society comprises of a diverse set of social groups, with varying requirements, rights and duties that need mutual support, co-operation and acceptance. In green infrastructure planning, most attention has been devoted to environmental justice considering elements of **distribution**, **procedure and recognition**.

Although there is no specific legislation to promote the **social justice and cohesion** within the city, some of the strategies followed for the urban planning include some social considerations. Valladolid has developed several Action Plans in social matters such as Municipal Accessibility





Plan, Municipal Plan on Drugs, Municipal Children Plan, Plan against Gender Violence, Municipal Plan for Equal Opportunities between men and women or Municipal plan on Immigration - intercultural coexistence.

The urban environment significantly affects the **health and well-being of residents**. Nature or green space may contribute to health through four principal and interacting pathways: improved air quality, enhanced physical activity, stress reduction and greater social cohesion.

Physical activity constitutes one of the main factors to promote health and well-being. This is closely related to green infrastructures in which citizen can practice sport. Valladolid has several initiatives to promote sport within the population. In 2013 Valladolid had 26 sport focused associations. There are reasons to suggest that Valladolid's dwellers are interested with sport-related issues and hence, will integrate any NBS that promoted sportive lifestyle thus improving populations' health. For example, "presupuestos participativos 2018" consultancy collected most of the proposals related with sports investments followed by urbanism and environment and cleanliness.

Valladolid City Council supports the development of sustainable projects to promote the green **economy opportunities** and the generation of **quality employment** with programmes like GREENWEEKEND. Furthermore, it carries out other plans and actions to increase business opportunities in the city and to promote more and more quality employs (employment plan 2016-2019, CREA programme or Talent return plan). However, employment remains one of the main issues of social concern and in which, both in Valladolid and in Spain in general, more has to be innovated to solve it. Green economy and green jobs are a great opportunity in this regard.

4.1 Summary of Challenges

Climate Change

- To enhance carbon savings per unit area and to carry out a comparison with calculations of carbon consumption of equivalent non-NBS actions (e.g. through Life Cycle Assessment).
- Calculation of CO_{2eq} emissions avoided (tCO_{2eq} /year) considering a life cycle approach and modeling the environmental impacts regard to indirect savings.
- Enhance carbon storage and sequestration in vegetation and soil using allometric forest models of carbon sequestration.
- To evaluate carbon savings per unit area (economic) through measurements of gross and net carbon sequestration of urban trees based on calculation of the biomass of each measured tree (i-Tree Eco model), translated into avoided social costs of CO₂ emissions.
- Achieve temperature reduction.
- Calculation of energy and carbon savings from reduced building energy consumption.

Water Management

- Some areas of the city present a high risk of flooding during heavy rain events.
- High flooding risk in some areas of the city.





- Prolonged water droughts limit the use of water in the city (i.e, for the irrigation of green areas).
- Low rate of treated water reuse for urban uses or irrigation of green areas in Valladolid city.
- Water infrastructures have a limited lifespan, thus, they require high investments for upgrading.
- Climate change projections show it is likely that heavy rainfall and flooding will become more frequent. Continuing to provide new sewer capacity to cope with these growing risks is unaffordable. The current management of water run-off (drainage to a combined sewerage) prevents from its reuse.

Coastal Resilience

Does not apply for Valladolid.

Green Space Management

- Lack of updated data to conduct a detailed and quantifiable diagnosis of the city.
- No description of the utilization of green areas as recreational, cultural and sports-based activities location.
- No guarantee about the accessibility of elderly people, people with reduced mobility and children to green public areas.
- Scarcity of green travel routes defined.
- Scarcity of green related social services provided to population.
- Scarcity of Natura 2000 within the city.

Air Quality

- Ozone and its precursors are the air pollutants that generate more problems in Valladolid.
- Air pollution episodes due to ozone commonly occur in the Valladolid during late spring and summer.
- In wintertime, some weather conditions, especially thermal inversion episodes, also cause some problems with NO₂ and PM.
- Reduction of noise levels in areas identified by the **Action Plan against Noise** in the city.

Urban Regeneration

- Achieve better management and urban and landscape quality.
- Regenerate urban infrastructure under premises of energy efficiency and rationalization.

Planning and Governance

- Complexity in administrative management at the local level of City Council, with long lead times that in some cases could delay the planned development of the projects.
- Perceptions of citizens on urban nature.
- Openness of participatory processes.
- Social learning concerning urban ecosystems and their functions/services.
- Know the social values for urban ecosystems and biodiversity.
- Transmit the communication messages of the projecto to the entire population; especially the citizens directly affected by the location of the actions in the Demo-sites A, B, C.





Social Justice and Social Cohesion

- Scarcity of programmes focused on green intelligence awareness
- Large number of felonies occur within the city, especially there is a large number of thefts.
- Violent criminality and robberies, homicides and murders still happening in the city
- Room for improvement in terms of participation of the people in the city decision processes such as elections or participative budget initiatives.
- Concentration of sale and consumption of drugs, low economic resources, gypsy ethnic minority, in Pajarillos Bajos neighborhood.
- High levels of unemployment, especially in the young people.
- Scarcity of engagement of Valladolid's citizens with local policies.

Public Health and Well-being

- Low participation in percentage of middle-age people in sports-based activities.
- Existence of the opinion between Valladolid's citizens about the lack of sports-based infrastructures-initiatives.
- Prevalence of obesity between children and young people.

Economic Opportunities and Green Jobs

- The absence of private companies which generate employment and economic development.
- Small traders go bankrupt due to the economic crisis and to the reduction of pedestrians in some streets.
- Spain's unemployment rate is the second largest in Europe with 19.5% and the economic crisis are a problem in the city and in the country.
- Bike rental service's opening hours cannot fit workers
- It is time for a shift to resource efficiency in all sectors of industry. The current economic model produces with a waste of energy.
- Air pollution episodes due to heating and road traffic make the City Council to close the city centre negatively affecting to the shopkeepers.
- The drought is affecting the crop production of the region and the gardens of the city.
- The real estate values and the price of urban land has fallen in the last years.
- GDP (Gross Domestic Product) measures monetary values, but it doesn't measure things that aren't traded, like a clean environment. A way to understand the value of natural systems is needed as well as the real cost of environmental impacts. Indicators that show our use of resources as well are necessary.

Table 40: Main conclusions about the main challenges for the project

4.2 Potential Actions to be Taken

Climate Change

Installation of an urban woodland with appropriate species adapted to temporary flood condition and with high capacity of carbon sequestration. The trees of this forest will be allocated in specific arboreal series. This area will be a new urban carbon sink.





- Deployment a new green cycle lane and re-naturing of existing bike lane which will allow the development of a real green corridor into the city. It will include innovative cyclepedestrian paths and trees plantation.
- Several rain gardens will be installed to complete the managing and treating surface water. This kind of gardens contributes to preserve the habitat value and diversity for local ecological communities. Native and adapted plants, more tolerant to local conditions will be used.
- Through the **plantation of new trees** in the City Centre, it is foreseen to increase the urban tree population with shade and cooling purposes.
- Installation of a green filter in the floodable park in order to complete the activity of this NBS. More than 1,000 trees of specific species for green filter activity will be used to foster carbon sequestration.
- Natural wastewater treatment Plant installation. It will allow irrigate surrounding green areas. It includes the creation of a surrounding green with trees and the park will include a Surface Flow Wetland which will be managed as a self-sufficient ecosystem useful for recreational and social activities.
- Natural pollinator's modules. Each pollinator module will be installed in several places of the city with Smart Soil and it will include a water fountain, housing facility for pollinators and birds, bushes and aromatics species to allow carbon sequestration.

Water Management

- Implementation of SUDs for water run-off management (including measures for flooding prevention and water reuse).
- Introduction of decentralised wastewater treatment plants based on nature solutions (such as wetlands or green filters) to promote local water reuse.
- Awareness campaigns addressed to the citizens for reducing water consumption at home.

Coastal Resilience

Does not apply for Valladolid.

Green Space Management

- Update environmental and socioeconomic indicators to be able to make a current diagnosis of the city challenges.
- Generation of nature based recreation, cultural and sports-based opportunities for improving quality of life.
- City's mobility and connectivity improvement adding nature based solution services in order to solve the problem.
- Creation of new green infrastructures and travel routes to guarantee the accessibility of all the citizens regardless their mobility condition.
- Creation of green related social services.
- Foster the inclusion of urban green spaces in Natura 2000 by fulfilling the required environmental indicators.





Air Quality

- Monitoring the amount of atmospheric air pollutants in wider areas to find out more vulnerable zones in the city.
- Calculating and mapping air purification service provided by existing green areas.
- Increasing the amount of urban trees and canopy cover in the city: in private domestic gardens, along the streets and urban parks etc. but pollution-sensitive species should be avoided in heavily polluted areas or used only as bio-indicators for citizen awareness.
- Maintain the canopy cover by avoiding unnecessary pruning.
- Increasing existing green infrastructure elements such as building green roof and green walls.
- Planting low maintenance and long-lived trees for long-term pollution reduction.
- Planting trees to shade parked cars to reduce vehicular VOC (volatile organic compounds) emissions but avoiding species with high production of biogenic VOC.
- Control fires of organic wastes and other origins especially at designated seasons.
- Installing green noise barriers in specific points in the city.
- Clean transport, the City of Valladolid is promoting the replacement of diesel engines in buses and trash trucks by gas-powered equipment. Apart from the obvious improvements in the consumption and emissions of particles, these modern engines will be quieter.
- Reduction of speed limits as long as it is feasible from the point of view of mobility. This
 action also converges with the action of promoting the use of the bicycle.

Planning and Governance

- Compile all the suggestions related to the implementation of the NBS in Valladolid through the permanently administration channels. As we can see, the citizens of Valladolid can be in touch with the administration permanently, using several channels (Citizen Services Office, website, telephone and e-mail). Through these channels they can make suggestions and complaints about the city. We propose to take advantage of this existing system.
- Create new open participatory processes in which citizens can discuss the implementation of BSS in their city. There are few participatory process opened at this moment, and none of them is useful for URBANGreen UP, because they are very specific. For these reason we have to create new one.
- Disseminating through different channels the functions and services of the BSS. If we want citizens to participate, they will know all the characteristics of the project. This information could be provided in person (meetings) or on the web.
- Know the social values for urban ecosystems and biodiversity. Take advantage of citizen questionnaires to get the information we want.

Urban Regeneration

- Foster actions to reduce the criminality within the city.
- Conserve and protect the environment and promote resource efficiency.
- Promoting social inclusion and fighting poverty and any form of discrimination.
- Promote sustainability and quality in employment.





Social Justice and Social Cohesion

- Generate information systems at neighborhood level to obtain data of the defined KPI.
- Foster actions to reduce the criminality within the city.
- Promote initiative to eradicate violent criminality and robberies.
- Promote initiatives to foster green intelligence awareness within population.
- Promote initiatives to engage citizens with participation processes.
- Promote initiatives to foster citizen's awareness about the importance of participating in city decisions processes about local policies.

Public Health and Well-being

- Promote the creation of open-spaces based on NBS for sports practice.
- Foster the number of recreational and sports-based activities organized at outdoor green areas.
- Foster the participation of middle-age people in sports-based activities.
- Gather Valladolids' dwellers interest in sports-activities/infrastructures and generate successful solutions to promote the physical activity.
- Reduce circulatory system morbidity by promoting healthy life through urban green spaces generation.
- Promote initiatives in order to reduce children and young population obesity.

Economic Opportunities and Green Jobs

- Reduction tax will be considered in less polluting vehicles and in actions focused in the reduction of environmental problems particularly with NBS.
- New green transport systems and green route be developed
- New renewable sources will be installed in the city. E.g.: Electro wetland roof, innovate wetland surface which can provide electricity through microbial fuel cell technology.
- The aim is to create more value while using fewer resources, and substituting them with more environmentally favourable choices wherever possible.
- Green infrastructures will be created making more comfortable and attractive the streets.
 New businesses will be attracted and additional business rates.
- New green jobs and new skills will be created particularly in NBS measures.
- Increased competitive advantage for cities applying NBS measures.
- Research shows that increasing the green areas in the urban environment has considerable co-benefits through, for example, positive health effects minimizing worker absenteeism and improving the liveability of cities. A good opportunity for green jobs and green economy.
- Clean transport, the City of Valladolid is promoting the replacement of diesel engines in buses and trash trucks by gas-powered equipment. Promoting the car factory installed in the city which is developing electric cars.
- Planting low maintenance and long-lived trees for long-term pollution reduction. Installing water savers and storage systems to effective use of water. These two actions are able to create new green skills and new economic opportunities.

Table 41: Main conclusions about potential actions to be taken within the project





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