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### Vitoria-Gasteiz's Green Infrastructure for a Sustainable Development

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Vitoria-Gasteiz's Green Infrastructure for a Sustainable Development  
by

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Forest and Natural Resources Management  
With Honors

May 2017

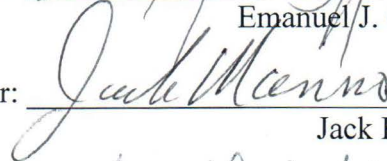
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5/10/17

## **Abstract**

Infrastructure is the basic physical and organizational structures and facilities needed for the operation of a society. In addition, it is in charge of sustaining the wellbeing of the members of society. Infrastructure is more than tunnels that reduce commuting time, or bridges that open trade between two regions; it is a tool to give society more time to enjoy their preferred activities, and a way to connect with other people. The strong tie infrastructure has with society's wellbeing, is the reason why a well-designed infrastructure is key to develop sustainably.

This paper illustrates the efforts of Vitoria-Gasteiz, Spain to develop sustainably through the adoption of a comprehensive green infrastructure. The importance of green infrastructure is that it reminds society of its bio-centric past, and of the vast number of wheels that need no reinvention. In addition of the aesthetic and environmental services green infrastructure provides when properly planned, society also gains a broad range of economic and social benefits. This document will explore such benefits using Vitoria-Gasteiz's Green Infrastructure (VG-GI) as an example and contrasting it to the United Nations (UN) Sustainable Development Goals (SDGs). This project is limited to the targets and goals in which VG-GI has had a direct impact.

It was determined that VG-GI has had a direct impact on UN SDGs 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, and 15. The study aims to demonstrate the potential green infrastructure has as a tool to meet the UN SDGs. It is worth noting that many of the targets examined in this study are not met solely by the physical aspect of VG-GI, but by a combination of projects, and outstanding individuals that rely on the green infrastructure as a source of inspiration, a space for experimentation, and a vital piece of the community. VG-GI should serve as an example of how infrastructure can once again become a tool for wellbeing, community, and sustainability.

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## **Introduction**

Infrastructure is the basic physical and organizational structures and facilities needed for the operation of a society. In addition, it is in charge of sustaining the wellbeing of the members of society. Infrastructure is more than tunnels that reduce commuting time, or bridges that open trade between two regions; it is a tool to give society more time to enjoy their preferred activities, and a way to connect with other people. The strong tie infrastructure has with society's wellbeing, is the reason why a well-designed infrastructure is key to develop sustainably. In the last century infrastructure has been focused on car mobility, and, for the most part, controlled by market forces rather than planned. This has led to urban sprawl, which has then led to loss of prime agricultural land and other ecosystems, increase in public expenditure, increased traffic, health issues, environmental issues, and detrimental impact on social lives.

Unlike gray infrastructure, a system engineered by people to provide a service, green infrastructure is based on nature's cycles and utilizes the environment to provide the intended service and other benefits. Green infrastructure, if properly designed, has the potential to alleviate many of the consequences of poorly planned gray infrastructure. It has been widely utilized to provide certain environmental services, but it is rarely integrated into the greater system of gray infrastructure. This is where Vitoria-Gasteiz's Green Infrastructure (VG-GI) excels. Divided into regional scale, municipal scale, and urban scale VG-GI is a comprehensive project that became central to the identity of the region. It was conceived as a comprehensive network of green spaces that embraced their importance for the landscape, culture, health, and the environment. Because of its integration of multiple services that transcend ecological services and include social, and economical benefits VG-GI is a prime example of a project that is helping a region develop more sustainably.





Sustainable development is a hard concept to define, and even harder to visualize. In “Our Common Future” it was defined as: development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This is the most common definition; however, it does not give a clear image of that kind of development. This is where the United Nations (UN) Sustainable Development Goals (SDGs) can provide a good metric to better visualize current and past efforts of sustainable development.

In September 2015, leaders from 150 countries agreed on The UN SDGs. A global development framework with 17 goals, 169 targets, and 232 indicators. The UN SDGs cover a wide range of issues. They include traditional Millennium Development Goals (MDGs) areas such as poverty, hunger, health, education, and gender inequality but add new topics such as energy, infrastructure, economic growth and employment, inequality, cities, sustainable consumption and production, climate change, forests, oceans, and peace and security. The UN SDGs have three main characteristics:

- Universal: applicable to developing and developed countries.
- Indivisible: cannot be positioned in a hierarchical or prioritization order.
- Transformative: Transforming current challenges into opportunities for the 5Ps (peace, people, planet, prosperity and partnership)

In this report VG-GI was broken down into different elements, and then analyzed using the targets of several UN SDGs. The report is limited to targets that were directly impacted by the green infrastructure, leaving out many projects and policies Vitoria-Gasteiz has that would meet many more targets. This report has the objective of providing an example of how a city or region can develop in a more sustainable way by using green infrastructure. It is important to note that VG-GI and the projects that shape it were not developed to meet the UN SDGs or any of its targets; they are the result of a community wanting to improve their lives, make their city a better one, and do their part to lessen humanity's impact on Earth.



## **Goal 2 - Zero Hunger**

### Introduction

Zero hunger is an important step towards sustainable development, given that proper nutrition translates into the energy and health required to earn a livelihood, and to improve quality of life. The objectives of the UN SDG 2 – Zero Hunger are: end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. The targets established in the UN SDG 2 plan on achieving zero hunger by promoting a redefinition of the way food is grown, consumed, and shared. Targets 2.1 and 2.2 focus on accessibility to nutritious food for everyone, and targets 2.3, 2.4 and 2.5 on sustainable food production systems. In this work I will address the latter targets.

UN SDG 2 targets focus on sustainable food production systems calls for: 1) increased small scale producers - According to the World Bank, agricultural development is about two to four times more effective in raising incomes among the poorest than growth from any sector. 2) Resilient agricultural practices - A resilient agriculture is one that meets both food and development needs over the short and long terms, without destabilizing the biosphere. 3) Protection of seeds' genetic diversity - A strong base of diverse seeds, enhances food security and promotes the preservation of traditional cultural practices and values. In addition, it lessens the threats of disease and climate change.

### 2.3 Small-Scale Food Producers

“By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment”

### *Vitoria-Gasteiz Green Belt Ecological Orchards*

With the objectives of encouraging the habit of healthy nutrition and active leisure, increase the production and consumption of local organic food, and expanding the city's green infrastructure the City Council of Vitoria-Gasteiz is stimulating the practice of urban organic horticulture. This is being done by creating urban orchards scattered throughout the city; in schools, civic centers, and peri-urban parks.



The remediation of degraded land for the construction of the Green Belt, led to the proliferation of unorganized and illegal orchards. The first project, *Huertas de Olarizu*, located in Olarizu Park was developed in 1998 as a response. This orchard is divided into 146 plots for individual usage and 6 for groups, all of which have access to tools, equipment, and workshops that can help them maximize their production in a sustainable way. The success of the previous project and the increasing demand from the citizens led to a second project, *Huertas de Urarte*. This is situated in Zadorra Park and expands for 60,000 m<sup>2</sup>. This project is being further expanded to support, by



providing plots and equipment, farmers and students who want to assess the option of organic farming in a larger scale, this is the Basaldea Project.

#### 2.4 Sustainable food production systems

“By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.”

##### *Municipal Ordinance for the Use of Municipal Urban Orchards of Vitoria-Gasteiz*

The urban orchards mentioned above have to follow an ordinance designed to manage the plots in a sustainable way. Some of the objectives of this regulation are: 1) to promote good environmental practices of cultivation: waste management, water, organic agriculture, and traditional agriculture, 2) Generate spaces of biodiversity, 3) Establish and value relationships between the natural environment and human activities and 4) Promote nutritious eating and healthier and more sustainable habits.

In a larger scale, in December 2016 Vitoria-Gasteiz announced an action plan to develop a sustainable agriculture system in the next decade. This plan will expand throughout the municipality with the goal of improving its resiliency to climate change, foster the connection between production and local consumption, reduce its ecological footprint, promote economic activity around this system, and provide healthy food to the whole population.

2.5 Maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species

“By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.”

*Botanical Garden of Olarizu*

The Botanical Garden of Olarizu is located in Olarizu Park, one of the parks that form the Green Belt. Its focus is on the study and conservation of vegetal biodiversity of the region and the European continent. Some of the projects in execution are: 1) collection of European forestall flora, 2) collection of local flora and vegetation, 3) ethnobotany collection, 4) Helophytes and hydrophytes collection, 5) a Bank of plant germplasm, and 6) a herbarium. In addition of being a place for research and conservation, the Botanical Garden of Olarizu is an important didactic tool. Workshops, lectures and student research are some of the educational services provided by the botanical garden. Since 2012 it is part of the, *Asociación Ibero-Macaronésica de Jardines Botánicos* and la *Red Española de Bancos de Germoplasma*, two organizations that focus on collaboration between botanical gardens in the country and continent.

## Goal 3 - Good Health and Well-Being

### Introduction

Sustainable development could not be complete without good health and well-being. Hence, UN SDG 3 has the objectives of ensuring healthy lives and promoting well-being for all at all ages. The scope of UN SDG 3 includes: 1) end epidemics of communicable diseases such as AIDS, 2) reduce maternal, neonatal and premature mortality, 3) prevent and treat substance abuse, 4) reduce fatalities and injuries from traffic accidents, 5) ensure access to sexual and reproductive health-care services, 6) achieve universal health coverage, and 7) reduce the number of deaths and illnesses from emissions of human processes. This section will focus on how green infrastructure can help meet some of these objectives.

The relation between VG-GI and UN SDG 3 must be explored holistically rather than by studying individual projects or sections. Therefore, this section will have a different structure than the previous one. The impact green infrastructure has on health and well-being depends on how the multiple elements of green infrastructure work together to create a system. The targets within UN SDG3 that I believe Vitoria-Gasteiz green infrastructure has addressed are:

- 3.4 Promote mental health and wellbeing
  - “By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and wellbeing”
- 3.6 Reduce the number of global deaths and injuries from road traffic accidents
  - “By 2020, halve the number of global deaths and injuries from road traffic accidents”
- 3.9 Reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
  - “By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination”



How does green infrastructure relate to health and wellbeing? This is the question that will be explored in three sections tightly related to the targets mentioned above: 1) mental health, 2) safe streets, and 3) emissions. In order to support the relation between green infrastructure and the previously mentioned targets, this analysis will be based on a project at the University of Washington which represents a collection of more than 2,800 scholarly works on these topics.



The first section, mental health, is especially focused on the benefits exposure to nature and green spaces have on our health, wellness, and function. This is a key topic when talking about Vitoria-Gasteiz as the entire population lives within 300 m of an open green space.

The World Health Organization identifies stress and low physical activity as two of the leading contributors to premature death in developed nations. In a 1991 study by Roger Ulrich and colleagues found that individuals who were presented with natural environment videos after watching a stressful movie experienced more rapid and complete recovery compared to those who were presented with built environment videos instead. This is just one of many examples that prove the positive impact exposure to nature has on our ability to ameliorate stress, depression and even dementia. In addition, the experience of nature helps to restore the mind from the mental fatigue of work or studies, contributing to improved work performance and satisfaction.



This is often referred as Forest Bathing or Shinrin-yoku, which is a cornerstone of preventive health care and healing in Japanese medicine.

In the second section, safe streets, Vitoria Gasteiz also serves as an example. Traffic fatalities are currently the sixth leading cause of preventable death in the U.S. The best way to prevent road injuries and fatalities is by reducing the use of vehicles. The green infrastructure of Vitoria Gasteiz makes up 32.67% of the urban area, resulting in 45 m<sup>2</sup> of green areas per person. This abnormally high percentage of green spaces results in an increased mobility by foot, and bicycles. In Vitoria-Gasteiz only 28.3% of travel in the city is done by car.

The third section, emissions, explores how green infrastructure can help reduce the number of emissions related deaths and illnesses. In addition to the reduction of emissions of the transportation sector by encouraging biking and walking, green infrastructure can help clean the air, soil, and water from pollutants. Some of the effects vegetation can have on pollution are:

- Can act as natural filters for both gases and particulate matter in urban environments.
- In areas with complete tree cover, trees can remove as much as 15% of the ozone, 14% of the SO<sub>2</sub>, 8% of the NO<sub>2</sub>, and 0.05% of the CO from the air
- Experiments with poplars demonstrated that the trees successfully removed 19 of 29 potential PCBs from contaminated garden soil within 96 growing days

The last example is currently being replicated in the industrial area of Jundiz, where the Green Belt is planned to be expanded. An intercropping phytomanagement design, with poplar trees and alfalfa is being implemented in an area with contaminated soil. A restoration and development project has already been successfully implemented in the Green Belt. Part of what today is the Zabalgana Park was occupied by an old gravel pit in a highly degraded state. After several years of work, that degraded land became the first park of the Green Belt of Vitoria-Gasteiz.

## **Goal 4 - Quality Education**

### Introduction

Ensuring inclusive and quality education for all, and promoting lifelong learning are the two main objectives of UN SDG 4. Education is a powerful tool that helps reduce inequalities and reach gender equality by allowing people to break from the cycle of poverty. In addition, quality education empowers people to pursue more sustainable, tolerant, and healthy lives. Furthermore, at a national level, an increase in average school attainment by one year has a demonstrated correlation to a 0.58% increase in national GDP per capita growth rates. At an individual level, each additional year of schooling strengthens individual earning potential by an average of 10% (Polacheck, 2007). A 12% reduction in global poverty could be achieved by ensuring that all children in low-income countries leave school with basic reading skills – this is the equivalent of lifting 171 million people out of poverty (EFA Global Monitoring Report 2011: 8)

Vitoria Gasteiz's green infrastructure has been an important element in pursuing UN SDG 4. With a combination of professional and civil programs hosted in facilities within the green infrastructure, Vitoria Gasteiz has tackled targets 4.4 - Increase the number of youth and adults who have relevant skills, and 4.7 - All learners acquire the knowledge and skills needed to promote sustainable development. Sustainable development can only occur if such development is continued by future generations, thus, education is key to ensure the continuity of Vitoria Gasteiz's efforts.

#### 4.4 - Increase the number of youth and adults who have relevant skills

“By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship”

### *Ecological Horticulture and Research Fellowships*

As an extension program to the urban organic horticulture facilities previously discussed, courses are offered to any citizen with an interest in ecological horticulture. These programs are hosted throughout the year and participants from all ages are welcomed to participate. The courses are meant to teach best practices for urban organic horticulture.

Recent graduates have the opportunity of receiving a scholarship to conduct research at the facilities within the green infrastructure. Seven positions are offered every year; four are designated to the study, diagnosis and evaluation of sustainability, two to innovation and information for sustainability, and one to the promotion and education of urban sustainability. In addition, successful researchers are often hired by the *Centro de Estudios Ambientales (CEA)* an organization focused on promoting the sustainable development of the region.

#### 4.7 - All learners acquire the knowledge and skills needed to promote sustainable development

“By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development”



## *Ataria*



Vitoria Gasteiz's core facility for environmental education is "Ataria", the Center of Environmental Interpretation of Salburua Park. The purpose of this center is to educate and communicate to the public about the importance of biodiversity and natural services. The Scholastic Program is one of the most important educational programs Ataria hosts. Students of all ages visit once per year and learn, through science and art activities, about geology, ecosystems, biodiversity, and sustainability. There are also programs focused on adults such as *Red de Participación en Ciencia Ciudadana*, in which citizens record and report sightings of exotic flora and fauna, and endangered native species. This program was to educate the public about the biodiversity of the region. Over 80 people join every year, making environmental conservation part of their daily lives. The work done at Ataria has a significant impact on the city meeting target 12.8 – "By 2030; ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature."

## Goal 6 – Clean Water and Sanitation

### Introduction

Proper management of water resources is crucial in the path of sustainable development.



In addition of being essential to the achievement UN SDG3, managing water sustainably contributes to economic growth, decent work, and improves the production of quality food. UN SDG6 address another more pressing issue, the large number of children, 800 every day, who die because of water and sanitation related diseases. Furthermore, the combined effects of poor water management, such as the discharge of wastewater from human activities into bodies of water without any treatment that accounts for 80 percent of all wastewater, and climate change have resulted in water scarcity all around the world, which affects more than 40 percent of the human race.



Vitoria-Gasteiz has experienced some of the consequences of inadequate water management in form of floods, loss of ecologic services, and pollution. To address these issues, Vitoria-Gasteiz has implemented several water management projects, many of which are directly connected with green infrastructure and will be discussed in this chapter. Such projects tackle targets 6.3 - improve water quality, 6.5 - implement integrated water resources management, and 6.6 - protect and restore water-related ecosystems. In addition, the projects examined in this section also benefit UN SDG 12 especially target 12.2 - By 2030, achieve the sustainable management and efficient use of natural resources, and UN SDG 13 target 15.2 - By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services and target 15.3- Strive to achieve a land degradation-neutral world.

### 6.3 Improve water quality

“By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally”

#### *Zadorra River Restoration*

Zadorra is the principal river of the plains of Alava. Located in the northern part of the city, the rivers and creeks that feed into it have been diverted underground and connected to the city’s draining system. In times of strong rain, the system exceeds its capacity resulting in a spill of untreated wastewater into the Zadorra River. In order to fix the system, some projects have already been implemented and their success will be followed by an expansion. Some of the rivers have been diverted around the city in order to avoid polluting them.

In addition, with the goal of restoring the environmental and social benefits of such creeks, while preventing the previously mentioned problems, some of the creeks will be brought back to the



surface where they will become part of the green infrastructure. A short section of Av. Gasteiz, one of the principal avenues of the city, has been the pilot site for this idea. As I mentioned in UN SDG 2, the establishment of the orchards in Zadorra Park has also been a successful project to reduce the pollution of the Zadorra River.

#### 6.5 Implement integrated water resources management

“By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate”

##### *Lakua & Phytoremediation*

Improving sewage and water treating systems are not the only ways to prevent contamination of waterways. The first method I will discuss in this section is a pilot project in the Lakua neighborhood. Utilizing green areas and vacant lots, Vitoria-Gasteiz is planning to expand their green infrastructure into this neighborhood. The goal of this project is to enhance the ecological service of the already established green spaces and to incorporate the vacant lots into the green infrastructure. The new and the enhanced green areas will be used to capture, and filter rainwater, hence reducing the inflow into the sewage system. The second method is the phytoremediation that took place in Zabalgana Park and the one taking place in the industrial area of Jundiz. As I mentioned in UN SDG 3 phytoremediation is a great way to clean the soil from toxic chemicals that would eventually be carried by permeating water into the groundwater.

#### 6.6 Protect and restore water-related ecosystems

“By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes”

## *Remediation of Salburua Wetland*

Probably one of the most iconic projects in the green infrastructure of Vitoria-Gasteiz is the remediation of one of the most important water bodies of the region. In the XIX century Salburua wetlands were drained and the surrounding forests cut to create arable land. It was not until late XX century when remediation projects began. A dam was built in order to prevent the drainage of the wetland, which resulted in the recovery of 200 hectares. These recovered wetlands also serve as a defense against floods in the city, as excess water from rivers is diverted into them.

## **Goal 7 – Affordable and Clean Energy**

### Introduction

One of the most pressing issues the UN SDGs are trying to address is climate change. In order to improve the current situation, there has to be an emphasis on energy systems, the source of 60 percent of greenhouse gas emissions. The world current energy mix consists of 81 percent fossil fuels, 5 percent nuclear, and 14 percent renewables. The large share of fossil fuels in the mix is a result of not taking into account the externalities of their life cycle, which results in low cost fuels. In addition to combating climate change, adoption of sustainable energy can have a direct impact on the quality of life in developing nations. Apart from supporting businesses, medicine, education, and agriculture, a well-designed energy system would ensure access to clean energy for future generations.

Vitoria-Gasteiz depends almost completely on energy from other regions of the continent. The city is well aware and have multiple campaigns to better their energy situation. However, in this document I will only focus on the projects within the green infrastructure. Target 7.2 – increase the share of renewables in the energy mix, is the target in UN SDG7 where the VG-GI has the greatest potential.



## 7.2 Increase the Share of Renewable Energy in the Energy Mix

Biomass energy, if managed correctly, has the potential of reducing the GHG emissions from the energy sector and even sequestering carbon already in the atmosphere. Large green areas near urban centers are ideal locations to grow energy crops such as shrub willow. In the phytoremediation project in the



industrial area of Jundiz some willow will be grown to assess its performance in degraded land, its impact on the soil quality, and its potential as an energy source for the region. In addition, some of the vacant lots in the Lakua project will be used to grow willow. If these pilot projects are successful, it could result in a more renewable energy mix.

### **Goal 8 – Decent Work and Economic Growth**

#### Introduction

The UN SDG8 objective is to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. While I disagree with the claim that economic growth is necessary, or even possible, for achieving sustainable development; it is important that cities and countries try to meet the targets proposed in UN SDG8. Decent work and job creation are important elements of a healthy and inclusive society. Most of the targets in UN SDG8 are policy based and will not be discussed in this paper. However, targets 8.3 -Promote policies that support productive activities, decent job creation, entrepreneurship, creativity and

innovation; and 8.9 - devise and implement policies to promote sustainable tourism are targets with which the green infrastructure of Vitoria-Gasteiz has had a significant impact.

### 8.3 -Promote policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation

“Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services”

As mentioned in UN SDG 2 & 4 the green infrastructure of Vitoria-Gasteiz has been a hub for entrepreneurship through the organic horticulture training services it provides. In addition, the educational projects hosted in the facilities within the green infrastructure have prepared citizens with useful skills that combined with the continuous improvement projects in the city have the potential of creating decent jobs in the locality.

### 8.9 Devise and implement policies to promote sustainable tourism

“By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products”

In 2016 Vitoria-Gasteiz received the Biosphere Responsible Tourism certification. This certification is managed by the Responsible Tourism Institute, one of the most important organizations in the sustainable tourism realm. The key feature that established Vitoria-Gasteiz as a sustainable tourism destination is its green infrastructure, especially the impact it has on the fight against climate change. Some of the projects praised by the institution were the Green Belt, the Salburua Wetlands and the educational services it has provided.



## **Goal 9 – Industry, Innovation and Infrastructure**

### Introduction

Infrastructure is defined as, the basic physical and organizational structures and facilities needed for the operation of a society or enterprise. It is one of the most important elements in our daily lives, and we only notice it when it underperforms. With imminent climate change, our site and climate dependent infrastructure will face many challenges. UN SDG 9 is a call for adaptation of our current infrastructure and industry through innovation. One successful tool to answer the call is green infrastructure. For many years it has been used to reduce the impacts of flooding, heat island effect, and pollution. Green infrastructure projects have usually been implemented at a small scale and with specific targets in mind; however, they have not been fully integrated to the greater infrastructure. This is one of the areas I believe the green infrastructure is different from other projects. In Vitoria-Gasteiz is hard to separate the green infrastructure from the “normal” infrastructure, it is perfectly integrated into the system.

### 9.1 Develop quality, reliable, sustainable and resilient infrastructure

“Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all”

Vitoria-Gasteiz has implemented a Climate Change Adaptation plan which has the green infrastructure at its core. In the plan, a study was conducted to find which areas would be the ones most affected by climate change. Green infrastructure is designed and modified to help reduce the severity of those effects. One of the projects that has already proved to be successful is the remediation of the Salburua Wetlands mentioned in UN SDG 6. These actions also tackle UN SDG 13 - Take urgent action to combat climate change and its impacts.

## **UN SDG 11 - Sustainable Cities and Communities**

### Introduction

At the core of the UN SDG is goal 11 - *Make cities and human settlements inclusive, safe, resilient and sustainable*. Cities are the home of half of humanity, 3.5 billion people, and by 2030, it will be for almost 60 per cent of the world's population. In Mexico, there is a saying that writes "Un buen juez por su casa empieza" which has had two meanings in my life; the real meaning, and the one I believed was the real meaning. Both definitions are important for all the UN SDGs but especially for goal 11. The first meaning is that before looking at the mistakes of others, look at your own mistakes. Despite the fact that 95 percent of urban expansion in the next decades will take place in the developing world, current cities should be scrutinized. Today's cities account for 60-80 percent of energy consumption and 75 percent of carbon emissions, in addition of the many social deficiencies they have. The second meaning is that the best place to start change is at home. The home of the majority of humanity is cities, if we want to achieve global sustainable development; we have to start there.

Vitoria-Gasteiz understands the importance of cities and communities, and the importance of improving their own. For many years now, the local government has implemented several projects and policies to make the city, region, and community more sustainable. VG-GI is one of those projects. The project has been successful in targets 11.2, 11.3, 11.4, 11.5, 11.7, and 11.a. The comprehensive nature of VG-GI results in major benefits to the city, including safety, culture and nature conservation, and a healthier society.



## 11.2 Provide access to safe, affordable, accessible and sustainable transport systems

“By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons”

### *The Sustainable Mobility and Public Space Plan*

VG-GI has served as a crucial tool to implement the Sustainable Mobility and Public Space Plan in Vitoria-Gasteiz. The plan has the objective of minimizing the dysfunctions caused by the high use of motorized modes. In addition to parking regulations, public transportation, and a super block model proposal, that seeks to give back the street to the pedestrians, VG-GI has been one of the main reasons for the success of the plan. 13 Km of new bike lanes and 22,319 m<sup>2</sup> of new urban trails have been added to the infrastructure. VG-GI not only has increased the pedestrian options, but also has improved them. Central to its design is the goal of making those places safe, comfortable, and useful. These goals could only be achieved with a complete integration with the broader infrastructure.



## 11.3 Enhance inclusive and sustainable urbanization

“By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries”

### *Information, Communication and Public Participation*

A system functions correctly only if all its components participate. VG-GI plan required a general agreement of all the agents involved, which included neighbors associations, citizen groups, teaching centers, shop-owner associations, and the university. The mechanisms to favor and encourage public initiatives included workshops, seminars, and hands on programs such as adopting a tree or biodiversity inventories.

#### 11.4 Protect and safeguard the world's cultural and natural heritage

“Strengthen efforts to protect and safeguard the world’s cultural and natural heritage”

##### *European Forest Arboretum Project*

As introduced in UN SDG 2, Olarizu Botanical Garden has a 30 hectares European Forest Arboretum. It is divided into five zones that represent the biomes that define the European Continent. Those five zones are further divided into forest types. In combination with the seeds bank, the forest arboretum is a living museum that protects the biodiversity of Europe’s forests.

#### 11.6 Air quality, municipal, and other waste management

“By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management”

Green infrastructure has long been associated with improving air quality. Trees and vegetation offset air pollution by directly removing pollutants from the air, reducing emissions. In addition to using trees and vegetation to improve air quality, permeable pavement allows storm water to seep into the ground. A recent project is looking into using some of the municipal organic waste as a compost source. It is currently in its developing stages and the quality and

safety of such compost is being assessed to determine if it could be used for food production or energy crops production.

#### 11.7 Provide universal access to safe, inclusive and accessible, green and public spaces

Thanks to VG-GI, the city is one of the European cities with more green surface area per inhabitant, with 20 m<sup>2</sup>/inhabitant. As a comparison, the amount recommended by the World Health Organization is 10 m<sup>3</sup>/inhabitant. The green surface is evenly distributed for the most part ensuring inclusiveness and accessibility for all. Green recreation areas are within a radius of 300 m from any point in the residential layout, just a 2.5-minute walk.

### **Goal 15 – Life on Land**

#### Introduction

UN SDG 15 calls for the sustainable management of forests to combat desertification, halt and reverse land degradation, and halt biodiversity loss. Human life depends on other land life; 80 percent of our diet is provided by plant life, and forests provide vital habitats for millions of species and are important sources of clean air and water. In addition, forests and nature are important for recreation and mental well-being, and key to combating climate change. Life on land needs to be protected more than it has been so far. Of the 8,300 animals known, eight percent have gone extinct and 22 percent are at risk of extinction.

As a result of its location, Vitoria-Gasteiz plays an important role in the ecological connectivity of northern Iberia and represents a key link for the configuration of the pan-European Ecological Network. Vitoria-Gasteiz is located at the center of the Functional Area of Alava, a natural geographic region. Its landscape connects: the Cantabria mountain range to the



west and the Pyrenean Mountain Range to the east, two important reservoirs of biodiversity. A reason FOR the success of VG-GI is its regional approach, which takes into consideration migration patterns and the connectivity of different ecosystems. This unique approach is best shown with targets 15.2, 15.4, and 14.5.

#### 15.2 Promote the implementation of sustainable management of all types of forests

“By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally”

#### *Armentia Park*

Fires and deforestation were the forces destroying Armentia Forest until the late XX Century. After being added to the Green Belt restoration and management practices started being implemented. Efforts to reverse land degradation were significant as it had been a poorly managed until that point and had accumulated a wide array of problems such as; eroded zones, accumulations of effluents, remains of fires, and too many paths. Today it is one of the most important green spaces in the region as it connects the urban region and the forest areas of the *Montes de Vitoria* Mountains.



#### 15.4 Ensure the conservation of mountain ecosystems, including their biodiversity

“By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development”

##### *Montes de Vitoria*

A central element of VG-GI is the mountain region *Montes de Vitoria*, which is considered a Special Zone for Conservation. Despite being in the outskirts of the city, the regional approach of VG-GI connects it to the rest of the system. Many rivers and streams originate from that region and cross through the urban region. In addition, this region is home of a wide variety of flora and fauna. In order to protect the mountains biodiversity, it is important to connect it to other regions, and that is the service VG-GI provides.

#### 15.5 Natural habitats degradation, biodiversity loss and, protect and prevent the extinction of threatened species

“Take urgent and significant actions to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species”

##### *Salburua Park*

Previously introduced, Salburua Park is perhaps one of the most important projects in VG-GI. After its remediation, the wetlands became one of the most important of the continent. Its location serves as a refuge for migratory birds, and hosts a wide variety of endangered species. One endangered species that has found a second chance a Salburua Park is the European mink, the most endangered carnivore in Europe.

## **Conclusion**

Despite not having the objective of meeting the targets of the UN SDGs, Vitoria-Gasteiz made an outstanding job by developing a green infrastructure which is in line with over 20 targets in over 10 UN SDGs. The carefully planned and superbly executed project that is VG-GI is a great example of how natural systems, the community, and government entities can work together to create a beautiful system that reconnects society with nature, individuals with the community, and infrastructure with wellbeing. In a world with limited resources, it is important to use them as efficiently as possible while ensuring sustainable scale and just distribution. VG-GI has demonstrated one way it can be done. Its regional and inclusive approach ensures the protection of natural resources and biodiversity while providing the inhabitants access to a healthier and sustainable life.

It is important to note that the purely physical aspect of VG-GI is not why it has been so successful. While design is crucial for the performance of any system, the combination of design, projects, community, and visionary professionals is what makes VG-GI a great example of sustainable development efforts. Moreover, VG-GI demonstrates that rather than a destination, sustainable development is a process that has to be constantly improved and expanded. While it has already been proven successful, the green infrastructure keeps evolving by adding new projects, and maintaining and improving the current ones.



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