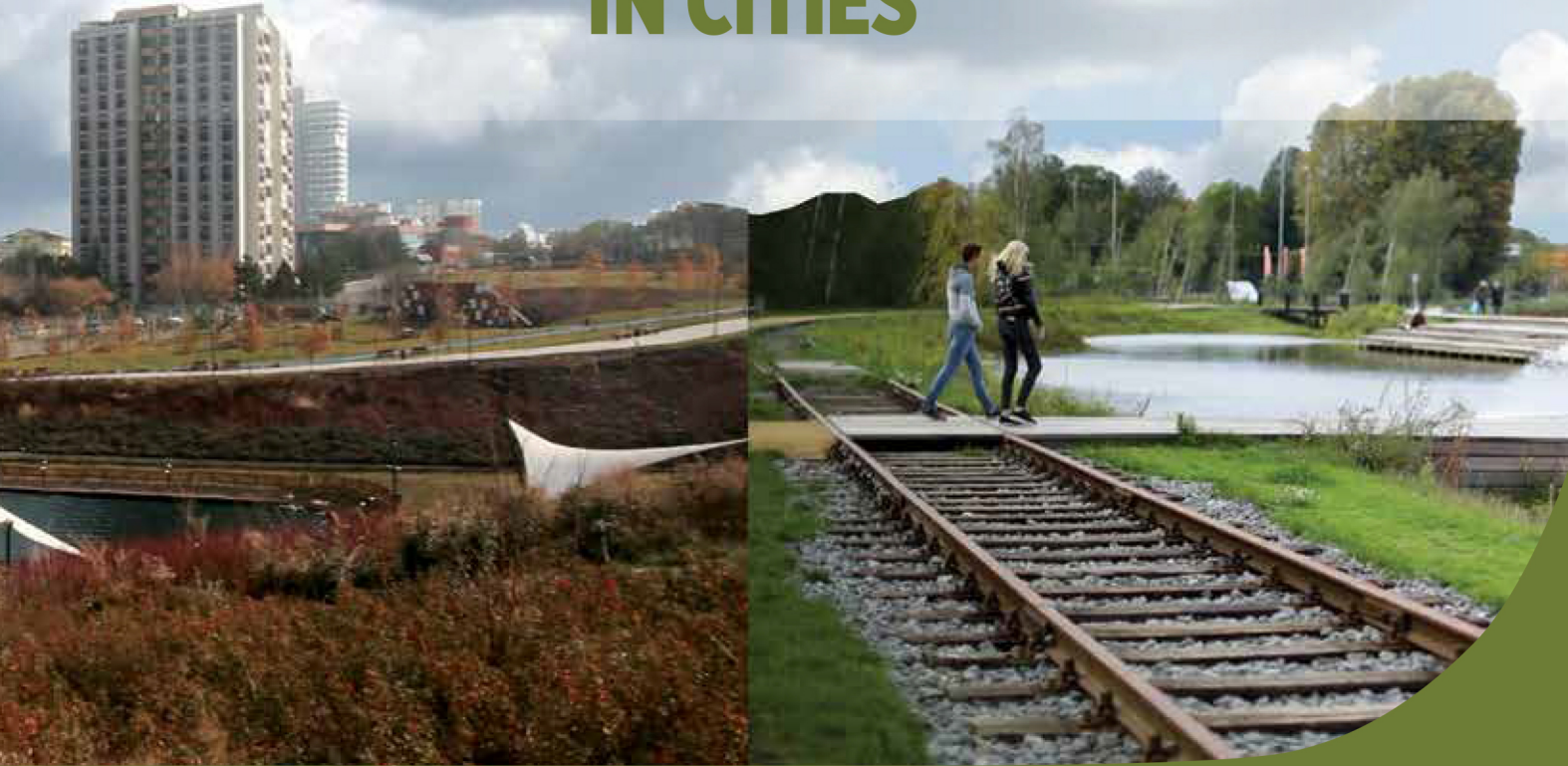




Bu proje Avrupa Birliđi tarafından finanse edilmektedir.
This project is funded by the European Union.

EXAMPLES OF BEST PRACTICES ON GREEN INFRASTRUCTURE AND NATURE-BASED SOLUTIONS IN CITIES





EXAMPLES OF BEST PRACTICES ON GREEN INFRASTRUCTURE AND NATURE-BASED SOLUTIONS IN CITIES

©Nature Conservation Centre, 2020

Çiğdem Mah. 1594 Sok. No:3 Çankaya, Ankara

Phone: 0312 287 81 44 • E-mail dkm@dkm.org.tr

www.dkm.org.tr

ISBN: 978-605-06990-6-7

Compiled by: Fethiye Arslantaş, Kübra Ceviz Sanalan, Ayşegül Çil

Editor: Deniz Şilliler Tapan

Translation: Senem Tuğ Aksoyek

Cover Photograph by: DKM Archive and Fethiye Arslantaş

Graphic Design: İdekaf

Printing: Emsal Matbaa Tanıtım Hiz. San. ve Tic. Ltd. Şti. Bahçekapı Mah. 2477. Cad. No:6 Etimesgut/ANKARA

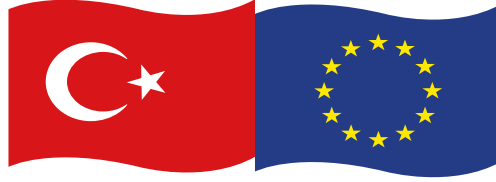
Phone: +90 312 278 82 00 - Fax: +90 312 278 82 30 Etimesgut V.D.: 3340992742 Setifika No: 46753

All rights reserved. The material may not be reproduced or distributed, in whole or in part, or the information there in cannot be used without the prior written permission of the Nature Conservation Centre. However, by providing the full name of the book and of the Nature Conservation Centre, citation is permitted for scientific researches, theses, articles, boks and similar works. The EU and its relevant institutions are exceptions.

Citation:

Arslantaş, F., Sanalan, K.C., Çil, A. (Eds.) 2020. Examples of Best Practices on Green Infrastructure and Nature-Based Solutions in Cities, 120 pages.

“This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of Nature Conservation Centre and do not necessarily reflect the views of the European Union”



Bu proje Avrupa Birliđi tarafından finanse edilmektedir.
This project is funded by the European Union.

EXAMPLES OF BEST PRACTICES ON GREEN INFRASTRUCTURE AND NATURE-BASED SOLUTIONS IN CITIES



EXECUTIVE SUMMARY

Increasing population, expanding residential areas and the effects of climate change increase the social, economic, and environmental challenges of growing cities. In addition to providing adequate housing and accessible physical and social systems for the sustainable development of cities, it is of great importance to develop a planning approach that takes into account sustainable production and consumption, offers an infrastructure that are resilient to disasters and climate change, covers all segments of the society and integrates them spatially. Population projections and urbanization estimates on a global scale reveal that biodiversity and continuity of ecosystem services will be adversely affected. The development of nature-based solutions and green infrastructure in cities offers important opportunities to mitigate these negative effects. In addition to being multifunctional and cost-effective, nature-based solutions and green infrastructure practices provide many benefits from improving public health, reducing energy costs and pollution, living in a clean and healthy environment, renewing of urban areas to conserving biodiversity.

Green infrastructure as defined in the EU Green Infrastructure Strategy, is a network of green areas that conserve the ecosystem values and functions, that are designed and managed to provide ecosystem services, and that are composed of interconnected natural, semi-natural and cultural areas. Green infrastructure, along with nature-based solutions, is an important tool to increase the resilience of cities in combating the negative impacts of climate change.

This book prepared within the scope of “Nature and Cities Project” presents eleven examples of best practices on green infrastructure and nature-based solutions in cities; six from Europe and five from Turkey. The best practices compiled in this book will be a guide for local governments, decision-makers and practitioners. Ankara and Tilburg examples in the book have been found significant during the study visits within the scope of the project. These examples have been chosen in terms of showing mutually inspiring and feasible features for both cities. The examples from outside of Turkey and Ankara, were selected among the practices from the cities that have ongoing interactions within the scope of the project and which will be members of the “Green Dialogue Platform” to be established. These practices are also important examples that can be expanded on a national and international scale. Finally, examples that stand out in the subject of green infrastructure and nature-based solutions in the European Union scale and that can be applied in Turkey are also compiled from a variety of platforms and included in the book.

When examples of best practice are being selected from Turkey, the Netherlands, and EU countries, multiple benefits and exemplariness of nature-based solutions and green infrastructure solutions at different levels, types and combinations are considered. In addition to the adequate economic and social infrastructure, importance was also given to providing a quality and healthy environment to the people living in the city. The same practice may not provide equal benefits in different geographies. Geographical features, sociocultural, environmental, and economic dynamics affect the level of success of the practice. Therefore, general information regarding the city is provided at the beginning of each best practice in order to understand which solution is designed for which problem of the city. Following that, a summary table of the example is presented. The table contains the location of the best practice, other green infrastructure practices and nature-based solutions. In addition, the key features section, which includes the prominent impacts of the practice, is provided with satellite images that change over the years for a better grasp of the impact of the best practice on the city.

Within the scope of Nature and Cities Project, study visits to the EU country Netherlands are organized to increase the knowledge and experience of Turkey with their expertise in nature-based solutions and green infrastructure; and workshops are held for local and international dialogue and cooperation, in addition to the Examples of Best Practices on Green Infrastructure and Nature-Based Solutions in Cities book. Additionally, the book “Ecosystem Services as an Urban Planning Tool: The Case of Çankaya District”, which presents an important technical infrastructure to decision-makers, is prepared; a documentary on the experiences of Netherlands and Turkey is produced to be broadcasted on beIN İZ TV; and short films are made for the social media and shared at national and international platforms. Furthermore, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions / Green Infrastructure - Enhancing Europe’s Natural Capital (COM 2013) 249 final) and the accompanying Commission Services Working Document, which contains technical information about the Green Infrastructure (GI), has been translated into Turkish to serve as a guide.

Nature and Cities Project supported by the program “Turkey - EU Civil Society Dialogue V” coordinated by the Ministry of Foreign Affairs, Directorate of European Union, conducted by the partnership of Nature Conservation Center Foundation and Eurosite Association, in cooperation with Çankaya Municipality and beIN İZ TV. The main objective of the project is to develop the dialogue, knowledge transfer and cooperation between civil society organizations in Turkey and the Netherlands on environmental and sustainable development issues, and to encourage nature-based solutions and green infrastructure in cities in the framework of the the European Union acquis.

INTRODUCTION

The process of compiling “Examples of Best Practices on Green Infrastructure and Nature-Based Solutions in Cities” consists of two steps listed below.

1. Seting outline for the best practice and tabulating:

The book was prepared to contain the information that can be needed for the target group to use the knowledge and for implementation. The topics were determined by the project team and the list of questions were prepared based on these topics in order to enhance better understanding of the best practice example. These topics are: background, implementation and evaluation criteria, and governance.

2. Compiling best practice examples from Turkey and Europe:

Examples were determined through the workshop, Tilburg and Ankara study visits, field research and expert comments. As a preliminary study, a list was prepared. European examples that can be applied in Turkey were scored in the list compiled. As a result of the scoring, the number of samples has been reduced, and diverse examples on green infrastructure and nature-based solutions have been selected. Among the resources used in the selection of European examples are the Oppla and Nature4Cities platform, funded by the European Union.

Furthermore, municipalities which has best practice experiences in Turkey were asked to participate at the workshop held on September 30, 2019 in Turkey in order to share their experiences and to support the establishment of a platform on Green Infrastructure and Nature Based Solutions under the project. These municipalities were contacted while the content of the book was being compiling, and it was requested them to give examples in accordance with designated format.

Finally, the overview tables were provided in each examples that present which green infrastructure component and its implementation scale. In addition, so as to guide the reader before passing the examples, a general table was provided in the last part of the book that present the scales and components of green infrastructure and nature-based solutions that can be implemented and which urban ecosystem service they provide and their economic and social impact .

CONTENTS

EXECUTIVE SUMMARY 2

INTRODUCTION 4

BEST PRACTICE 1: Eskişehir, TURKEY 7

BEST PRACTICE 2: Gaziantep, TURKEY 17

BEST PRACTICE 3: İzmir, TURKEY 23

BEST PRACTICE 4: Ankara, TURKEY 33

BEST PRACTICE 5: Ankara, TURKEY 41

BEST PRACTICE 6: Oppla..... 47

BEST PRACTICE 7: Barcelona, SPAIN..... 53

BEST PRACTICE 8: Tilburg, The NETHERLANDS..... 61

BEST PRACTICE 9: Berlin, GERMANY (URBES Project)..... 89

BEST PRACTICE 10: Balaton, HUNGARY 93

BEST PRACTICE 11: Vienna, AUSTRIA 99

REFERENCES..... 105

OTHER EXAMPLES OF BEST PRACTICES..... 108

SUGGESTED READINGS 110

ONLINE PLATFORMS 111

BEST PRACTICE 1

Eskişehir,
TURKEY



Background

Eskişehir, situated in the northwest of Central Anatolian Region, has a surface area of 13,652 km² and a population of 871,187.

Within the boundaries of Eskişehir province, 573,639 ha (42%) is agricultural land, forested area is 367,327 ha (26.3%) and meadow-pastures cover 325,851 ha (23.8%). There is 10,013,316 m² of green space in the city center and as of the end of 2019, there is 13,96 m² green area per person.

Eskişehir has the geographical character of the Central Anatolian Region. The Central Anatolian steppes, North Anatolian and Western Anatolian forests constitute the vegetation of Eskişehir. Oak, black pine, red pine, willow, poplar and elm trees are among the most common plants. The annual average temperature is 10.9 degrees. Based on the monthly averages, the coldest month of the year is January with the average temperature reaching -2°C. Very cold days and frost are seen from mid December to mid February. Degrees may range between -10 to -25°C. Average annual precipitation is 378.9 kg/m³.

Porsuk River that makes Eskişehir one of the rare cities divided with a river in the middle, originates from Murat Mountain on the border of Kütahya and flows into the Sakarya River by passing through Kütahya and Eskişehir city centers. The flow rate of Porsuk River is 15 m³/sec per year, on average.

The riverbank of Porsuk, which flows across the city centre of Eskişehir, is now a green corridor feature in the city. Almost undivided green spaces have been created and continuity of the green corridor is maintained with the efforts to protect, repair and reconstruct the existing vegetation on both sides along the riverbank, which is approximately 10 km long.

Until the mid-1970s, Porsuk Stream was used by the residents of Eskişehir for recreational purposes, as well as a source of water for drinking and irrigation. People of Eskişehir could go fishing by or swim in Porsuk River. With the growing industry of Eskişehir and Kütahya provinces and the negative effects of urbanization, the pollution of Porsuk River has become the biggest problem of Eskişehir. Domestic and industrial waste discharge continued until the beginning of 2000s and Porsuk River could not keep up with this pollution. During the common mind initiative that took place in 1999 with many participants, Porsuk River, which was considered as the most important asset of the city, also proved to be the most important problem of the city. In 2002, Porsuk River was described as “a river that any living thing cannot live on except for the harmful bacteria and viruses, it is full of waste deposits and it is one of the most dangerous Rivers in terms of pollution and health” by the Organization for Security and Co-operation in Europe (OSCE).

		City, region
Name	Porsuk Riverbank Green Corridor	■ Restoration of 9.6 km of river basin ■ Healthy environment ■ Increased recreational and sporting activities along the corridor ■ Increased socio-cultural value of the city ■ Increased per capita green space ■ Transportation on Porsuk River ■ Green space accessibility ■ Urban ventilation ■ Mitigating urban heat island effect ■ Adaptation to climate change ■ Flood control ■ Increased water and soil quality ■ Erosion control ■ Noise reduction ■ Providing habitats for the living and pollination ■ Increased carbon sequestration
Location	Eskişehir, Turkey	
Utilized nature-based solution and green infrastructure	Green Corridor	
Implementation Scale	City	
Zone of influence	City, region	

Within the scope of “Eskişehir Urban Development Projects” launched in 2003, Natural Disaster Risk Minimization Project (Porsuk Project) and Eskişehir Water and Sewerage Administration (ESKİ) Water Projects; There have been studies carried out to reclaim Porsuk riverfront for the city.

Porsuk River, which has a Class 4 water quality while exiting Kütahya, enters Eskişehir after resting in the Porsuk Dam reservoir, which is also a key point in flood control for the city, and its water quality is converted to Class 1 and 2. All wastewater coming from the city is treated at Eskişehir Central Wastewater Treatment Plant by Eskişehir Water and Sewerage Administration (ESKİ) and thus clean water is released into Porsuk River.

In addition to these works, Natural Disaster Risk Minimization Project (Porsuk Project) is realized in line with the objectives below:

- *To ensure that vehicle and pedestrian bridges are renewed, and river improvements are made in order to repair the damages that occurred after the 1999 earthquake and to mitigate the damage from a possible earthquake.*
- *To make natural life possible again in Porsuk Stream, which has been damaged ecologically.*
- *To make Porsuk River an aesthetic value of the city, to add value to the city, and to enable all residents to benefit from recreational and sports activities.*
- *To ensure that Porsuk River is a clean transportation alternative with the opportunity provided by the river passing through the city dividing it into two.*

- *In order to meet the water needs of the agricultural areas around the city, to provide a solution to groundwater problems in the residences and urban areas in the immediate vicinity due to the infiltration problem caused by the two irrigation canals located separately from the main bed of Porsuk River entering the city.*



View of Porsuk River through Eskişehir city and its surroundings (Photo: Eskişehir Metropolitan Municipality)

Eskişehir Metropolitan Municipality has prepared the project package for the improvement of the parts of Porsuk River within the city, to be resistant to disasters such as floods, earthquakes, to prevent leaks caused by irrigation canals and together with environmental concerns and has also initiate the implementation phase by credit support provided from the European Investment Bank.



A part of Porsuk River within the city after Porsuk Project (Photo: Eskişehir Metropolitan Municipality)

Implementation and Evaluation Criteria

Within the scope of the Natural Disaster Risk Minimization Project (Porsuk Project), which reclaimed Porsuk River for the city and transformed its surroundings into green corridors, the following are realized:

- *9.6 km of the riverbed within the city is improved.*
- *13 vehicle and 9 pedestrian bridges on Porsuk River are renewed, with priority to the bridges in the city center.*
- *8 water level control structures for transferring boats are built.*
- *Three multifunctional parks are established in Eskişehir.*
- *3 islands are built on Porsuk River.*
- *City is supplemented with 1,445,074 m² more of green space.*

In 1999, the green space per person in Eskişehir was 0.50 m², but today this ratio is 13.96 m². The Porsuk Riverbank has an almost continuous green space within the city. It is an indispensable recreational and attraction center of the city with its numerous parks, seating and viewing areas, sports fields, children's playgrounds, walking and cycling routes. The green corridor band on the shore of Porsuk River, on both sides, has a total of 597,094 m² of parks and greenery.

Porsuk River hosts wildlife, aquatic and terrestrial, again, as a result of the implemented and sustained practices. Today, Porsuk has become a river where the locals go fishing.



Porsuk River green corridor together with the Porsuk River and surrounding greenery (Photo: Eskişehir Metropolitan Municipality)



Kent Park, which was created on an area of 257,000 m² at one end of the Porsuk Project, has an average of 150,000 m² green area. It provides space for many recreational activities such as cafes, restaurants, buffets, artificial ponds, indoor olympic swimming pool, outdoor pool, children's pool, a 310 m-long artificial beach, sports fields, playgrounds, and horse-riding area. If Porsuk is the necklace of Eskişehir today, the beach in Kent Park has become the most flamboyant stone of this necklace. The beach is built on the shore of the artificial island, which was built with a canal opened separately from the Porsuk riverbed within Kent Park.

*The view of Kentpark Porsuk River and surroundings
(Photo: Eskişehir Metropolitan Municipality)*



The view of Kentpark and Porsuk riverbank (Photo: Eskişehir Metropolitan Municipality)

As Porsuk River is a tourist attraction, thousands of people visit Eskişehir every year. While large-scale arrangements were made to clean Porsuk River and mitigate the risk of disasters, additional adjustments and work are undertaken to make use of Porsuk in urban transportation, as in other developed cities in the world with a river passing through. Also, canoe and dragon boat races are held annually in Porsuk River.



A sight of the dragon boat race on Porsuk River (Photo: Eskişehir Metropolitan Municipality)

Porsuk Riverbank before and after Porsuk Project



Adalar, 1970 and today (Photo: Eskişehir Metropolitan Municipality)



Porsuk Riverbank in front of Tülomsaş, before and after (Photo: Eskişehir Metropolitan Municipality)



Before and after of a bridge crossing Porsuk River (Photo: Eskişehir Metropolitan Municipality)



View of Porsuk River from Köprübaşı (city center) (Photo: Eskişehir Metropolitan Municipality)



Porsuk Riverbank at Kanlıkavak location (Photo: Eskişehir Metropolitan Municipality)

Governance, Decision-Making and Policy Tools

The Porsuk Project, which started its implementation phase with a loan agreement signed between Eskişehir Metropolitan Municipality and the European Investment Bank; For the first time since the establishment of the European Investment Bank, it has provided funding to the main idea of “Urban Development Projects” instead of individual projects, and Eskişehir has become the first example of this in Europe.

The legal tools for the implementation of the Natural Disaster Damage Mitigation Project (Porsuk Project) implemented based on the article 14 of the Municipality Law No. 5393, the article 7 of the Metropolitan Municipality Law No. 5216 and the article 8 of the Zoning Law No. 3194.

The Porsuk Riverbank green corridor line, which was launched as a Natural Disaster Damage Mitigation Project (Porsuk Project) and is continually provided with new green spaces, has been awarded many awards in the fields of sustainability and urbanism at home and abroad. With its projects and implementations, it has become a pioneer to many cities of the world that have rivers running through but have not realized its value.

BEST PRACTICE 2

Gaziantep,
TURKEY



Background

Gaziantep is situated in the Southeast Anatolia Region. It has a continental climate. Gaziantep has a population of 2,028,563 and 17,575,076 m² of active green space. There are 593 parks available to the residents of Gaziantep. There are three urban forests in the city. Alleben Stream that runs on the west-east direction passes through the city centre. There is a green corridor along the stream. In the city, the area covered by Euphrates River, Alleben Stream, Alleben Pond, Burç Pond, Erikçe Forest, Burç Forest, Dülük Baba Forest, Gerçiğın Forest and other forests is 1,129,230 decares.

		Key Features
Name	Green Corridor Along Gaziantep Allaben Stream	- Healthy Environment - Recreational and sportive activities along the corridor - Increased socio-cultural value of the city - Increased per capita green space - Increasing accessibility to green spaces - Urban ventilation - Mitigating urban heat island effect - Adaptation to climate change - Flood control - Increased water and soil quality - Erosion control - Noise reduction - Providing habitats for the living and pollination - Increased carbon sequestration
Location	Gaziantep, Turkey	
Utilized nature-based solution and green infrastructure	- Green Corridor - Permeable pavement - Rainwater planting strips	
Implementation Scale	City	
Zone of influence	City, region	

There are 18 thematic parks and natural areas integrated in the Allaben Stream flowing in the west-east direction in Gaziantep. These parks all have vegetation along the banks of the stream with surface rainwater flow control, percolation and filtering functions.

These areas are:

- Allaben Pond and its surroundings
 - Harikalar Diyarı
 - Fıstık Park
 - Hayri Tütüncüler
 - Traffic Park
 - Hayri Tütüncüler 2
 - Kavaklık
 - Maanoğlu
 - Fairytale Park
- Planetarium
 - Botanical Garden
 - Festival
 - 100.yıl Atatürk Kültür Parkı
 - Castle
 - Tüfekçi Yusuf
 - Nurgana
 - Şehreküstü

Considering nature-based solutions and green infrastructure practices, Kavaklık Park has permeable pavement, and 18 parks along the edge of the stream have rainwater planting strips. The pedestrian axis made of terracotta chippings throughout the Kavaklık Park permeates and percolates rainwater to the soil.



A view from the park within the green corridor (Photo: Gaziantep Metropolitan Municipality)



Various uses of space can also be seen within the green corridor established around the Allaben Stream (Photo: Gaziantep Metropolitan Municipality)

Governance, Decision-Making and Policy Tools

Metropolitan Municipality Law No. 5216, Municipality Law No. 5393 and Public Financial Management Law No. 5018 and related articles became the legal tool for the practices and infrastructure works for building green corridors in the city. The process of creating a green corridor in the city also includes field work and observations. In the study, oral responses were collected, and a questionnaire study was held. As a result of these studies, data regarding the problems and needs of the users were obtained. Considering this information, new practices in the parks are included in the implementation process.

Parks on the stream banks are used extensively by the public. Children's playgrounds, walkways, sports fields and 18 thematic parks attract great attention. All kinds of opinions received from the users are evaluated by the administration, solutions are produced by the relevant units and necessary implementations are carried out. 18 thematic parks include special functional structures and gardens, such as, The Planetarium, The Botanical Garden and The Green Building.

BEST PRACTICE 3

İzmir,
TURKEY



Background

Located on the western coast of Turkey, İzmir is Turkey’s third largest city with a population exceeding 4 million. The city, under the influence of the Mediterranean climate, experiences hot summers and relatively warm winter conditions. Being one of the oldest port cities of the Eastern Mediterranean, İzmir has a wide range of historical and cultural sites with its 8,500 years of history. In addition to all these assets, İzmir is the center of the Aegean Region with its modern and dynamic infrastructure. Its local economy comprises mainly the developing service sector and manufacturing industry and agricultural production.

		Key features
Name	İzmir Green Infrastructure Strategy and Implementation Process	- Green area accessibility and increase in green area per capita - Increased socio-cultural value of the city - Increased recreational and sporting activities along the Green Corridor - Urban draught - Reduce urban heat island effect - Adaptation to climate change - Flood control - Increase in air, water and soil quality - Erosion control - Noise reduction - Providing living space for pollination and species - Increased carbon sequestration - Reduction in air pollution from heavy urban traffic
Location	İzmir, Turkey	
Utilized nature-based solution and green infrastructure	- Green corridor - Street afforestation - Swale - Green fence structure - Green roof - Parklet - Permeable flooring - Sustainable urban drainage - Pollinator house	
Implementation Scale	City	
Zone of influence	City	

URBAN GreenUP is a project supported by the European Union’s Horizon 2020 Program. With the aim of developing, implementing and repeating city plans, it aims to reduce the effects of climate change, improve air quality, improve water management, as well as increase the sustainability of cities through innovative nature-based solutions, with a group of partner cities from Europe and outside Europe. The projected end date of the project, which started on 1 June 2017, is 31 May 2022.

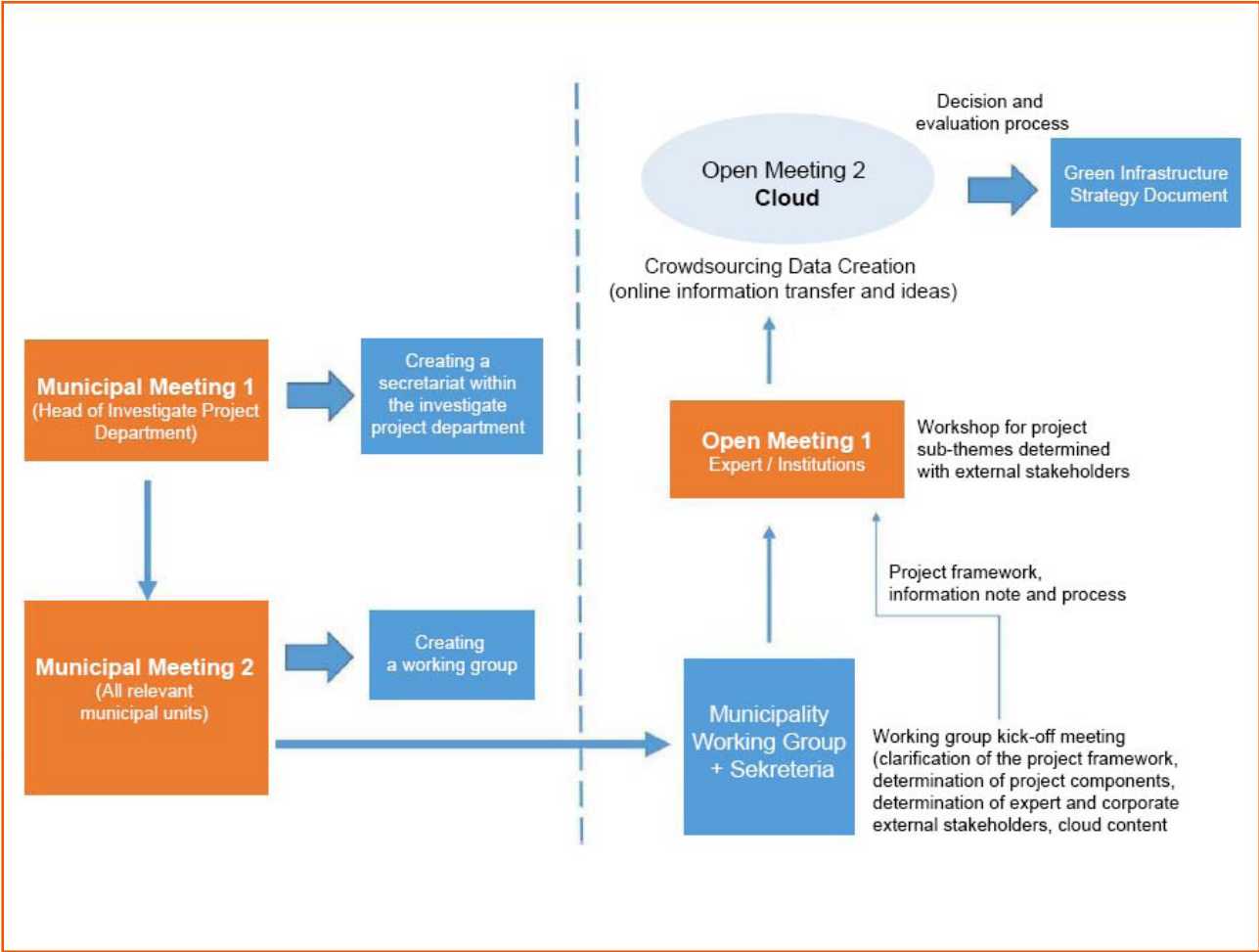
With its large population and expanding urban area, İzmir faces the problems experienced by the rapidly urbanizing world. These issues include:

- 1. The weak integration of the blue-green infrastructure with the existing gray urban infrastructure
- 2. The establishment of a green-blue network system and the relations between intense urban texture and the background on the coastline of the bay in its surroundings within the city-region of İzmir
- 3. Development of a project spatial database inclusive of nature and climate data, mapping, and lack of integration of gray and green infrastructure projects of different units
- 4. Lack of inter-institutional cooperation
- 5. The weak relationship of other thematic strategies and projects implemented in the city

İzmir Green Infrastructure Strategy has been developed based on this context. With the proposed solutions, building green corridors and reducing the heat island effect in the city were the focus. More specifically, the solutions to be implemented are grouped in the categories below.

- **Re-naturalization of urbanization:**
 - Building pedestrian and bicycle trails on the green corridor
 - Establishment of woodlands and parks, and afforestation works
 - Establishment of carbon sinks through urban copses
- **Water solutions**
- **Building storage pools and natural rain ditches for storing and filtering water**
- **Restoration of riverbank and establishment of green pavements**
- **Singular green infrastructure elements:**
 - Production and use of biocoal
 - Implementation of various pollinator units
 - Implementation of green hedges
 - Green canopy and cold pavement practices
 - Creating climate sensitive greenhouse areas for educational purposes
- **Non-technical interventions:**
 - Public participation in various educational activities
 - Supporting public participation into co-design activities

Process of Development of İzmir Green Infrastructure Strategy:



Process of Development of İzmir Green Infrastructure Strategy

The process was initiated with the establishment of a secretariat in support of ‘nature-based solutions’ within the İzmir Metropolitan Municipality in January 2017 for the reasons stated in the İzmir Green Infrastructure Strategy. Later, a ‘Municipal Working Group’ was formed with the participation of the municipal units associated with the subject, and with the efforts of this group, İzmir Green Infrastructure Expert Workshop was held with over 150 experts participating from all local and national level institutions (universities, public institutions, NGOs) in June 2017. The following theme topics were established in this workshop:

- **Planning and Governance**
- **Wetlands**
- **Green Areas**
- **Corridor and Connections**
- **Structures, Idle Areas and Areas to Repair**

Within the scope of these theme titles, ideas were developed by the participants under the facilitation of the Municipality Working Group and the Moderators on the related theme.

STRUCTURAL ELEMENTS FOR GREEN INFRASTRUCTURE PLANNING AND GOVERNANCE	STRUCTURAL ELEMENTS FOR WATER AREAS	STRUCTURAL ELEMENTS FOR GREEN AREAS	STRUCTURAL ELEMENTS FOR THE CORRIDOR AND CONNECTION AREAS	STRUCTURAL ELEMENTS FOR BUILDINGS, PASSIVE AND RESTORED AREAS
■ Green economy / green infrastructure training and employment ■ Green procurement procedures, financing ■ Eco-efficiency ■ Green infrastructure governance panel, software and applications	■ Dam, pond and reservoirs ■ Marshland, wetlands (coastal / continental) ■ Flood land ■ Coastal and beach areas ■ Marine habitat, artificial reefs ■ Rivers, creeks and other running waters ■ Lagoons, saltens and fishgarths ■ Riverside / creekside corridors ■ Irrigation channels, tanks and wells ■ Coastal structures: culvert, breakwater, shore embankment, aqueducts ■ Blue roofs	■ Gardens ■ Coppice and afforested areas ■ Forest, urban forest / fruit forest ■ Agricultural lands ■ Children's playground, neighborhood park / district park, city park ■ Recreational area ■ Thematic green areas ■ Hobby gardens / urban gardens ■ Excursion spot / picnic spot ■ Green roofs ■ Cemetery, burial sites ■ Sports fields	■ Roadside planting/ shoulder and verge ■ Border / hedge plants ■ Urban drainage areas: water ditches, permeable pavements, etc. ■ Bicycle / pedestrian roads / routes and crossings ■ Parklet ■ Vertical gardens / green walls ■ Ecological bridges (wildlife) ■ Pollinators: bee houses etc.	■ Quarries (active, out of use) ■ Garbage-rubble dump sites ■ Old industrial zones ■ Abandoned construction sites ■ Debris sites / scrap yards ■ Single component of urban green structures ■ Old gray infrastructures / empty parcels

The Tools:

HORIZON 2020, URBAN GREEN UP ‘European Union Framework Programme Nature Based Projects’

- **Reducing the heat island effect and decreasing carbon emissions**
 - Green Roofed Parking (completed)
 - Parklet (completed)
- **Increasing biodiversity, enriching groundwater, and transferring new farming techniques against drought**
 - Sasalı Climate Sensitive Urban Agriculture Laboratory (construction process continues)
 - Bioçar (Smart Soil) Production Unit (tender process continues)
 - Using wastewater sludge in agriculture and landscaping (tender process continues)
- **Increasing biodiversity, enriching groundwater by creating permeable surfaces and reducing carbon emissions**
 - Peynircioğlu Creek Re-naturing Project (construction process continues)
 - Planting 4,800 trees and Industrial Heritage Route (construction process continues)

- **İzmir Green Infrastructure Strategy Practices**
 - Implementing Parklets, Green Roofed Parking
 - Climate Sensitive Urban Agriculture Laboratory
 - Peynircioğlu Creek Re-naturing Project



Practices within İzmir Green Infrastructure Strategy, realized and at project phase



Green Parking Practices (Photo: İzmir Metropolitan Municipality)



*Climate Sensitive Urban Agriculture Education and Research Institute Practices
(Illustration: İzmir Metropolitan Municipality)*



*Peynircioğlu Creek re-naturalization project Green Parking Practices
(Illustration: İzmir Metropolitan Municipality)*



Parklet and Green Parking Practices (Photo: İzmir Metropolitan Municipality)

Implementation and Evaluation Criteria

With URBAN GreenUP, increasing the quality of life in urban areas, increasing the awareness and mindfulness among citizens regarding environmental protection, and creating international networks and synergies will also be encouraged. As the last and most important point, it underlines the importance of accomplishing this by drawing attention to the impacts of climate change and by directly involving the city people through production activities and by ensuring active participation of local communities.

Expected Impacts

Suggested solutions for environmental conflict areas such as heat island effect, flood risk, intense urban traffic air pollution and loss of natural areas are as follows:

1. **Re-naturing urbanization:** Green roads, afforestation works, resting areas and carbon sinks
2. **Water solutions:** Sustainable urban drainage, flood measures and green pavements
3. **Singular green infrastructure solutions:** Biocoal, pollinators, vertical and horizontal green infrastructure solutions, and urban agriculture
4. **Non-technical interventions:** Educational activities, public participation, city guides, and supporting activities

Bu çözümlerin yardımıyla aşağıdaki etkiler beklenmektedir:

1. Re-naturing of urbanization

a. Green roads: It is estimated that approximately 700,000 people will use the region from the stream restoration to the wildlife park using the walkway and biking trails practices within the green corridor. In addition, over 500,000 people are expected to benefit from the BISIM rental bike system.

b. Afforestation works: With this process, an annual carbon emission reduction equivalent to 46 tons of carbon dioxide is expected and the temperature in the selected areas are expected to decrease 3 to 5 degrees in the summer months.

c. Resting areas: Shaded areas will be created in selected sites.

d. Carbon sequestration and storage: Annually 36 tons of carbon dioxide equivalent is expected to be sequestered and stored. In addition, the biodiversity of the region is planned to be increased.

2. Water solutions

a. Sustainable drainage systems: It is expected to hold 165 tons of water annually.

b. Flood measures: Flash floods and overflows are planned to be prevented and water holding capacity is projected to be increased. In addition, the stream band will be replaced with ecology-friendly and permeable material. 300,000 inhabitants are expected to visit and use the area with added attractions.

c. Green pavements: The felt temperature during the summer months is expected to drop between 2 and 4 degrees.

3. Singular Green Infrastructures

a. Biocoal practices: It is expected that the level of 1.05 CO₂ and 0.4 NO₂ tons equivalent will be reduced every year. In addition, a 1.5 degrees reduction in heat island effect is predicted.

b. Pollinators: It will allow to increase the biodiversity in the region and can be used for educational purposes. It is anticipated that the pollination activity will increase by 45%, and the number of indigenous plant communities will increase.

c. Vertical green infrastructure: It is expected to reduce the risk of floods due to heavy rain.

d. Horizontal green infrastructure: Green shades to be installed in selected parking areas are expected to meet the water needs of the plants, as well as providing shade for citizens. In addition, the sidewalks in the park area will be designed as solar reflecting (albedo) with the aim to decrease the heat absorption. Green infrastructure systems (such as green canopy) that will be applied individually will increase the green cover by 75%; the temperature will be reduced 2 to 4 degrees. Among other expected effects are that the organic gas evaporation will be reduced by 2% and NO_x emission rate will be decreased by less than 1%. On the other hand, pavement surface temperature is expected to decrease by 10 degrees. An estimated 230,000 people will benefit from the green canopy and the rest of the green infrastructure practices.

e. Urban Agriculture: It is expected that 7.5 tons of water will be stored annually by growing drought-tolerant plants (plants with low irrigation needs) in climate-sensitive greenhouses.

4. Non-technical interventions

a. Educational activities: The welfare of approximately 90,000 citizens is expected to increase and their sensory qualities are expected to be improved with different green infrastructure options. Additionally, more than 150,000 citizens are estimated to participate in the Bio-Boulevard oriented educational area to be established; and they will be informed on issues such as biodiversity and climate change. This open area, which will be called “the laboratory of the future”, will disclose the results of climate change to the participants with a special education and communication program. Therefore, 840,000 people are expected to visit this “laboratory of the future”. Finally, with the help of local administrations, a strong producer presence comprising women’s cooperatives and producer stalls will be represented. Approximately 420,000 residents are expected to visit these market stalls.

b. Participation: With the transfer of information, supporting the welfare of farmers, encouraging women’s co-operatives, and organizing bioblitz activities in Izmir, the number of citizens anticipated to participate is 50,000 for the portal, 300,000 for municipal-supported urban agriculture, and 85,000 for women’s cooperatives and 100,000 for bioblitz and open platforms.

c. City guides: Awareness-raising activities and mobile applications are expected to reach 500.000 users for ecological awareness.

d. Supporting activities: By establishing a new citizen-supported platform that facilitates the monitoring of Nature Based Solutions in the city; a city guidance strategy will be developed, involving approximately 60,000 people.

Governance, Decision-Making And Policy Tools

- *As a signatory of the "Covenant of Mayors", which envisages the reduction of carbon dioxide emissions, the Izmir Metropolitan Municipality has committed to reduce the carbon dioxide emission by 20% in the areas under its authority until 2020.*
- *The impacts of practices completed within the scope of Urban Green Up on heat island effect, carbon emission and biodiversity will be measured and reported for two years. According to the results obtained after these measurements, it is planned to expand the nature-based solution practices into the crucial regions of the city. For example, parklets, green roofed car parks, permeable surfaces, and pollinator houses.*
- *At the point of implementing the strategies mentioned in the İzmir Green Infrastructure Strategy, studies have started in two different areas; 'Meles Creek and Yeşildere Valley Ecological Corridor Urban Design Competition' and 'Olivelo Urban Fringe Ecology Park Design Competition'. These contain both rural and urban areas owing to their large scale. The targets here are to plan approaches that strategically plan the link between natural and urban areas, provide and manage biodiversity, and improve nature's ability to offer ecosystem products and services such as fresh air and water.*
- *The 'Climate Change and Environmental Protection Department' was established within the Izmir Metropolitan Municipality, which will provide coordination of analysis and solution-oriented studies on the effects of climate change. A working group was formed as the first step for the 'İzmir Green City Action Plan Project' by the same department and a search workshop was organized.*
- *Enlarging the electric bus fleet and arranging new biking trails are the topics on the agenda to reduce the carbon footprint resulting from transportation.*

BEST PRACTICE 4

Ankara,
TURKEY



Background

Çiğdemim urban garden is established on an approximately 1,500 m² area in Çiğdem neighborhood with a population of 14,071 in Çankaya district of Ankara. There is METU forest approximately 500 m air flight from west and east. Accross the road, there is Can Yücel Park. There is no unconstructed land in the neighborhood where the high-rise residences make up the majority. Çiğdemim urban garden and its surroundings are located in an open area compared to the other parts of the neighborhood and is surrounded by apartments and coumpounds with specially maintained gardens that have large green areas.

The two sides of the garden facing the road are surrounded by a fence covered with ivy to protect against external influences. The works were carried out under the guidance of METU, with the participation of many neighbors and associations. The land of the urban garden has a soil that is poor in nitrogen – phosphate and is of compact gravelly clay texture due to the land being priorly used as a construction site. Excavation soil was laid in the area in the first year and repair works continued for a long time.

8 pans and 10 raised beds that are 120 cm wide are firstly planned. Making use of the slope of the area, two drip irrigation pipelines, which are 45 cm apart, are laid for each bed with three water tanks; one 5-tonnes and two 200-kg. Hence the beds and pans are made ready for planting.

Initially, planting areas in beds and pans are tried to be improved by using burnt manure but with time, the percentage of organic texture was increased with compost production - utilization practices.

In the garden, where various fruit trees, medicinal and aromatic plants and vegetables are grown, heirloom seeds and seedlings shared by reliable stakeholders were used in the first year. Moreover, no chemicals or fertilizers have been used to combat diseases and pests or to improve soil.

		Key Features
Name	Çiğdemim Neighbourhood Urban Garden	- Change of production habits and consumption habits in the neighbourhood - Facilitating access to food - Decreasing the reliance on long distance transportation for food supply, thus contributing to reduction of greenhouse gas emissions - Contributing to in-situ biodiversity conservation - Contributing to the recycling of waste by methods such as compost - Increasing citizens’ knowledge and awareness on responsible production and consumption, biodiversity, agricultural production, and climate change - Improvement of healthy eating habits - Contributing to local development by supporting the local producers - Providing cool areas for the environment in the city
Location	Ankara,Turkey	
Utilized nature-based solution and green infrastructure	Urban Garden	
Implementation Scale	Neighbourhood	
Zone of influence	Neighbourhood, city	

Çiğdemim urban garden fills an important gap in improvement of the life practices in harmony with nature and more importantly, to draw attention to the urban-rural relationship, local production and consumption, and clean and accessible food. With the “Çiğdemim Neighbourhood Urban Garden” created within the neighbourhood and the activities organized here, the knowledge and awareness of the residents in the fields of ecological agriculture, composting, sustainable life and seeds are increased. The aim is to share basic information on natural cultivation, especially to provide children and young with responsible production and consumption habits.

The established neighbourhood urban garden has proved that natural products can be grown within the neighbourhood. Seeds are grown in the urban garden, seedlings are grown from seed, crops are grown from seedlings, natural seeds are kept alive in cooperation with many food communities, and collaborations are developed with local producers. The neighborhood urban garden is designed to experience practices in a small area, on symbolic scales, but whose effects are thought to be large. It has been set out with the view that the heirloom seeds, which have been adapted to the Anatolian climate and soil for centuries and are fertile and disease-resistant, can be defended in the city center.

Despite the poor and compact structure of the soil in the garden, three compost tanks were prepared, considering that the chemical residues, weed seeds and larvae brought by the animal fertilizer used to improve the soil will cause problems; the use of hot composts made using domestic organic wastes brought by the members and pruning-mowing wastes from the surrounding compound gardens, parks, and urban gardens has been accelerated. The resulting hot compost was used in ‘Hügelkultur and ‘Lasagna Mulch Bed’ practices as fertilizers with rich organic components. Good practices without fertilizers, which require less maintenance and little water, free of quackgrass seed and residue have been implemented and information has been shared.

It has been observed that the results from two Hügel Beds and Lasagna Pans are quite good; there is no quackgrass and no prominent plant disease. A worm tower was put into practice to enrich the microorganisms in the soil. In addition, work for the preparation and production of Bokashi Compost and Bokashi Serum are ongoing.

Çiğdemim Association develops itself, with the help of the volunteers, through EU grants projects, training programs, food community events, seed exchange programs and practices carried out in the urban garden It also brings together academicians, scientists and rural producers working in this field, with young people.

Within the scope of **‘Ankara Ecological Life and Society Days’** between 2013-2017, under the topics such as **Real Food and the Right to Food, Let’s Shape Our Neighborhood Ecologically, Bridging the City and the Country, Awareness for a Sustainable World and Children**, activities and awareness raising studies were carried out on many subjects such as applied information programs related to the problems experienced; designing Permaculture and Ecological Life; Food Independence Manifest; Food Self-Efficacy and Access to Real Food; Urban Gardens and Rural Urban Brotherhood; Experiences in Production and Distribution from Traditional Food to Industrial Food; Yogurt, Cheese, Barley and Sourdough Bread and Ointment Production from Medicinal Plants and Eco Architect Workshops.

In addition to many differentiations in the ecosystem of the urban garden since its establishment in 2012, there have been increase in insect and plant diversity. In the compost production stage, in the maintenance and hoeing stages of beds and pans, species such as millipedes, centipedes, earthworms, ants, beetles, mantis, ladybirds, woodlouse, slugs, butterflies, and bumblebees, as well as the decomposers and scavengers on the plant and / or soil structure are observed as they continue their ecological cycles.

Through the activities carried out with local producers, the sharing of information and experience has been ensured, the contact between the consumers and food communities in the city center and the farmers in the countryside has been increased, and the recognition of their nature-friendly agriculture and livestock practices has been ensured. In this context, the first -but planned to be made traditional- **‘Natural Products Directly from the Producer Fair’** can be expressed as a product of the internal dynamics of the urban garden.



A view from the urban garden (Photograph: Çiğdemim Association Archive)



The urban garden and its surroundings (Photograph: DKM Archive)



The urban garden and its surroundings (Photograph: DKM Archive)



Products from the urban garden (Photograph: DKM Archive)

Implementation and evaluation criteria

Çiğdemim urban garden aims to develop livelihood practices in the city that are in harmony with nature and to create permanent and sustainable differences especially in urban-rural relations, local production and consumption, access to clean and healthy food:

- *Conversion of mowing-pruning wastes from parks, gardens, compounds, and organic domestic waste brought by association members and neighbours,*
- *Repairing the soil with organic wastes brought from the urban garden and outside, by lasagna, hügel beds and mulching practices, and sustaining productivity,*
- *Making children ecology literate and providing them with practical information by introducing soil, sowing seeds, planting seedlings, and making seed balls, with summer school programs,*
- *To share information with the undergraduate students who conduct Erasmus projects or surveys on subjects like urban gardens, compost and ecological transformation, and provide them with practice opportunities,*
- *To be an intermediary in establishing the link between the rural and the urban; to introduce the products of small family farmers in rural areas to neighbours and members of the association; facilitating access to healthy, reliable, fresh food,*
- *To create a sense of belonging for the visitors and to create an environment for them to return to work in or to visit the urban garden,*
- *To create opportunities for people to grow natural peppers, tomatoes, mint, parsley, arugula, etc. in their gardens, balconies or terraces and for them to meet real food.*

Governance, Decision Making and Policy Tools

Çiğdemim Association was established in 1996 by 14 volunteers from the neighborhood. The association, main purpose of which is to improve the quality of life of the residents and to strengthen the neighborhood relations that are becoming weaker, carries out a wide range of studies in line with its purpose. All decisions are taken at the General Assembly, the highest decision-making body of the association. Members who wish to attend the Board of Directors meetings held at least once a month can submit opinions. Decisions are made with the participation of 20 people.

BEST PRACTICE 5

Ankara,
TURKEY



Background

Çankaya became a district in 1936. As of the end of 2018, it is Turkey’s most populated district with a population of 920,890. Also, being in the capital, it holds important public buildings such as the Grand National Assembly of Turkey, ministries, force commands, and embassies. In Çankaya, with a population exceeding 2 million in the daytime, there are 123 neighborhoods and 470 parks designed by Çankaya Municipality. The total surface area of active green areas in the district under the responsibility of the Çankaya Municipality is 1.259.493 m². There are also large green areas such as Seğmenler, Botanik, Kurtuluş Park, within Çankaya, which are under the responsibility of the Metropolitan Municipality of Ankara. The total area of the passive green areas under the responsibility of the Çankaya Municipality is 295.624 m².

Key Features		
Name	İsmet İnönü Parkı	■ Protecting an area with high commercial value by turning it into a green area ■ Preserving the existing ecosystem with biological ponds that provide habitats, as well as save in maintenance and conserve water ■ Protecting the local ecosystem and saving water, mitigating the flood risk with the use of local plants and shrubs, ■ Controlling the surface flow with the use of permeable material and contributing to the water cycle ■ Providing a refreshing environment for residents and parks in the summer months and preventing the formation of heat islands in the area by protecting the existing trees and especially planting trees along the bike
Location	Ankara,Turkey	
Utilized nature-based solution and green infrastructure	■ Park	
Implementation Scale	Neighborhood	
Zone of influence	Neighborhood, city	

Implementation and Evaluation Criteria

İsmet İnönü Park is one of the newest parks of Çankaya. Located in Birlik Neighborhood, which has a high population density, the park significant with its proximity to the dense commercial region located in Yıldız Neighborhood. Despite the commercial recreation and zoning pressure around it, the park, which has been designated as a green area, has become part of the green system, together with the older Lozan Park and the Zafer Park designed with this park that extends to the Imrahor Valley in the south and the Presidential Palace in the north although narrowing at certain areas. The park, with a total area of 52,000 m², has 33,000 m² of green space. In addition to the indoor and outdoor facilities where recreational activities can be carried out in the area, there is also the Çankaya House where neighborhood residents can perform sociocultural activities.

In İsmet İnönü Park, which welcomes visitors with the ceremony area in the entrance section, there is a middle square, a cafeteria with indoor and outdoor sections, a large ornamental pool, a 2 meter-wide natural stream, and bicycle paths and vehicle roads. Covering an area of 1,400 m² in the park, the biological pond not only contributes to ecosystem processes, but it is also noteworthy with its aesthetic role in urban life. Biological pond in the park has the function of treating and purifying water without any chemicals, thanks to the aquatic plants and beneficial microorganisms. Furthermore, the bird species in the region benefit from the pond to fulfill their vital needs. The pond also saves on water and maintenance costs.

The most striking feature of the park is that it has been designed by considering its ecological value without touching its topography. The existing trees in the park were preserved, the natural stream and the pit were used to create a biological pond, a landscape was created with bushes to prevent landslides on the slopes, and a lavender field and an amphitheater for recreation are built in the other pit. The playgrounds, which have a total area of 1,262 m², are built using basin, river stones, red mosaic stones; jogging paths and fitness areas are built with water-resistant materials; trees are planted along the bicycle path within the park, and the administrative area is designed with green roofs for energy conservation by making use of the topography. Another point that draws attention in the park is the use of permeable surfaces. Thus, while preventing the accumulation and runoff of rainwater, it also contributes to the water cycle.

Governance, Decision-Making and Policy Tools

Parks within the borders of Çankaya Municipality are generally built by following the design and activation procedures of green areas with the political will of the Mayor, upon the demands of the citizens. İsmet İnönü Park is very important because it is an active green area that is protected despite the zoning plan pressure in an area where there is a shopping mall and commercial areas in its vicinity. In addition, the park, which is designed by considering many components in terms of green infrastructure, has been planned to be connected to the other parks, establishing an ecological band. Socially, the main target is that the people living in dense commercial and structured areas due to urbanization pressure can access recreational services in a healthy environment and socialize. Social elements that will provide social benefits and appeal to all age groups have also been considered, and small areas where people can sit for a long time and areas that provide food and beverage services that do not disturb the integrity of the park have been created.

The fact that Çankaya Municipality is a member of the Association of Healthy Cities, and the goals of creating a healthy city, as well as the will of the Mayor in combating climate change was effective in designing these areas as green areas and usage of green infrastructure elements. Green infrastructure practices in the park have been designed and implemented with the experiences of Çankaya Municipality Directorate of Parks and Gardens in many other park implementations, the EU projects it has realized, and the technical support it has received. The projects and works carried out or included by Çankaya Municipality are implemented with a philosophy based on participation and social equality, with priority on climate change and health issues. Studies such as EU Town Twinning Program, Environment and Energy, Climate Change and Gender Equality projects, Rainwater Harvesting Project, European Voluntary Service Project, Nature-Based Solutions as part of Horizon 2020 Project can be considered as important steps and sample practices. Çankaya Municipality, which undertook the strategy of combating climate change and adaptation to climate change on the city scale, is also among the European towns that have signed the Covenant of Mayors on “Combating Climate Change”.



İsmet İnönü Park (Photo: Çankaya Municipality)



Biological pond practices in the park (Photo: DKM Archive)



İsmet İnönü Park (Photo: DKM Archive)

BEST PRACTICE 6

Oppla



Background
Information hub for nature-based solutions

OPPLA is offering the widest knowledge and application transfer opportunity on Ecosystem Services and Nature Based Solutions, supported by the European Commission Research and Technical Development 7th framework program under the theme of environment (including climate change). It was developed jointly by OpenNESS and OPERA research projects in order to translate the concept of ecosystem services into practice. Currently, more than 60 universities, research institutes, agencies and businesses are included in this platform and are developing the Oppla prototype.

Oppla is a virtual hub where discussions and practices on ecosystem services, natural capital and nature-based solutions are brought together across Europe. It is also an area that brings together good practice examples from the world to Europe. It is an open platform designed for people with different needs and interests to communicate, benefit and disseminate. The platform is developed with the contribution of public, private sector, NGO, volunteer individuals.

In addition to sharing the most innovative science, policies and practices, it also provides access to a wide variety of resources. The purpose of Oppla is to be a ‘one stop shop’ for the latest knowledge and good practice on ecosystem-based solutions for issues such as climate change mitigation and adaptation, disaster risk reduction, desertification, loss of biodiversity. It aims at providing useful advice, tools and techniques, quickly and easily accessible. At the same time, it has the ambition to grow into Europe’s foremost platform for sharing environmental knowledge, where the outputs of research can achieve greater impact. It has also planned to feature a range of networking services, helping members to collaborate and work together in developing good practice.

		Key Features	Platform
Name	Oppla Platform	- Nature-based solutions, ecosystem services and green infrastructure applications dissemination - Contact - Knowledge transfer - Project development - Application and testing - Scientific research - Sustainability - Science and politics - Collaboration	
Location	The Netherlands		
GI and NBS	Knowledge exchange		
Implimantation scale	Any		
Impact scale	Any		

Oppla membership is arranged for free and includes access to the following services:

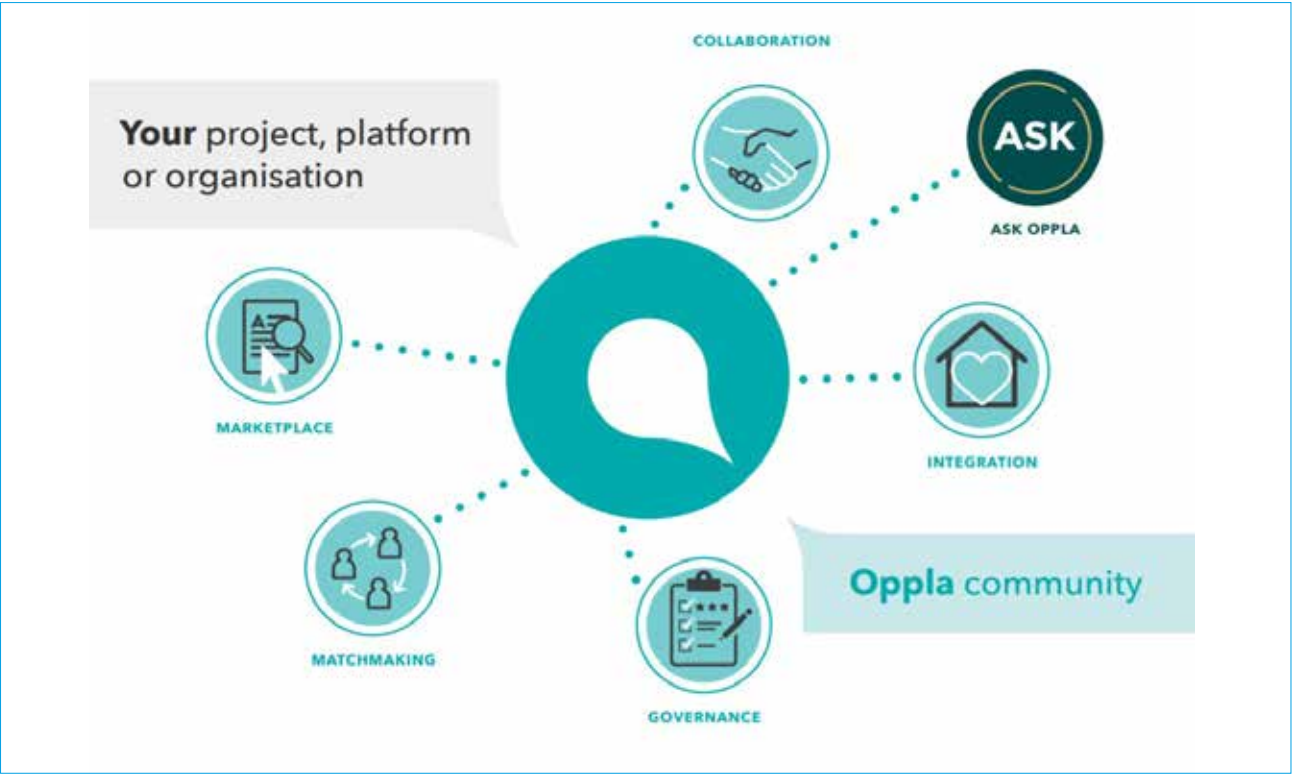
	Ask Oppla: A crowd-sourced enquiry service, where members of the Oppla community help to answer each other’s questions.
	Oppla Marketplace: A ‘knowledge supermarket’ where you can obtain guidance, software, data and other useful resources — as well as promote the outputs of your own project or network.
	Oppla Matchmaking: An easy-to-use system for networking with other members of the Oppla community.
	Oppla Case Studies: Facility to share and browse examples of good practice from around the world.

OPPLA, the largest platform in this field in cooperation with members from all over the world, supports the following topics:

Helping engage with the Oppla community.	Promote your work to new audiences.	Make your outputs more sustainable.

OPPLA also provides its members with technical cooperation and supports the stages of project development and implementation. For instance;

	Integrating projects into Oppla; A special area, “home”, is provided with the own brand, content and website address to the projects. In this way, you can continue promoting your application, even with direct access to the developing OPPLA communities within OPPLA platform, and manage and maintain your online presence, which is essential for long-term sustainability after the projects’ completed contracts.		Consulting with the Oppla community. By establishing a direct relationship with the Oppla community, it provides an environment where new members and partners can benefit from outreach activities and participate in practices. There is also a space for surveying Oppla members to take advantage of their ideas and practice applications. In addition, it can create expert focus groups and develop ideas through panels.
--	--	--	---



Case Studies

This section was designed as a database that consists of uploaded studies including ecosystem services, nature based solution and green infrastructure practices around the world. In this data base, there are searching tools; scale of the study and the type of NBS. Furthermore, there is an interactive map showing case’s location in around the world.



BEST PRACTICE 7

Barcelona, SPAIN



Background

Barcelona is the capital city of the autonomous community of Catalonia and Spain's second largest city with the population 1.6 million within city limits; its urban area within the Province of Barcelona home to around (estimated) 5.5 million people in 2020. At the same time, Barcelona is one of the biggest metropolitan cities in Europe and one of the densest and most compact urban areas, with a population density of around 16,000 inhabitants per square kilometer.

The city within the dense urban fabric is located in the north of Spain between the coast of the Mediterranean Sea and the Serra de Collserola mountain range. Its 3,611 hectares of green infrastructure is as follows: 30% is public urban green area, 50% pertains to the local area of Parc de Collserola and 20% to private property.



Green infrastructure network of Barcelona

An overview Barcelona natural heritage

- Collserola: 1,795 ha in the municipal district with more than 8,000 ha in total.
- Two rivers and the sea forming its borders.
- 1,076 ha of public parks and gardens, 30 ha of beaches, 30 ha of crops and 740 ha of private greenery.
- Montjuïc, Els Tres Turons and Parc de la Ciutadella are its main natural strengths.
- 53 local listed areas of natural interest.

- Constructed space serving as a habitat for fauna.
- Plant heritage with exotic and native species in the parks and gardens with nigh on 77,000 trees (excluding forest areas).
- 153,000 street trees from 150 species.
- Aquatic flora and fauna in naturalized ponds.
- 103 native species of vertebrates in the city center.
- 75 native species of common birds in the city
- Barcelona's birdlife: swifts and other birds, as well as bats.
- Migratory birds.
- Key vertebrates: falcon, jackdaw, heron, alpine swift, squirrel, hedgehog, owl, amphibians, etc.

Urban Challenges in Barcelona

- In 2012, the amount of urban green space per capita (6.82 m²) in the city was well behind the recommendation (26 m²) determined by the European Union (Laghai, 2012).
- The air quality of the city is under World Health Organization standards. Studies show that improvement in air quality to meet the standards could save 3500 lives annually (Künzli and Pérez, 2007)
- Rising temperature in the city as consequences of urban heat island effect and climate change causes extreme weather events.
- The city has natural boundaries with the sea and mountains around. Around 5 million inhabitants are sharing the same infrastructure. High population, dense urban fabric and lack of space for developments causes urban areas to extend into neighboring municipalities.

		Key features
Name	Barcelona Community Garden (Espai Germanetes, Barseelona)	- Increasing environmental quality, including air quality and waste management - Urban Regeneration, land-use and urban development - Social justice, cohesion and equity - Change of production and consumption habits in the neighborhood - Increasing the accessibility of food and green areas - Increasing green space, habitat and biodiversity in their area - Contributing to the recycling of waste by methods such as compost - Increasing citizens' knowledge and awareness on responsible production and consumption, biodiversity, agricultural production, climate change. - Development of healthy eating habits - Contributing to local economy by supporting the local producer - Reducing urban heat island effect
Location	Carrer Viladomat 142, 08015 Barcelona	
GI and NBS Provision	Community garden	
Implementation scale	Urban plot	
Impact scale	Neighborhood, City	

Governance, Decision Making and Policy Tools

In Barcelona, where urban gardening was almost lost in the center of the city with a rapidly increasing urban renewal, urban gardening actually had a long tradition until the 1980s (Mubvami et al., 2006). Since global financial crisis in 2008, Barcelona like other cities in Europe urban community gardens again became a trend. Social protests, known as the “indignados” or “15-M” movement that emerged in the spring of 2011 after the crisis, also doubled the number of urban gardening initiatives, neighborhood associations and political activists (Camps-Calvet et al., 2015). Accordingly, the number of urban gardens between 2008 and 2013 almost doubled with these initiatives. In addition, the Barcelona City Council, which has been forming public gardens since 1997, announced that it will take a series of actions to bring nature to the city by presenting the Green Infrastructure and Biodiversity Plan in 2013 until 2020. The main objectives of this plan, which will provide social and environmental benefits for the local people, are to protect the green infrastructure and biodiversity and to define how people can discover their natural heritage and take advantage of them with great care. The plan recognizes urban gardens as important components of urban green infrastructure (Barcelona City Council, 2013:71 and 80). In 2013, the Barcelona City Council also put in place the initiative ‘Pla Buits’(Empty-Spaces Plan) to promote gardening on vacant public lots (Barcelona City Council, 2015). The Barcelona City Council (2013) estimates that urban gardens cover only 0.3% of the total urban area.

There are two main types of urban gardens in Barcelona. One is called **allotment gardens** the Xarxa d’Horts Urbans de Barcelona (Network of urban vegetable gardens of Barcelona), regulated by Barcelona City Council, dividing parcels and managed by families or single gardeners. The other one is called **community gardens** regulated by self-governed gardening initiatives where the land is managed collectively. The members of such initiatives are mainly elderly low-middle income, and migrant people (Camps-Calvet et al., 2016).

Pla BUIITS (Regional and Socially Participated Urban Spaces Plan)



To encourage civil society to participate in the regeneration and revitalization of urban fabric, Barcelona City Council uses the BUIITS (Regional and Socially Participated Urban Spaces) Plan to revitalize unused lands in the city of Barcelona. This plan provides a temporary social and community use for specific municipally owned land sites that are currently “empty”. Thus, the demands of the neighborhood communities are met and the empty spaces are used for social and environmental benefits. This relationship established through urban gardening also affects production and consumption relations.

The plan invites public and non-profit organizations to propose a usage or activity of public interest and temporarily run a site. The proposals are assessed and selected by an evaluation committee which will give special consideration to the program’s flexibility, its short-term (from one year to max. three years extension) and provisional nature, efficient self-management that keeps the facilities in good condition, and any positive social impact on the city as a whole.

The first call was launched in October 2012. In April 2015, 2nd edition of this program began, with 11 new spaces. In February 2016, the tender was resolved with the transfer of six of these plots.

A case, Espai Germanetes

The land is a superblock with measures over 5,500 m used as host the Convent of the Sisters of the Poor. Closed in 2001 and demolished three years later, the building left a large space with enormous potential for the densely built Eixample District. Municipality took the ownership of the superblock in 2006, and planned as a building with several facilities which neighborhood was in need (such as a day care center, a nursery, a secondary school and apartments for young and senior people). In 2007, real estate crisis in Barcelona affected the plans, and the plot left vacant until 2012. Thus, municipality transferred 585m² of the total space under the Pla BUIITS.



The area is in Pla BUIITS (Empty Urban Spaces with Territorial and Social Involvement Plan)

Espai Germanetes was one of the projects proposed for the Pla BUIITS competition. It was proposed as a meeting point to discuss the problems of the neighborhood and to produce innovative solutions, as well as a neighborhood self-management venue where green areas demanded by the public will be brought to the agenda. It has been a temporary alternative to passivating traffic, implementing urban gardening, organizing activities to reactivate public space.



Before and after picture of the area

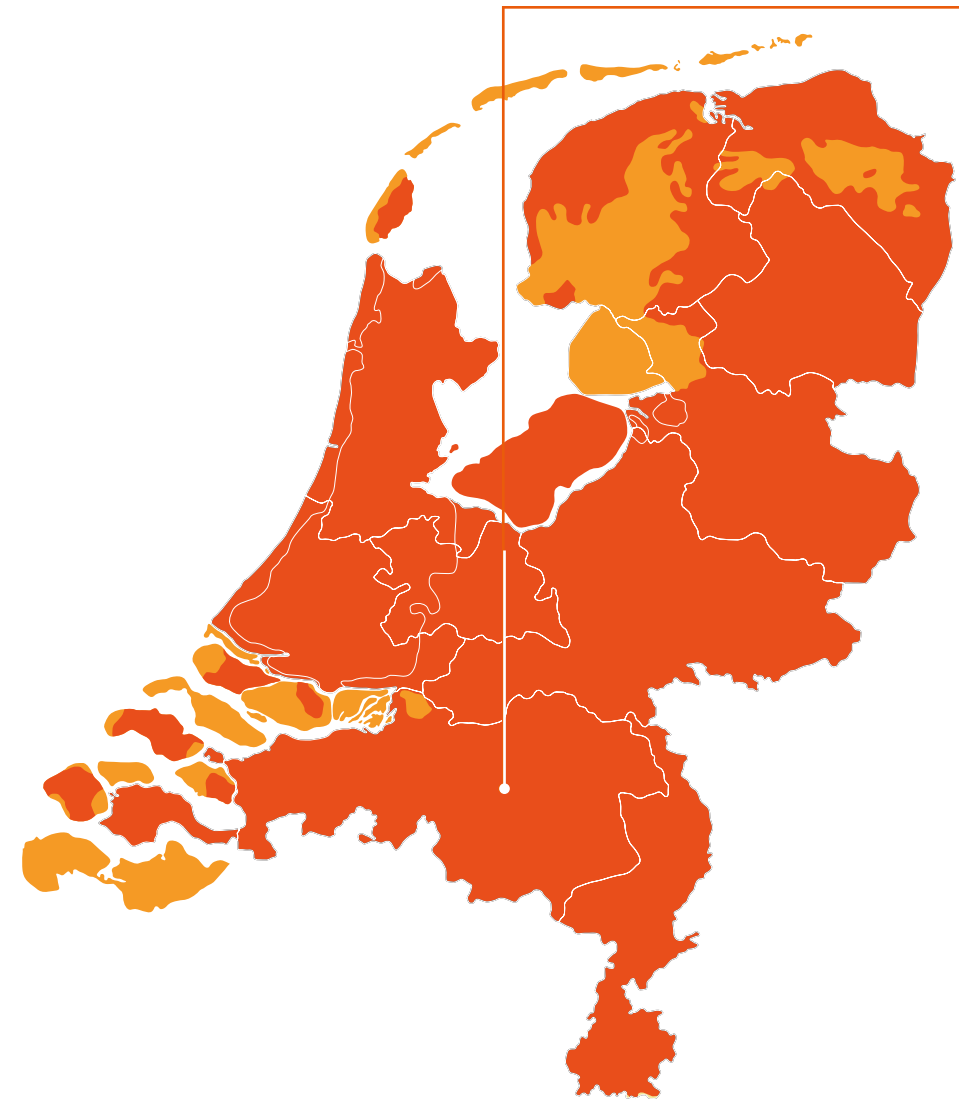
(Source: <https://ajuntament.barcelona.cat/ecologiaurbana/ca/pla-buits/espais-en-actiu/espai-germanetes>)

The project has five main pillars (Axinte, 2015):

- *Creating a community garden*
- *Arranging a multifunctional space for physical activities*
- *Pedestrianizing the adjacent streets and calming down traffic*
- *Claiming the educational community (the insufficient number of schools left 800 children out of the public system, obliging parents to pay for their education in private facilities)*
- *Establishing a gathering area where social and cultural activities take place*

BEST PRACTICE 8

Tilburg, The NETHERLANDS



Background

Tilburg is located 10 km from Belgian border. It has a population of over 200,000 representing many nationalities. A student population of over 27,000 makes Tilburg one of the Netherlands’ principal educational centers.



Location of Tilburg

The city was formed by a group of a small villages with the main economic activity of wool production. The city grew over years into one of the largest in the Netherlands. The main factor for its extensive growth was the presence of textile industry. Eventually, the city became one of the most important textile cities in Europe. And this change turned the villages into a textile city. Large factories, connecting roads and the new working villas typologies shaped the urban form of Tilburg. Rising textile industry not only affect to socio-economic and cultural structure, but also natural systems and environment. Discharge wastewater of factories into the river and open sewage system caused destruction to the nature and threatened the health of citizens. The practices related with water quality improvement have an importance on Tilburg’s urban agenda. It should be noted that the citizen of Tilburg has the impact on urban decisions. The main reason behind the success of nature-based solution practices is directly related to this: citizen participation on planning decisions in the city.

Key features		
Name	Spoorpark	- Community initiatives - Camping, recreation, sport (skate park, basketball, beach volleyball), playground facilities - Open space for art - Outdoor education activities 7.5 ha - Wildflowers, pollination
Location	Sint Ceciliastraat, Tilburg	
GI and NBS Provision	- Biological pond - Permeable pavement - Revitalizing stream	
Implementation scale	Neighborhood	
Impact scale	Neighborhood, city, region	

Tilburg is a city with active green areas, parks, pocket parks, gardens and other green areas with high accessibility opportunities by citizens. However, there was a need for an open and natural area where citizens can gather and spend time together. As mentioned in the previous section, water and water related studies are among the priority issues in the city’s agenda. Spoorpark is a park where both the need for open space and the trail of water are accentuated. Spoorpark also attracts attention with its design reflecting the cultural and natural values of Tilburg, which was once the textile center of Europe. In the middle of the park, a “zipper” used as a landscape element follows the river emphasized as a metaphorical reference to the wool and textile livelihood, and also emphasizes the unity of the water.

The location of the park is also important. It is close to Tilburg Municipality and located in the railway zone and central business district. Therefore, the land value and the urbanization pressure on the land is high. The tallest building of Tilburg (Westpoint) is located next to the park. Nevertheless, citizens have a great influence on land use and planning decisions in the city.

Work and dream (Lucy Bathgate- Spoorpark Initiative)

When I started to work, I was a building contractor for 23 years; doing renovations of houses and buildings. Then I was a teacher of young builders for one year. I have been working for the municipality of Tilburg since 2003, guiding entrepreneurs on how to start, continue or end their businesses. Since 2013 I have had a dream: to realize the living water, which is streaming and clean, in this town. Making the city a quieter, cleaner place to live, work and play in, and creating an environment that supports us.

Like the stream grandma used to take my sister and I to, when we were little. It flowed between the green lawns and trees right into the middle of the city. Its banks were lined with huge leaves that we called ‘plumpy leaves’. We would sit under them like elves under an umbrella. One day, grandma let us pick a couple, and showed us how to bend them gently and stick the stalk through the leaf to make a little boat with a sail and a keel. We dropped them into the water on one side of the bridge and ran to the other side to see them emerge slowly and majestically. “Where are they going, Grandma?”, we asked and she told us that they would sail all the way down the stream into the river. “And then?” we asked . “They will sail down the river to the great sea. But that takes a very long time.” When I went to the seaside with grandma three years later, I asked her again, “Have the leaves got here yet?” “Yes, they have, dear.”



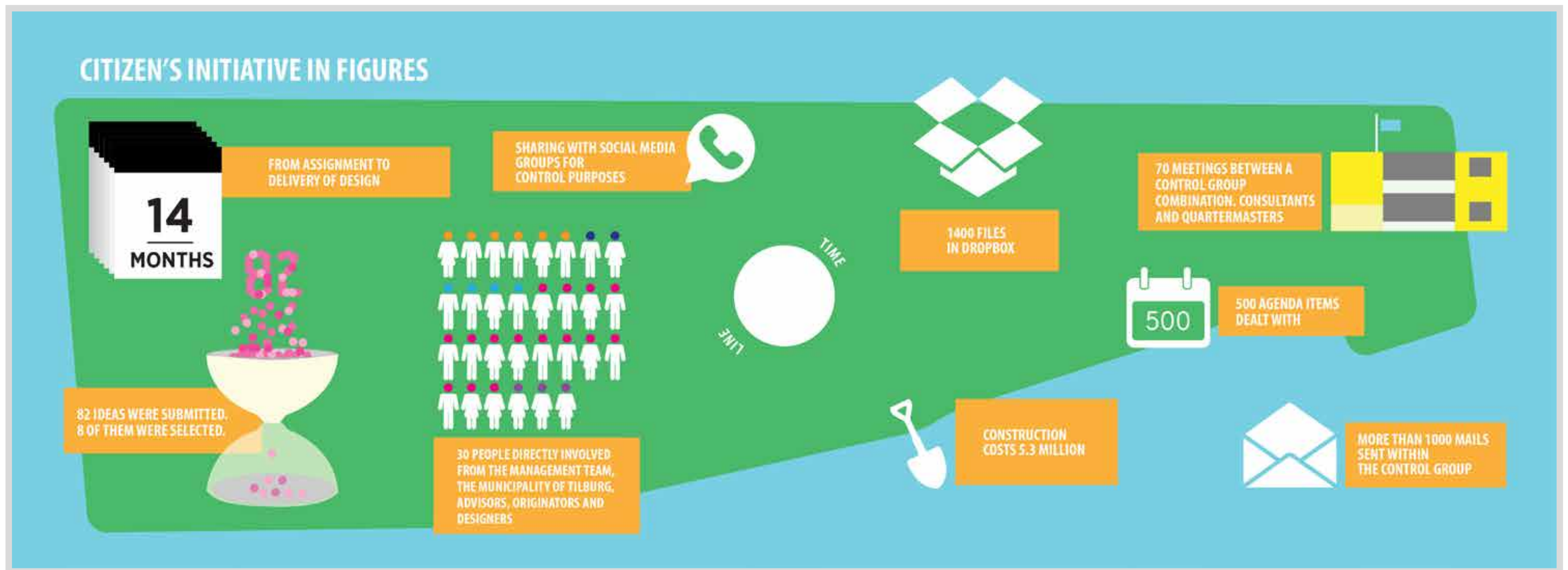


Spoorpark is close to the central train station. Image was taken in at the beginning of the project.

Spoorpark

It is a project of transforming 10 hectares of “vacant” area very close to the train station, in the center of the city, which Tilburg Municipality had planned as a business center before 2016. However, the planned business area could not be implemented due to the economic crisis, and in 2016 Tilburg Municipality conducted a survey and a competition to gather the ideas of the residents of the city. The municipality has set some criteria for the competition of projects regarding the use of this area. The most important criterion is that each idea should also include financial support. 82 ideas were submitted by the public. They were reviewed by the committee and 8 of them were selected. 8 originators met each other and the planning process was facilitated by 3 consultants. The consultants comprised of a builder/contractor, a business consultant, and a process guide. Numerous meetings were held and a project team consisting of a landscape architect, 3 independent process managers, engineers, a project leader, and a liaison person from the municipality was established. This was the beginning of three very special, vibrant, busy, inspiring, tiring, creative, productive, and fulfilling years. The most striking aspect of the project is the presence of the stream and the biological pond, in which the rainwater is used and where children can play. The pond can rise and fall 70 cm and contain 2170 m³ of extra rainwater and is naturally reduced within 24 hours. These calculations were made considering the Tilburg climate and precipitation. The park, opened in June 2019, attracted great attention, and is visited by approximately 200,000 people. In the planning phase, landscape work was done by protecting the existing vegetation and trees with the use of local plants. The State has donated for these ecological studies and nature education, and many ecologists have contributed voluntarily. The park, which has recreation areas such as for walking, having picnics, camping, as well as a concert area, a cafeteria, which can all be used by people from all strata. The park also includes proper landscape planning to reduce the noise of the railway, making use of the topography.



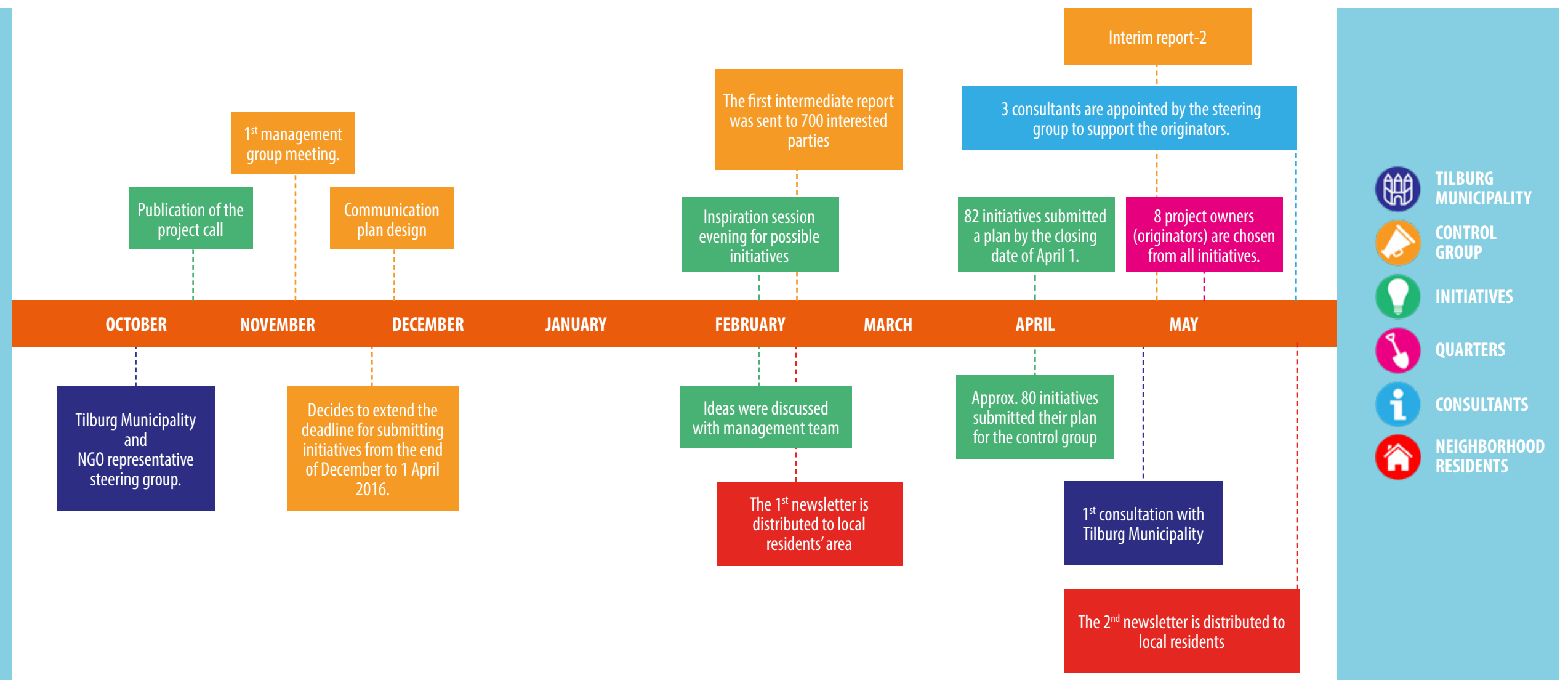


Community involvement process on building the park

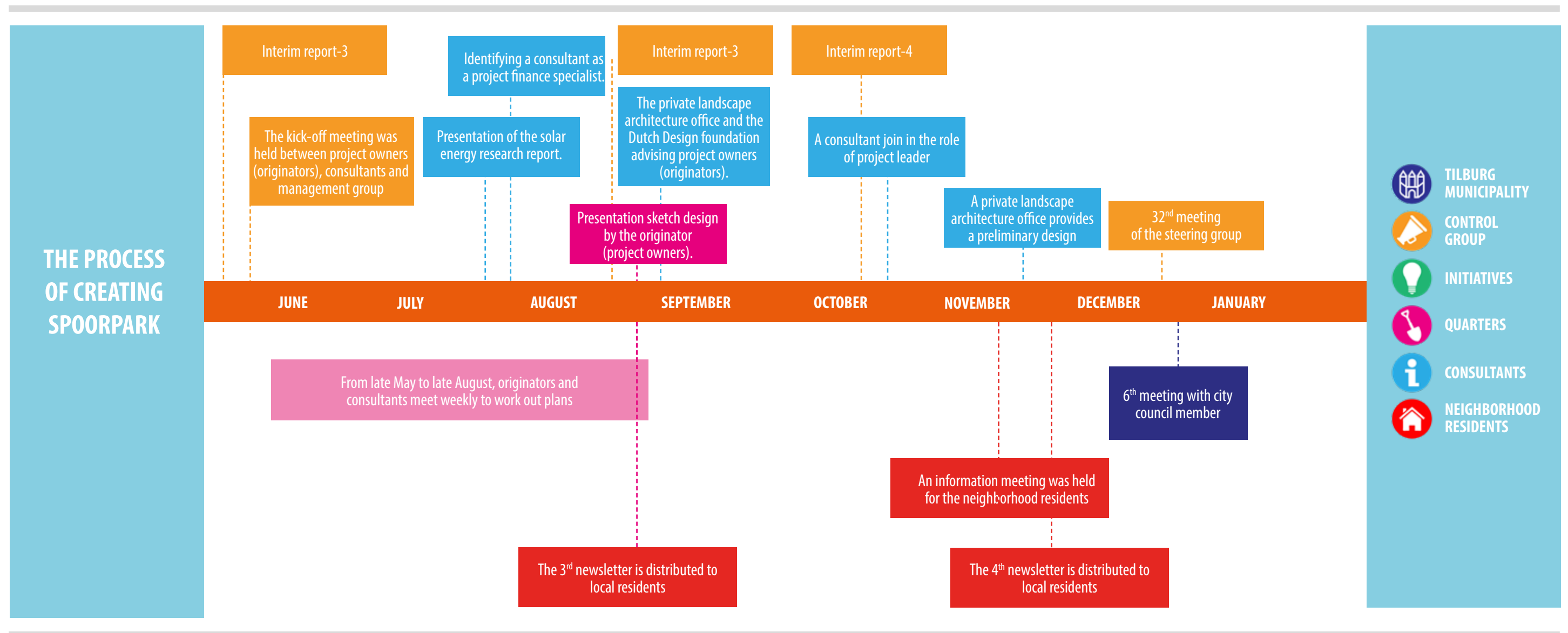


A workshop on discussing the decisions for Spoorpark, that is established by a dedicated community

THE PROCESS OF CREATING SPOORPARK



The process of the implementation (<https://spoorparktilburg.nl/wp-content/uploads/spoorpark.pdf>)



The process of the implementation (<https://spoorparktilburg.nl/wp-content/uploads/spoorpark.pdf>)



Tilburg residents have been involved in every stage of the building the park. (Photos: Spoorpark Citizens' Initiative)

Tilburg residents have been involved in every stage of the building the park. (Photos: Spoorpark Citizens' Initiative)



The selected plan for implementing on the land



There are different types of surfaces and activity areas in the park. (Photos: Spoorpark Citizens' Initiative)

The difference in altitude between north and south of the park is about five meters. The northern part of the park is higher feeding the stream with rainwater. By establishing a barrier that cuts the flow of the stream, a small lake with characteristics of a biological pond was created in the middle of the park. Biological pond installs a natural filtering system using substrates and plants that clean and filter the water.



Biological pond (Photo: DKM Archive)



The Park was opened in May 2019 (Photos: Spoorpark Citizens' Initiative)

		Key features
Name	Regte Heide Biological Farm	- From military usage to biological farm - Green energy usage - Recycling, reusing - Agroforestry - Rainwater infiltration - Energy-efficient farming practice - Renewable energy usage (rainwater, solar, wind) - Biodiversity monitoring - Water sensitive usage - Nature Protected Area (Natura 2000)
Location	Regte Heide, Tilburg	
Supported GI and NBS Provision	- Bat cellar - Plantation based on enriching the soil with beneficial nutrients	
Implementation scale	Farm	
Impact scale	City, Region	

The Regte Heide and Riels Laag lie between the streams Lei and Roppelsche Leij, the latter of which falls outside the boundary. The area can be divided into the stream valleys and the slightly undulating sand landscape located outside, in which low dune areas occur here and there. The area consists of dry and moist weather, swampy lowlands, acidic and weakly buffered fens, and deciduous and coniferous forests.

Seven highly visible burial mounds from the Middle Bronze Age (2000-700 BC) can be found on the Regte Heide. Excavations were carried out here in 1935, where grave goods were found such as battle axes, wrist guards, stone daggers, buttons, and beads. The restoration of the hills took place in 1998 and 1999. Five of them were provided with a pile crown.

In 1909, Regte Heide was purchased by the municipality of Tilburg, which in the following year rented it out to the Ministry of War for military exercises. Until the 1990s of the twentieth century, the site was used for this purpose. In recent years mainly as a landing site for practicing paratroopers. In 1990 the area was purchased by the ‘Het Brabants Landschap’, which is a foundation to manage the site for nature conservation.



Het Brabants Landschap continues nature conservation activities in the area. It also provides arrangements to enable citizens to have their recreational activities. (Photo: DKM Archive)

Regte Heide is also designated as a Natura 2000 site by the EU and its proximity to the big city gives it a huge attraction for the nature lovers visiting the land.

The land is managed by Brabant Landschap (membership-based and subsidies by the Province of North Brabant). This regional institution’s main aim is to work for nature conservation at the regional scale. For the Regte Heide, Brabant Landschap focuses on the conservation of flora and fauna. Since the Regte Heide area is a watershed, the main results of the work in the two streams have been pursued and the results are rich in flora and geology.

Regte Heide has addressed GI and NBS through its 800 ha (free from building) area, where water comes down from the streams and flow to the north and the rainwater is collected and pumped up in the de Blaak (Tilburg’s green neighborhood) to provide drinking water, therefore it is an important place for water supply (with filtered rainwater).



De Blaak, Tilburg. (Photo: Aysegül Çil)



De Blaak, Tilburg. (Photo: Aysegül Çil)



Bat houses in the farm support the biological pest control (Photo: DKM archive)

Issues and Tools

Regte Heide has addressed GI and NBS through its 800 ha (free from building) where water comes down from the streams and floating to the north and rainwater collected and pumped up in the de Blaak (Tilburg's green neighborhood) to provide drinking water, therefore it is important place for water supply (with rainwater infiltrated).

Regte Heide provides:

- *Nature education (especially for kids but for everyone)*
- *Ranger activities*
- *Monitoring biodiversity*
- *Recreational connections to the city (walking, hiking and exploring the historical facts, birdwatching, etc.)*
- *Established farms in close proximity to the nature conservation site provides organic food and shelter to the daily visitors.*

Governance, Decision-Making and Policy Tools

The Regte Heide Farm is one of the first initiators of an organic farm in the region, and not by coincidence; the farmers recognized the richness of the soil in the lower part of the land and set their farms in this part of Regte Heide. The project that is selected as Regte Heide farm, owned and managed by a family (Wim & Harritte) is the best case in the nature conservation area. This farm has been practicing the nature based solutions in their farms including using green energy such as with solar panels all over the farm, recycling and reuse of the farm's materials and regularly grazing the cows in the pasture. Regte Heide nature reserve was developed because of these farms, to get compost and manure to use in their lands, due to their free-grazing areas for cows, which consume all herbs and

plants in a biodiversity-rich area and eventually become a heathland with its conditions of heathland soil and that makes an important area. If there were no farms, Regte Heide would not be there as it is today. So, it is created as a nature-based solution to conservation measures. Wim and Harritte tried to restore the dynamics over time as they established a chicken farm as in the medieval times: mobile chicken farm to regenerate the soil by aerating the soil.

- **Agroforestry:** the farm used some part of the land to plant nut trees (especially nut trees) for cows to graze for better food but also, they benefit from the shade in the summer, as well as other natural benefits.
- **Agroecologically,** their business philosophy is “working with and learning from nature”. So, there is a connection between soil, plant, animal, people and environment. A constant search and learning process to improve the interaction between all parts. The optimal shape of the farm provides for different themes; cycles, soil, natural behavior and animal health, economy, energy, social responsibility, biodiversity, and water management.
- **Cycles:** Cycles are the foundation of the farm. The farm uses everything that nature, people and animals produces as well as possible, to produce high-quality and healthy food. Nature works according to an ingenious cycle in which waste does not exist. The aim is to maximize the reusability of products and raw materials.
- **Economy:** To produce responsibly where the emphasis is on quality rather than quantity.
- **Energy:** Milking the cows is done with an energy-efficient frequency-controlled vacuum pump and a heat recovery system for cooling the milk. It has produced energy through solar panel and obtained hot water by using heat from milk and solar collectors. The rainwater from the cowshed is collected in a cellar. The fully electric heat pumps extract heat from this rainwater and convert it into heat for heating the buildings and tap water.
- **Social responsibility:** De Regte Heide way of farming is not a mission but a matter of course for them. The world does not get any worse if you are a bit frugal about it within your means. The natural nutrient cycle is as follows. The cattle produce manure. The manure is spread over the land and provides sufficient nutrients for the crops. For example, food for the cows can grow on the land. These produce milk and manure.
- **Ground:** A healthy and vital soil is the basis for our future. The soil is the stomach of the crops. If we feed the soil well, the plant will thrive.
- **Natural behavior and animal health:** The cows graze in herb-rich meadows planted with trees and hedges. Supplement the ration and shade for the animals and crops. The herb-rich grass contains chicory, narrow plantain, caraway seeds, yarrow, various types of clovers and various grasses. Because the cows calve in the spring, more milk from grass is obtained and not feed concentrates. It is let the calves walk with the mothers for about 5 months to drink and learn. Cows are social creatures of habit, so it is important that they live together in the herd.
- **Biodiversity:** Their grassland with grasses, herbs, trees and shrubs complements biodiversity. It enhances the landscape. The plants provide a supply of organic matter and minerals, carbon capture and nitrogen fixation. Together with the Goirle / Riel biodiversity team, they have built a bat cellar at the Regtzaal. In 2014, they created a forest meadow (1ha). This is a combination of trees and shrubs with livestock and animal feed production. Trees and pasture and livestock are managed as a system. None of the three should negatively affect the other. The trees are evenly distributed in the forest meadow, so that the livestock will almost always run in partial shade. There is a hive in the forest meadow.
- **Water management:** De Regte Heide Farm should be careful with water. That is why they ensure that the rainwater from buildings and pavement flows into a wadi (ditch). A wadi is a facility for infiltrating, buffering and draining rainwater. The rainwater sinks to the groundwater, closing the (rainwater) cycle. The rainwater from the cowshed is collected in a cellar.

Urban Gardening in Tilburg

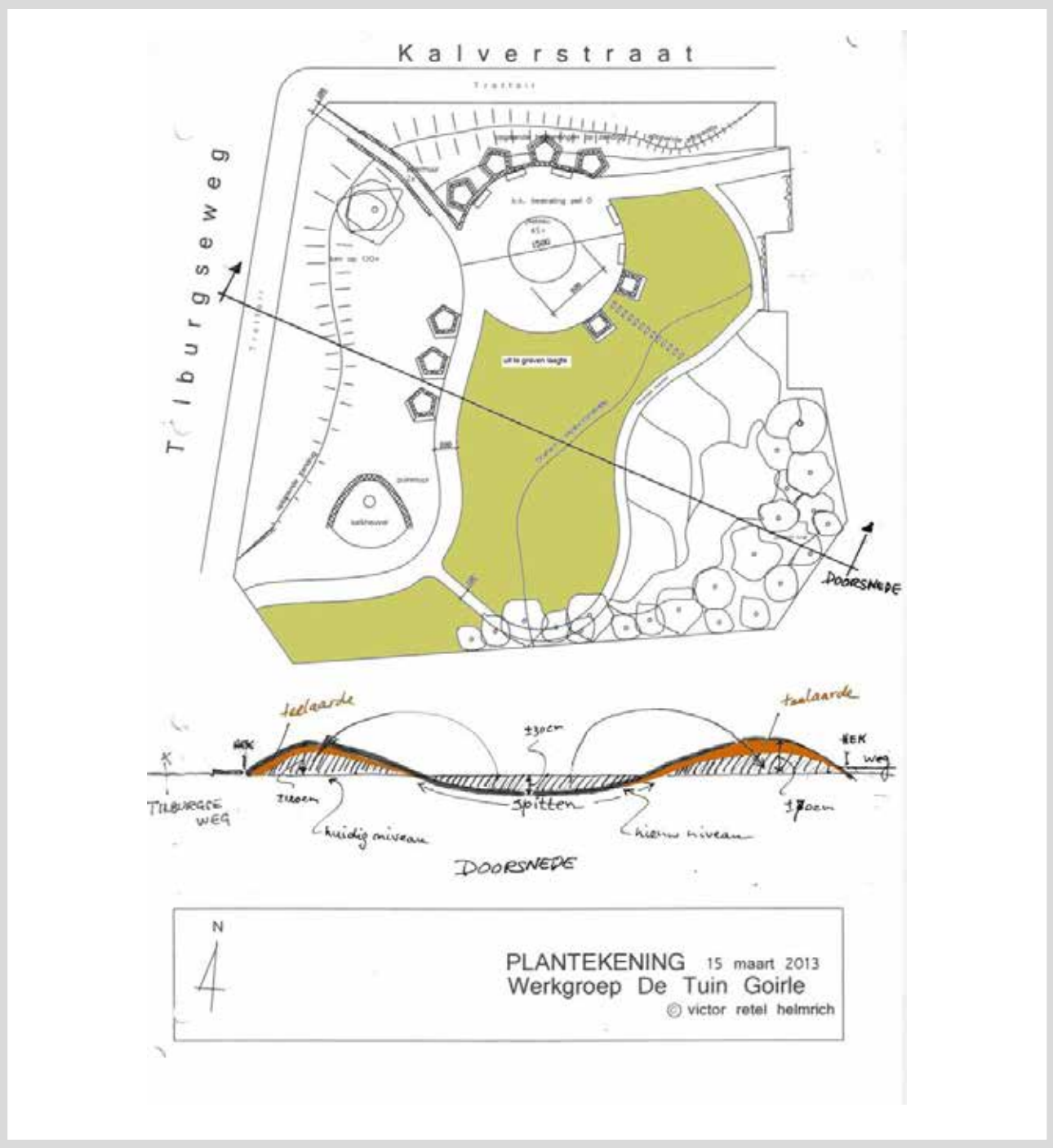
Tilburg and Volkstuins (allotments for vegetable growing):

Tilburg, just like any other city in the Netherlands, as a general regional policy in the country, has number of allotments in the close periphery of the city where people could prepare organic soils to grow vegetables, fruits and flowers for their own pleasure and needs. These allotments are like people’s own gardens, however they are not the landowners, in other words, they do not buy these plots but rent them from the municipality. An interesting fact is that there is a huge waiting list to have one of these plots, as people do not use their own gardens to grow vegetables or they do not have space to do so. People using these allotments are managed by an organization set up as a small management team based on elections and membership of the each allotment. The basic rule is to keep the soil organic and perform organic farming to also contribute to the nature conservation and ecosystem maintenance in the region. Other rules in general are related to social benefits; people gather and share their experiences, sell or give away their surplus in each harvesting period. These allotments are also providing ecosystem services such as cleaning the air through tree plantations in the public use areas of the allotments reuse and collect rainwater and therefore contribute to water conservation and management in the city and pollination through biodiversity friendly flowers (attracting bees and butterflies).

Key features		
Name:	De Tuin Biodivers - Biodiversity Garden Project	■ Transformation of private housing plots to public-used garden ■ Wildflowers, shrubs, fruit trees, herbs and vegetable garden ■ Community initiative ■ Covers 0,20 ha ■ Outdoor education for civil society and neighborhood citizens ■ Enhancing the human-nature relation ■ Community involvement
Location	Cross Kalverstraat and Tilburgseweg, Tilburg	
GI and NBS Provision	■ Bioswale ■ Irrigation is provided by NBS ■ Permeable surface ■ Community garden ■ Planting for pollination	
Implem. Scale	Neighborhood	
Impact scale	Neighborhood, city	

The De Tuin project originated on the initiative of the political fraction in the city council, and subsequently developed into a citizens’ initiative. While a high-rise building was planned to be built by a housing company, the construction halted due to the economic crisis. The board of the De Tuin Foundation consists of the initiator, two gardeners, the chairman of the Goirle Biodiversity Team, the center manager, and two involved citizens. The unified residential plots make up the area, which is about 0,20 ha. The main consideration in the design of the garden is getting maximum benefits from its natural features and that the local character is protected.

As the most **efficient use of rainwater** will reduce both cost and effort, it has been adopted as the main principle in the design. The differences in height on the land is one of the main solutions for reducing irrigation needs. In the area, nature-based solution implementations were used in two different locations by means of the height difference. One is the bioswale that passes through the area orthogonally. Since berries need more water than other vegetables in the garden, they were planted accordingly. The other implementation is that the sand ridge lane rises from one side orthogonal to the other, taking the streets as reference. The sandy lane has a high capability of holding water and leads the water to the groundwater directly. Moisturized soil provides the water need of the plants and trees. The remaining irrigation that requires energy, a small-scale water mechanism is established for pumping accumulated rainwater.



Landscape Design Plan of the Garden (by Ecologist Architect Victor Retel Helmrich)



Overview of Biodivers Public Garden Goirle 1 (Photo: Victor Retel Helmrich)



Water pumping system for the irrigation (Photo: Victor Retel Helmrich)



Small windmill pumping water in pond and gardens. (Photo: Victor Retel Helmrich)

From ecological perspective, wild flowers, plants and fruit trees attract **pollinators** and birds and enhancing biodiversity of the ecosystem in the city



Public Kitchen gardens (Photo: Victor Retel Helmrich)



Wildflowers and plants attract the pollinators and provide diversity in the garden. The photo was taken in Study Visit to Tilburg under the project scope in September 2019. (Photo: DKM Archive)

User practice also has shaped the design of the garden. Generally, people tend to use the shortest path. As you can see in the plan, there are two different route choices that are 1 m and 2 m wide paths both running along the bioswale area. Main path has the strong connection with the open-gathering place. Although the use of hard surface intensifies in the main gathering place, attention is given to the use of **permeable surfaces**.



Gathering place for neighborhood residents (Photo: Victor Retel Helmrich)



Usage of natural elements for the urban furniture. (Photo: DKM Archive)

While the created soil surface provides uninterrupted human movement in the garden, it is also permeable surface feature rainwater can reach the groundwater easily



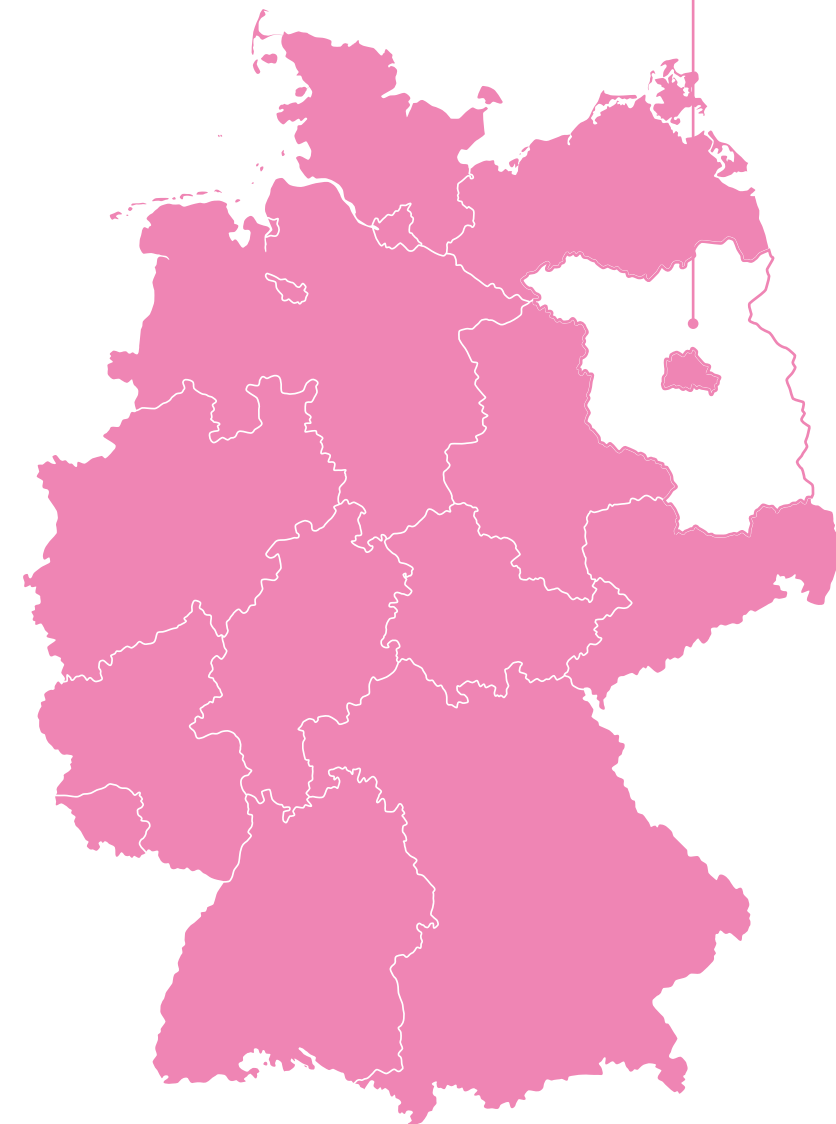
Garden path (Photo: Victor Retel Helmrich)



The park provides to do social and cultural activities (Photo: Victor Retel Helmrich)

BEST PRACTICE 8

Berlin, GERMANY (URBES Project)



Background

Berlin is the capital and the largest city of Germany with a population of 3.5 million people. The city is one of the greenest cities with developed green infrastructure in Europe, with more than 2,500 public green areas. Approximately 40 % of the city is green (parks, gardens, forests, etc.) and blue (rivers, channels, ponds, lakes, etc.) areas within its border. After Second World War, there was a tremendous population loss. Berlin is in a transition shaped by simultaneous urban growth and shrinkage (of the population), residential vacancy on the one hand, famous (re)construction sites on the other. Other land uses are built-up areas with 25% and fertile land for farming activities with 25%. Future projections driven by global climate change shows that Berlin will be affected by climate change and heatwaves, increase of poverty, and environmental injustice (Source: <https://oppla.eu/casestudy/18413>).

Key features		
Name	Urban Biodiversity and Ecosystem Services (URBES Project), Berlin Case	- Urban regeneration through nature-based solutions - Nature-based solutions for improving well-being in urban areas - Ecosystem Services valuation - Green Infrastructure - Urban resilience and sustainability - Stakeholder perceptions
Location	Berlin, Germany	
Supporting GI and NBS Provision	- Creation of green jobs relating to construction & maintenance of NBS - Increase awareness of NBS solution & their effectiveness and co-benefits - Increase stakeholder awareness & knowledge about NBS - Increase willingness to invest in NBS	
Implementation scale	Bu araştırma, 7 Avrupa ülkesinde ilgili örnek çalışmalar ile birlikte URBES projesinin bir parçasıdır.	
Impact scale	Şehir	

Issues and Tools

Researching, evaluating and mapping ecosystem services and biodiversity in urban areas is one of the increasingly common practices. It is also important in that it is a unique resource where decision-makers can find data and assessments by experts. The Urban Biodiversity and Ecosystem Services (URBES) research project implemented in Berlin is also an EU project funded by BiodivERsA. The project was financed for three years from August 2012 to the end of 2014.

Cities of the case studies within the URBES project are Berlin, Rotterdam, Stockholm, Salzburg, Barcelona, and New York and the project analyzes urban ecosystem services, biodiversity, and urban green areas, using Urban Atlas data, with a particular focus on climate change and future impacts, terrain and demographic features. Future urban land use scenarios have also been developed in cooperation with local stakeholders and decision-makers. URBES project members include the Stockholm Resilience Centre, the Dutch Research Institute For Transitions Rotterdam, the ICLEI European Secretariat Freiburg, the Institute for World Economy in Kiel, the IUCN in Brussels, the Technical University Munich, the Universitat Autònoma de Barcelona, the University of Salzburg, the New School New York and the University of Helsinki.

The URBES project focused on functional diversity, urban ecosystem services and the science of NBS, institutions, economics and resilience science, and worked to transform scientific principles and research into landscape designs and practices. The driving forces behind the loss/development of urban ecosystem services offered by nature-based solutions such as urban green space, biodiversity in urban diversity and monetary and non-monetary valuation of ecosystem services have also been the focus.

In the Berlin case study, the objectives were to (i) compute general ecosystem services at the city level and work on their valuation, and (ii) Raise stakeholders’ awareness about these ecosystem services and co-develop scenarios of urban planning changes and related impacts on the delivery of ecosystem services.

The following activities were carried out within the scope of the project;

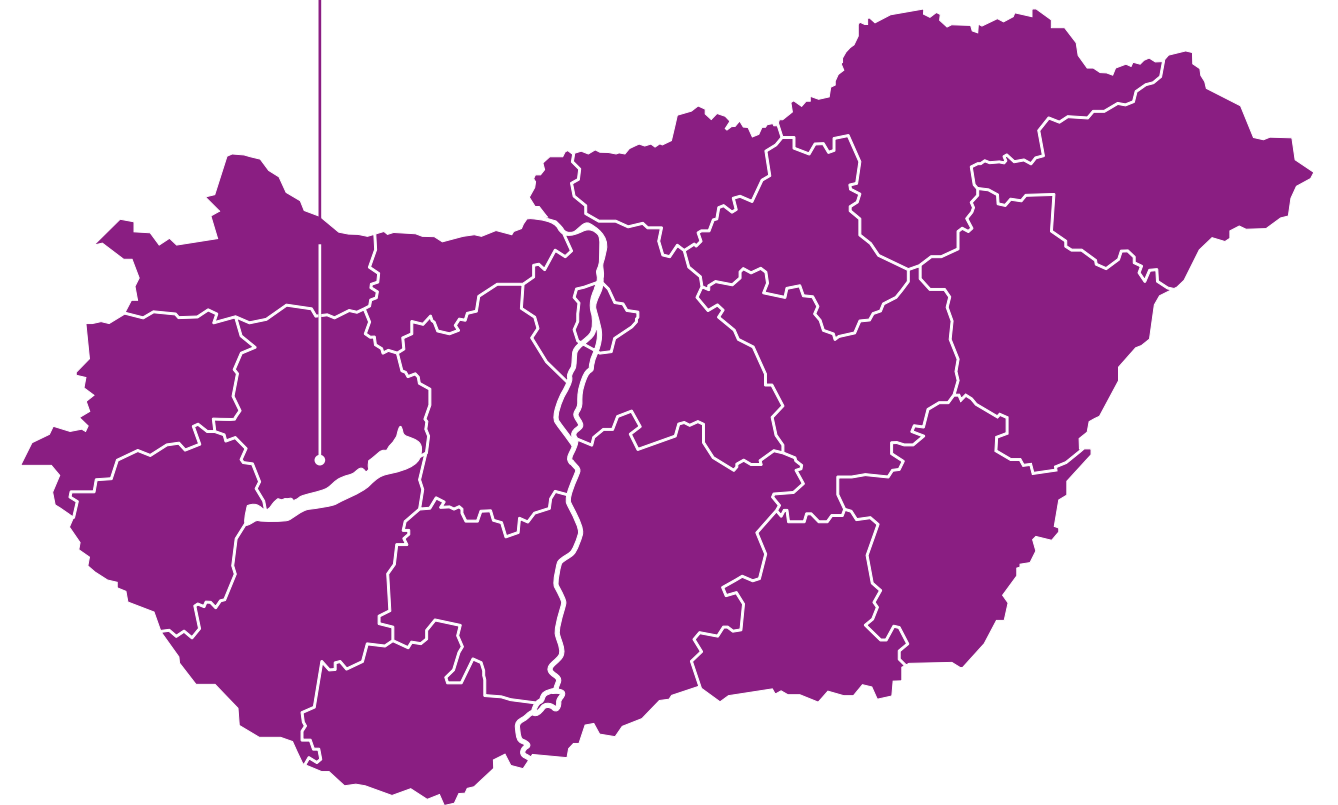
- Ecosystem services calculation and valuation studies
- The demand and supply of ecosystem services in 4 cities, including Berlin was studied. (see Baro et al. 2015). This study includes ecosystem services such as air purification, global climate, and urban temperature regulation.
- Implementation of ecosystem services in green space planning and related governance difficulties were analyzed (see Kabisch 2015): With this study, the extent to which the ecosystem service framework is integrated in planning is based on the analysis of strategic planning documents and expert interviews with local stakeholders. It includes identification of the system and its main challenges in urban green governance.
- The main challenges identified in Berlin’s green management are: (a) increased pressure from development due to population growth and financial constraints on the municipal budget, (b) loss of expertise, and (c) low awareness of green benefits between different actors through inadequate communication. However, the concept of ecosystem services has potential to provide a useful argument to promote the conservation of existing urban green spaces and to convey benefits to citizens at all levels of urban nature’s green space governance.
- The impact of biodiversity and ecosystem services on human health and welfare. This study presents research findings and policy recommendations that emphasize the value of biodiversity and ecosystem services in the construction and protection of people’s physical and mental health. In addition, a comparison of the heat island effect was made with natural solutions in Helsinki, Salzburg and Stockholm. (<https://www.oppla.eu/product/2084>)
- Urban resilience and sustainability: With this activity, a case study on brownfield regeneration in Berlin studied the importance of understanding the relationship between people and nature in urban planning and decision making to achieve urban resilience and sustainability.
- The project also included a study involving interviews to measure the concept of ecosystem services and to evaluate stakeholder perceptions, to understand their views, and to use them in planning and decision making (see Kabisch 2015). The development of participatory scenarios regarding the current and projected delivery of ecosystem services according to different urban planning projects in European cities has also been a research of value (see Haase et al 2014b).

In the Berlin case study, the main objectives are:

- Measuring urban ecosystem services and valuation
- Raising stakeholders’ awareness about these ecosystem services and co-develop scenarios of urban planning changes and related impacts on the delivery of ecosystem services.

BEST PRACTICE 9

Balaton, HUNGARY



Bacground

Balatonfűzfő is located 100 km from Budapest, and one of the settlements on the shore of Lake Balaton. The city that offers opportunities such as swimming, fishing and sailing; It is an important holiday destination with its beaches and facilities. It has been decided to establish an eco-park in the city in order to improve the ecosystem and functions of the ecosystem.

		Key features
Name	ECO-Park development (Balaton lake) of Balatonfűzfő city	- Restoring ecosystems and their functions - Nature-based solutions for improving well-being in urban areas - Establishing nature-based solutions for coastal resilience - Multi-functional nature-based watershed management and ecosystem restoration - Nature-based solutions and the insurance value of ecosystems - Development of an ecological park at the lake Balaton - Renewable energy system (solar panels, etc.) - A new bridge was built with design fit harmoniously into their environment, made of eco-friendly materials - Soil management and quality - Creating connection between natural areas
Location	Balaton	
Supporting GI and NBS Provision	- Renewable and eco-friendly material usage - Renewable energy system (solar panels, etc.)	
Implem. Scale	Neighborhood	
Impact scale	City, region	

Issues and Tools

The aim of the municipality is restoring the ecosystem and their functions to create an inclusive ecological park that allows for different outdoor activities, including the gulf area, as well as to create a participatory planning example by engaging civilian local organizations.



The main aim of the eco-park project in the city was to re-plan the semi-natural area for recreation and to establish an ecological connection between the two natural areas. A comprehensive reconstruction of the area in Balatonfűzfő, from Fővenystrand Beach to Tobruki Beach, is planned.

The project was carried out in two stages:

1. In the first stage, a semi-natural recreation area with a special playground was created. At this stage, an alternative route has been developed for the Balaton Bicycle Trail. Entertainment, relaxation and food and beverage facilities are provided for bicycle users and tourists along the way
2. In the second stage, this recreation area and two beaches were connected to each other and a corridor was created and the construction of these areas was prevented.



A view from the ECO-Park (Photo: Oppla Platform)

On the one hand, the project offers recreational opportunities in a natural environment for citizens, especially families, by providing active facilities. On the other hand, with the new stage of the Balaton Cycling Ring Road, the region creates an attraction area that will attract the country's cyclists or other sports tourists to the region. Easily accessible to the project area is one of its most important features.

The benefits of implementing nature-based solutions in the area are:

- *Improving well-being in urban areas*
- *Establishing nature-based solutions for coastal resilience*
- *Multi-functional nature-based watershed management and ecosystem restoration*
- *Better protection and restoration of coastal ecosystems*
- *Restoring ecosystems and their functions*
- *Improve connectivity and functionality of green and blue infrastructures*
- *Increase Biodiversity*
- *Increase quality and quantity of green and blue infrastructures*
- *Improve air quality*
- *Improve water quality*
- *Increase accessibility to green open spaces*

- *Increase amount of green open spaces for residents*

Implementing Measures/Practices

Transferability of the result:

The governance process has been carried out as follows:

- *Information transfer was provided through awareness activities and NBS ambassadors.*
- *Co-creation and participation, rotational or adaptive governance are considered as governance principles.*
- *Public-private partnerships (PPP) have been realized for economic drivers.*
- *Forward-looking and sustainable plan, PPP financing and good partners were intended.*
- *The project site is planned as a large area on an urban scale.*

Cooperation between project stakeholders was essential; municipality, designers, and sports clubs worked together. The main challenge in the project was the uncertainty of the ownership of the land.

Business Model:

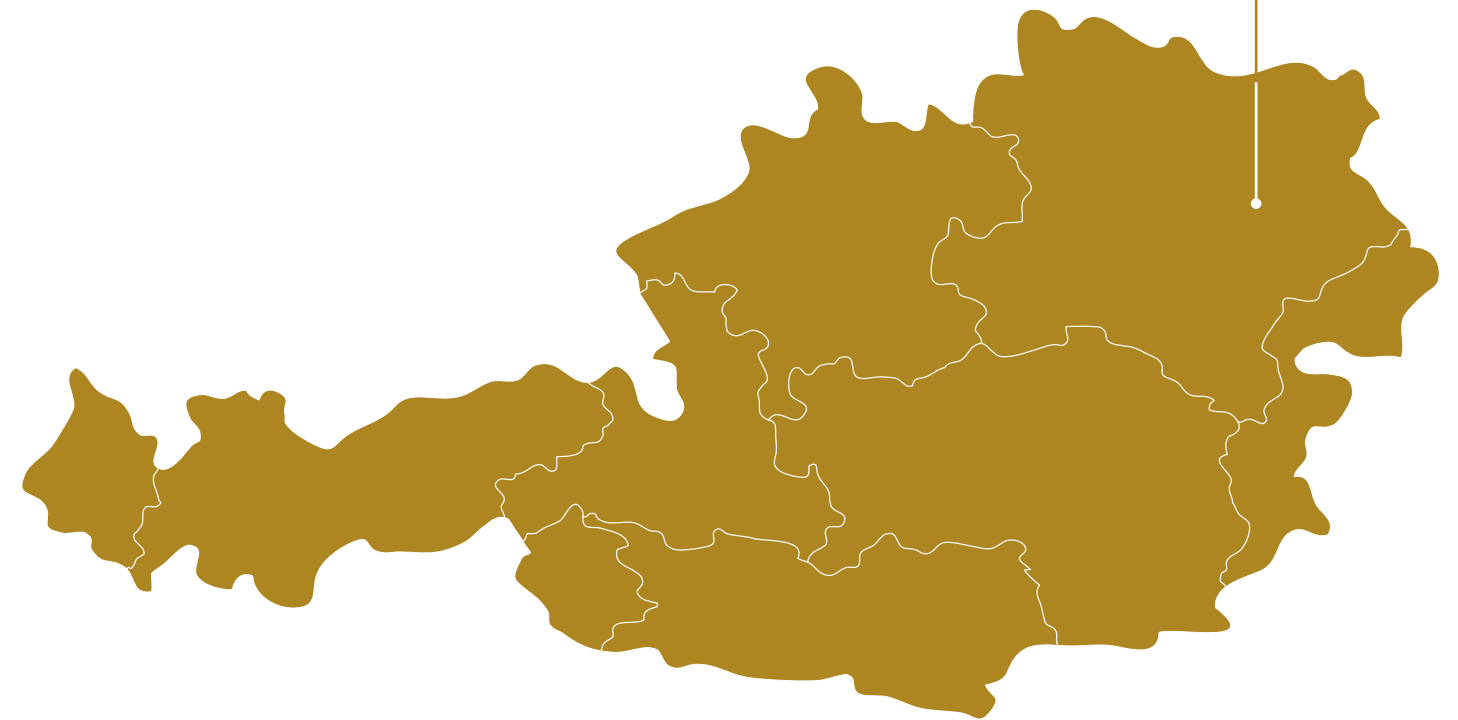
The innovativeness of the business model is, that local private investors and the local sports clubs were both involved in the planning and implementation process. The co-operation of private and civil partners is a novelty in Hungarian project management.

Governance, Decision Making and Policy Tools

Contracting authority of the project is Balatonfűzfő Municipality; the main partners of the project are Tourist Associations and Sports Clubs Balatonfűzfő, and Tourists and Bike enterprises. Other stakeholders involved in the project are European Union, Balatonfűzfő - Litér Tourist Association, Surf Sports Club by Balatonfűzfő, Fűzfő Sailing Boat Club and Sailing Boat Association. The estimated total cost of the project is between 200k€- 1M€ 90% of which was covered by EU funds, while the remaining 10% was financed by the local municipality, and other national funds. The installation of sport facilities was covered by private investors, but the local sport clubs also took part in the operation.

BEST PRACTICE 10

Vienna,
AUSTRIA



Background

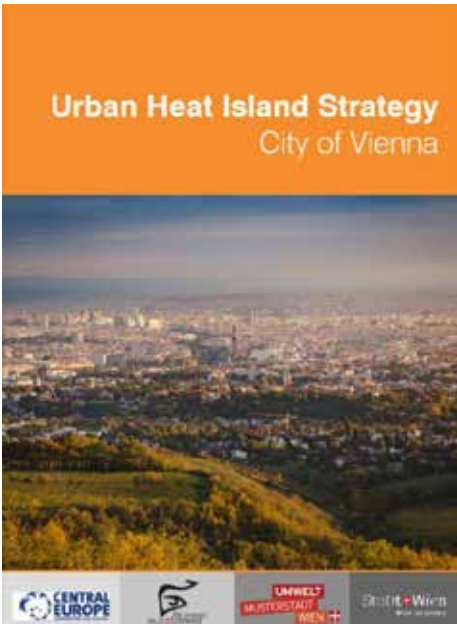
Vienna is the national capital and the most populous city with about 1.9 million inhabitants. It is the 6th-largest city by population within city limits in the European Union. Studies show that the population of the city will reach over 2 million by 2030.

According to researches, the average number of maximum temperature duration in Vienna increased from 9.6 days to 15.2 in years between 1961-2010. According to climate models, the number of warm days (25° C or more) in Vienna 30% to 50% in the next 50 - 80 years increase is foreseen (ZAMG, 2012). The growing pattern of the city is particularly relevant to urban land expansion and regeneration of the old brownfield areas (Czachs, 2013). The dense urban fabric and the effect of climate change leads to an increase in the urban heat island effect.

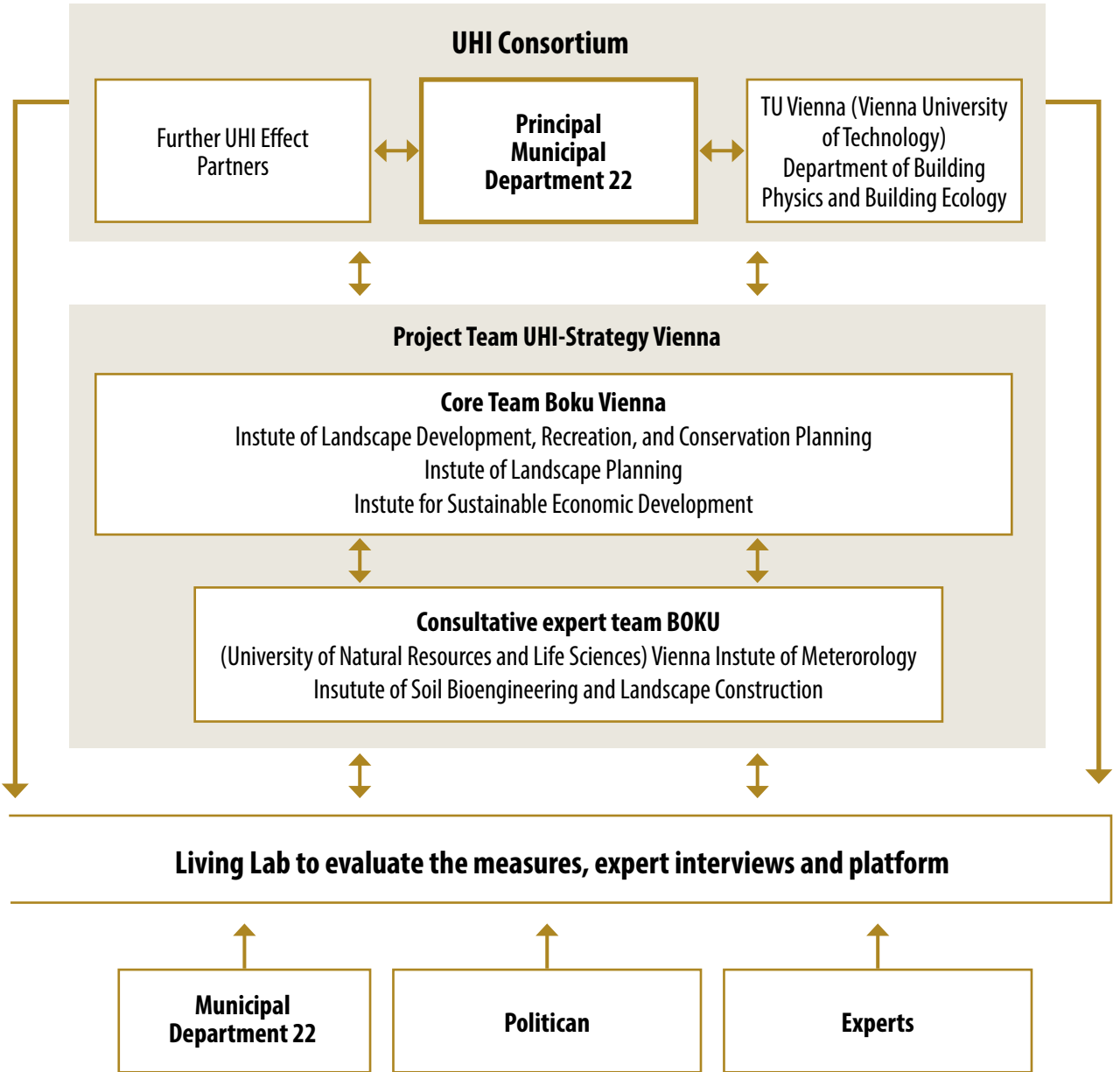
		Key features - Awareness raising about UHI and promote acceptance of measures that reduce UHI - Urban infrastructure and large-scale strategic measures - More detailed technical and structural measures - Improving city’s resilience to climate change
Name:	Urban Heat Islands Strategic Plan Vienna (UHI)	
Location	Vienna, Austria	
Implem. Scale	Şehir	
Impact scale	Region, city, neighborhood, street, building	

Issues and Tools

Urban Heat Islands are becoming the problem of many cities in the world, especially in Europe, with the increasing construction, deforestation, and climate crisis in the cities. For this reason, cities develop special measures, strategies, and actions for this issue. Vienna has developed this project as one of the cities with this problem. The main objective of the project is to minimize summer overheating and develop actions to adapt to and reduce overheating. In this context, a strategic plan has been developed for the implementation of urban and open space planning measures of the City of Vienna, as well as urban ecology measures that reduce the impact of UHI in the city, and nature-based solutions, green infrastructure practices have been proposed with this plan. The project is based on the development of tools and equipment at different control levels that encourage urban planning, awareness-raising, and the adoption of measures that reduce urban heat effects.



“Urban Heat Islands - Vienna Strategy Plan” is one of the components of the international Central Europe (CE) project. Eight different cities were examined within the scope of the project. The main goal of the project is to calculate UHI effect and identify adaptations to reduce it.



Organization of the project and networking flow (Czachs et. al., 2013)

The project includes three fields of action to enhance consideration of the UHI effect (Damyanovic et al., 2016):

- *Awareness building, information and public relations for UHI*
- *Urban infrastructure and large-scale strategic measures*
- *More detailed technical and structural measures*

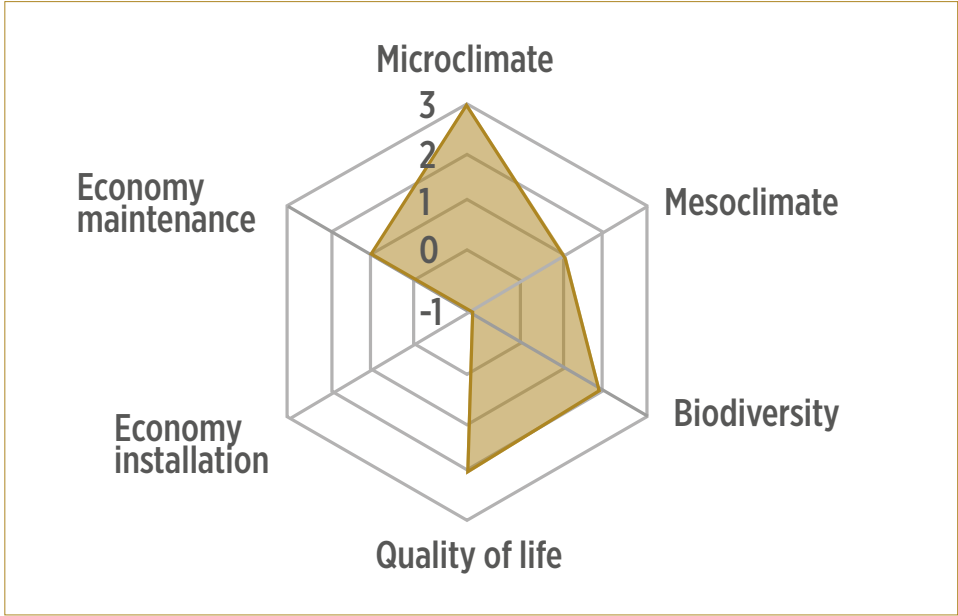


Workflow of developing UHI strategy Vienna (Source: https://www.corp.at/archive/CORP2013_78.pdf)

The strategy was developed through a cooperative dialogue with (and for) the planning and project development departments of the Municipal Authority of Vienna together with external experts (Municipality of Vienna, 2018). The project consists of six main work packages (Czachs et. al., 2013)

There are two critical aspects of the project workflow. The one is in the beginning (WP2); comprehensive literature review and the analysis of good practice examples on UHI with consideration of scale, urban ecology, social and economic aspects was carried out to identify actions. Experts from a range of disciplines and the Municipal Authority of Vienna contribute to this step. An assessment tool was developed. In the tool, nature-based solution and green infrastructure practices for reducing UHI were evaluated based on the following categories:

- *Microclimate, mesoclimate*
- *Biodiversity, people’s quality of life*
- *Construction and maintenance costs*



*Sample of spider web diagram for street greening: two sided avenue of trees
(Source: Municipality of Vienna, 2018)*

The other aspect (WP3) is testing and implementing actions at various management levels, areas of activity, and tools for city planning and urban development in Vienna.

With these two aspects, practical actions of implementation in urban planning and design context with enrich various examples. In this way, possible challenges at different urban scales into the implementation of UHI sensitive urban design presented (Municipality of Vienna, 2018).

The structure of the Vienna UHI Strategy and focus (Municipality of Vienna, 2018):

■ **Urban Heat Island and Urban Planning**

Areas of actions, levels of control and options for action

Legal and strategic frameworks for climate-sensitive urban planning

■ **Strategic Actions for climate-sensitive urban planning**

Strategic actions for climate-sensitive urban planning

Examples, information and basic principles

■ **Practical Actions**

Practical actions for urban planning and project design

Examples, information and basic principles

■ **Implementation**

Areas of action and implementation case studies

Examples and implementation options at the planning level

REFERENCES

Turkey

- European Commission (EC) (2013a): Green Infrastructure (GI) — Enhancing Europe’s Natural Capital. COM(2013) 249 final, Brussels, 6.5.2013. Çeviri: DKM, 2019
- European Commission (EC) (2013b): Commission Staff Working Document. Technical information on Green Infrastructure (GI) Brussels, 6.5.2013. SWD(2013) 155 final. Çeviri: DKM, 2019 (çevrimiçi) URL <https://www.dogavesehirler.org/yayinlar>
- Çağlayan, S.D., Balkız, Ö., Arslantaş, F., Sanalan, K.C., Lise, Y., Zeydanlı, U. 2020. Şehir Planlama Aracı Olarak Ekosistem Hizmetleri: Çankaya İlçesi Örneği. Ankara, Doğa Koruma Merkezi, 236 sayfa.
- Barker, A., Clay, G., Rothwell, J., Gilchrist, A., Tantanasi, I., Morrison, R., & Payne, S. (2019). Understanding GreenInfrastructure at Different Scales: a signposting guide. The University of Manchester. <https://doi.org/10.13140/RG.2.2.26366.95045>
- www.eskisehir.bel.tr
- <http://www.antebinparklari.com/>
- <http://izmirdoga.izmir.bel.tr>
- <http://www.iklimin.org/moduller/kentmodulu-yesilaltyapi.pdf>
- <https://www.urbangreenup.eu/izmir/urban-greenup-in-izmir.kl#section2>
- <https://www.cigdemim.org.tr/>
- <http://www.cankaya.bel.tr/pages/282/Yildiz-Lozanpark-Spor-ve-Dinlenme-Tesisleri/>
- <http://www.cankaya.bel.tr/pages/7967/ISMET-INONU-PARKI-VE-LOZAN-ZAFER-ANITI/> (Retrieved May 2020)
- Çankaya Belediyesi Park ve Bahçeler Müdürlüğü
- Gaziantep Büyükşehir Belediyesi Park ve Bahçeler Müdürlüğü
- Eskişehir Büyükşehir Belediyesi Park ve Bahçeler Müdürlüğü
- İzmir Büyükşehir Belediyesi

Barcelona

- City Council of Barcelona. 2013. Barcelona Green Infrastructure and Biodiversity Plan 2020, <https://bcnroc.ajuntament.barcelona.cat/jspui/bitstream/11703/85101/1/12888.pdf> Retrieved May 2020
- Laghai H. A., Bahmanpour H. 2012. GIS Application in Urban Green space Per Capita Evaluation. Annals of Biological Research, 2012, 3 (5):2439-2446.
- Künzli, N., Pérez, L. 2007. The Public Health Benefits of Reducing Air Pollution in the Barcelona Metropolitan Area. Centre de Recerca en Epidemiologia Ambiental (CREAL), Barcelona I.
- City Council of Barcelona. Ecology, Urban Planning, Infrastructures and Mobility Area. <https://ajuntament.barcelona.cat/ecologiaurbana/ca/pla-buits> Retrieved May 2020
- City Council of Barcelona. Ecology, Urban Planning, Infrastructures and Mobility Area. <https://ajuntament.barcelona.cat/ecologiaurbana/en/bodies-involved/citizen-participation/buits-plan> Retrieved May 2020
- City Council of Barcelona. Ecology, Urban Planning, Infrastructures and Mobility Area. Social Urban Gardens Pla Buits Vacant Lots Plan. <https://naturvation.eu/nbs/barcelona/social-urban-gardens-pla-buits-vacant-lots-plan> Retrieved May 2020

- City Council of Barcelona. Ecology, Urban Planning, Infrastructures and Mobility Area. <https://ajuntament.barcelona.cat/ecologiaurbana/ca/pla-buits> Retrieved May 2020
- City Council of Barcelona. Ecology, Urban Planning, Infrastructures and Mobility Area. Empty Urban Spaces with Territorial and Social Involvement Plan. <<https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/Mesura%20de%20Govern%20Pla%20Buits.pdf>> Retrieved May 2020
- City Council of Barcelona. 2013. Barcelona Green Infrastructure and Biodiversity Plan 2020. <https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/Barcelona%20green%20infrastructure%20and%20biodiversity%20plan%202020.pdf> Retrieved May 2020
- Axinte, L.F., 2015, Formalising the Informal Temporary Use of Vacant Spaces, Erasmus Mundus Master Course in Urban Studies 4 CITIES (2013-2015)
- Mubvami, T., Mushamba, S., de Zeeuw, H., Van Veenhuizen, R. (Ed.). 2006. Cities Farming for the Future: Urban Agriculture for Green and Productive Cities, IDRC, Silang, the Philippines, pp. 54-74
- Camps-Calvet, M., Langemeyer, J., Calvet-Mir, L., & Gómez-Baggethun, E. 2016. Ecosystem services provided by urban gardens in Barcelona, Spain: Insights for policy and planning. *Environmental Science & Policy*, 62, 14–23. <https://doi.org/10.1016/j.envsci>
- Laghai, H. A., Bahmanpour, H. 2012. GIS Application in Urban Green space Per Capita Evaluation. *Annals of Biological Research*, 2012, 3 (5):2439-2446.
- Künzli, N., Pérez, L. 2007. The Public Health Benefits of Reducing Air Pollution in the Barcelona Metropolitan Area. *Centre de Recerca en Epidemiologia Ambiental (CREAL)*, Barcelona I.
- Green Surge. 2020. Barcelona Case. https://greensurge.eu/products/case-studies/Case_Study_Portrait_Barcelona.pdf Retrieved May 2020
- Oppla website. 2020. <https://oppla.eu/casestudy/17283> Retrieved May 2020
- “Raymond, C.M., Berry, P., Breil, M., Nita, M.R., Kabisch, N., de Bel, M., Enzi, V., Frantzeskaki, N., Geneletti, D., Cardinaletti, M., Lovinger, L., Basnou, C., Monteiro, A., Robrecht, H., Sgrigna, G., Munari, L. and Calfapietra, C. 2017. An Impact Evaluation Framework to Support Planning and Evaluation of Nature-based Solutions Projects. Report prepared by the EKLIPSE Expert Working Group on Nature-based Solutions to Promote Climate Resilience in Urban Areas. Centre for Ecology & Hydrology, Wallingford, United Kingdom”
- City Council of Barcelona. Ecology, Urban Planning, Infrastructures and Mobility Area. <https://ajuntament.barcelona.cat/ecologiaurbana/ca/pla-buits/espais-en-actiu/espai-germanetes> Retrieved May 2020
- Menawhile Foundation. 2019. <https://www.meanwhile.org.uk/resources/13-espai-germanetes-barcelona-spain> Retrieved May 2020

Berlin

- Baró, F., Haase, D., Gómez-Baggethun, E., Frantzeskaki, N. 2015. Mismatches between ecosystem services supply and demand in urban areas: A quantitative assessment in five European cities. *Ecological Indicators*, 55, 146–158. <https://doi.org/10.1016/j.ecolind.2015.03.013>
- Kabisch, N. (2015). Ecosystem service implementation and governance challenges in urban greenspace planning—The case of Berlin, Germany. *Land Use Policy*, 42, 557–567. <https://doi.org/10.1016/j.landusepol.2014.09.005>
- Haase, D., Frantzeskaki, N., Elmqvist, T. 2014. Ecosystem Services in Urban Landscapes: Practical Applications and Governance Implications. *AMBIO*, 43(4), 407–412. <https://doi.org/10.1007/s13280-014-0503-1>
- Development by the Belgian Biodiversity Platform. <http://www.biodiversa.org/> Retrieved May 2020
- Oppla web sitesi. Barcelona Case. <https://oppla.eu/casestudy/18413> Retrieved May 2020

- For more information: <https://www.youtube.com/watch?v=Yq1QtmmZTbs>
- Humboldt University. 2015. <https://www.geographie.hu-berlin.de/en/professorships/landschaftsoekologie-en/projects/completed/urbes/urbes-project> Retrieved May 2020

Oppla

- The European Climate Adaptation Platform Climate-ADAPT. 2020. <https://climate-adapt.eea.europa.eu/metadata/portals/oppla-information-hub-for-nature-based-solutions> Retrieved May 2020
- Oppla website. 2020. https://oppla.eu/sites/default/files/docs/Oppla-WelcomePack_0.pdf Retrieved May 2020
- Oppla website. 2020. <https://oppla.eu/> Retrieved May 2020

Tilburg

- Wikipedia. 2020. https://nl.wikipedia.org/wiki/Ministerie_van_Oorlog Retrieved May 2020
- Wikipedia. 2020. <https://en.wikipedia.org/wiki/Tilburg> Retrieved May 2020
- Piazza, M.P. 2016. Urban Analysis of the City of Tilburg and Portrait of possible Appropriation of Public Space, Presentation: https://issuu.com/matiaspiazza/docs/open_up_that_window/6?ff. Retrieved May 2020
- Spoor Park Tilburg. 2020. <https://spoorparktilburg.nl/> Retrieved May 2020
- Spoor Park Tilburg. 2020. <https://spoorparktilburg.nl/wp-content/uploads/spoorpark.pdf> Retrieved May 2020
- De Regte Heide. 2020. <http://www.deregteheijden.nl/de-boerderij/> Retrieved May 2020
- Brabants Landschap. 2020. <https://www.brabantslandschap.nl/ontdek-de-natuur/natuurgebieden/ten-oosten-van-tilburg/regte-heide-and-riels-laag/> Retrieved May 2020

Vienna

- Central Institute for Meteorology and Geodynamics (ZAMG) 2012.
- Damyanovic, D., Reinwald, F., Brandenburg, C., Allex, B., Gantner, B., Morawetz, U., Preiss, J. 2016. Pilot Action City of Vienna – UHI-STRAT Vienna. In *Counteracting Urban Heat Island Effects in a Global Climate Change Scenario* (pp. 257–280). Springer International Publishing. https://doi.org/10.1007/978-3-319-10425-6_9
- Urban Heat Island Strategy, City of Vienna 2018 Municipality of Vienna, Vienna Environmental Protection Department – Municipal Department 22
- Czachs, C., Reinwald, F., Damyanovic, D., Brandenburg, C., Gantner, B., Allex, B., Preiss, J., Liebl, U. 2013, May. Urban Heat Islands–Strategy Plan Vienna. In *PLANNING TIMES–You better Keep Planning or You get in Deep Water, for the Cities they are A-Changin’*. Proceedings of 18th International Conference on Urban Planning, Regional Development and Information Society (pp. 1037-1044). CORP–Competence Center of Urban and Regional Planning.
- <https://www.nature4cities.eu/>

OTHER EXAMPLES OF BEST PRACTICES					
	City	Green Infrastructure and Nature Based Solution Example Name	Implimantation scale	Impact Scale	Reference
1	Stuttgart	The Green Living Room	Building	Building, neighbourhood	Eclipse, https://urbangardensbarcelona.wordpress.com/
2	Freiburg, Germany	Eco District Freiburg Vauban	Neighbourhood	Neighbourhood, building	Oppla
3	Hannover Kronsberg, Germany	rainwater system	Neighbourhood	Neighborhood, city	https://www.zu.de/lehrstuehle/soziooekonomik/assets/pdf/Ramboll_Woerlen-et-al_BGI_Final-Report_small-1.pdf
4	Helsinki, Finland	Engaging residents in blue open space management	Neighbourhood	Neighbourhood, city	Eclipse Platformu
5	Saint-Just, France	Water treatment plants	City	National	Nature4cities
6	Bézannes, France	Stormwater management	Building	Neighbourhood, building	Oppla
7	Bordeaux Métropole, France	Lichens indicators	City	City	Oppla
8	Nantes, France	Green roof of the Aimé Césaire school complex	Building	Building	Oppla
9	Valenton, France	Fertile soil construction by using recycled materials: Blue beach case study of Valenton	Neighbourhood	Neighborhood, city	Oppla
10	Nantes, France	Artificial shelters for fauna	Neighbourhood	Neighborhood, city	Oppla
11	Lille, France	Create pollinators shelters	Building	Building, neighbourhood	Oppla
12	Strasbourg, France	Urban Natural Park	City	City	Oppla
13	Paris, France	Ecological Building	Building	Building, neighbourhood	Oppla
14	Saint-Etienne, France	Wildlife passage	City	City, regional	Oppla
15	Mouans-Sartoux, France	Local food network	Neighbourhood	Neighborhood, city	Oppla
16	Amsterdam, The Netherlands	The Edge building in Amsterdam.	Building	Building, neighbourhood	Eclipse
17	Alkmaar, Netherlands	Green roof	Neighbourhood	Neighbourhood	https://www.operatiesteenbreek.nl/
18	Amsterdam, Netherlands	GREEN DEAL Green roof	Building	Building, neighbourhood	Oppla, Green Surge
19	Utrecht, The Netherlands	Designing green and blue infrastrucutre to support urban livin	Building	Building, neighbourhood	Eclipse
20	Barcelona, Spain	Urban Gardening	Neighbourhood	Neighborhood, city	Eclipse
21	Madrid, Spain	The edible forest of Alcalá de Henares	Neighbourhood	Neighborhood, city	Eclipse
22	Rome, Italy	Urban agriculture system	neighbourhood	Building, city	Eclipse
23	Genoa, Italy	Vertical green system	Neighbourhood	Neighbourhood	Eclipse
24	Milan, Italy	Vertical forest	Building	Neighbourhood	Eclipse
25	Milan, Italy	Flood retention	City	Regional	http://www.parks.it/parco.lura/Epar.php
26	Budapest, Hungary	Urban regeneration in Ferencváros	Neighbourhood	Building, neighbourhood	Oppla
27	Nagykovácsi, Hungary	Community Garden Nagykovácsi	Neighbourhood	Neighborhood, city	Oppla
28	Poznan, Poland	Green Backyards	Building	Neighborhood, city	Green Surge
29	Londra, İngiltere	Green Infrastructure Resource Library	All	All	Green Infrastructure Resource Library

SUGGESTED READINGS

- Biodiversity blooms in cities when green spaces go wild:
<https://www.dw.com/en/green-spaces-flora-fauna-wild-native-wildflowers-insects-dublin-dessau-wilderness/a-53955388>
- Copenhagen to plant communal fruit trees on city streets
<https://matadornetwork.com/read/copenhagen-plant-communal-fruit-trees-city-streets/>
- The greenest school in Valencia: a vertical garden and reused water for irrigation
<http://growgreenproject.eu/greenest-school-valencia-vertical-garden-reused-water-irrigation/>
- Herbal Remedy: Making Space For Nature in Cities
<https://www.the-possible.com/nature-in-cities/>
- URBAN GreenUP activities
<https://www.urbangreenup.eu/insights/>
- The secret of wellbeing in cities: green help at hand
<https://www.nature4cities.eu/post/the-secret-of-wellbeing-in-cities-green-help-at-hand>
- EU pledges to raise €20bn a year to boost biodiversity
<https://www.theguardian.com/environment/2020/may/20/eu-pledges-20bn-a-year-on-boosting-biodiversity-aoe>
- Gehrels, H., van der Meulen, S., Schasfoort, F., Bosch, P., Brolsma, R., van Dinther, D., ... & Massop, H. T. L. (2016). Designing green and blue infrastructure to support healthy urban living. TO2 federatie.
<https://library.wur.nl/WebQuery/wurpubs/504847>
- Cities in a 1.5 degree world: What is there to learn from Leuven's Mayor Ridouani?
<https://www.climate-kic.org/community/what-is-there-to-learn-from-leuven/>
- London National Park City
<https://www.nationalparkcity.london/>

ONLINE PLATFORMS

- Oppla
<https://oppla.eu/>
- Nature4Cities
<https://www.nature4cities.eu/>
- Eklipe
<https://www.eklipse-mechanism.eu/>
- Green Surge
<https://ign.ku.dk/english/green-surge/>
- Think Nature
<https://platform.think-nature.eu/>
- Sustainable Cities
<https://sustainablecities.eu/home>
- Green Infrastructure Resource Library
<https://brillianto.co.uk/GIRL/>

Table 1: Assessment of ecosystem services provided by green infrastructure and nature-based solutions at different implementation scales (Retrieved from Barker, A., et. al., 2019; Hansen, R., et. al., 2017)

		URBAN ECOSYSTEM SERVICES													
		Provisioning services				Regulating services							Cultural services		Supporting services
Implementation Scale	Green infrastructure and nature-based solution	Food production	Fresh water	Wood	Medicines	Urban temprature regulation	Air purification	Water purification	Pollination	Noise reduction	Carbon sequestration	Runoff mitigation	Recreation	Ecotourism	Habitats for species
Building, street	Domestic garden	X			X	X	X		X	X					X
Building, street	Rain garden	X			X	X	X	X	X			X	X		X
Building, street	Permeable pavement					X						X			
Building, street	Green façade					X	X	X	X	X					X
Building, street	Green roof	X			X	X	X		X	X		X			X
Building, street	Green parking lot					X	X		X						
Street, neighborhood	Street trees	X				X	X	X	X	X	X	X	X		X
Street, neighborhood	Sustainable urban drainage systems					X	X	X				X			
Neighborhood	Community/food growing area	X			X	X	X		X	X	X	X	X		X
Neighborhood	Neighborhood park	X				X	X	X	X	X	X	X	X		X
Neighborhood	Urban park	X				X	X	X	X	X	X	X	X		X
Neighborhood	Botanic garden				X	X	X	X	X	X	X	X	X	X	X
Neighborhood	Fruit garden	X			X	X	X	X	X	X	X	X			X
City, region	Green corridors					X	X	X	X	X	X	X	X		X
City, region	Water channel		X			X		X				X	X	X	X
City, region	Streams		X			X		X				X	X	X	X
City, region	Forest	X		X	X	X	X	X	X	X	X	X	X	X	X
City, region	Agricultural land	X			X										

Table 2: Assessment of the economic benefits provided by green infrastructure and nature-based solutions in different implementation scales (Retrieved from Barker, A., et. al., 2019; Hansen, R., et. al., 2017)

Implementation Scale	Green infrastructure and nature-based solution	ECONOMIC BENEFITS											
		Increase land value	Enhancing economical growth	Enhancing tourism opportunities	Increasing productivity	Increasing good provisioning	Increasing commercial recreational areas	Enhancing quality of place	Reducing health and wellbeing expenditure	Increasing land and biodiversity management	Reducing flood risk	Enhancing climate change adaption	Enhancing climate change adaption
Building, street	Domestic garden	X	X	X	X	X	X	X	X	X	X	X	X
Building, street	Rain garden							X	X	X	X	X	X
Building, street	Permeable pavement						X	X		X	X	X	X
Building, street	Green façade	X			X			X	X	X	X	X	X
Building, street	Green roof	X			X	X	X	X	X	X	X	X	X
Building, street	Green parking lot	X					X	X		X	X	X	X
Street, neighborhood	Street trees	X	X	X	X	X	X	X	X	X	X	X	X
Street, neighborhood	Sustainable urban drainage systems	X	X	X		X	X	X	X	X	X	X	X
Neighborhood	Community/food growing area	X			X	X	X	X	X	X	X	X	X
Neighborhood	Neighborhood park	X	X	X	X	X	X	X	X	X	X	X	X
Neighborhood	Urban park	X	X	X	X	X	X	X	X	X	X	X	X
Neighborhood	Botanic garden	X	X	X	X	X	X	X	X	X	X	X	X
Neighborhood	Fruit garden	X	X		X	X	X	X	X	X	X	X	X
City, region	Green corridors	X	X	X	X		X	X	X	X	X	X	X
City, region	Water channel	X	X	X	X	X	X	X	X	X	X	X	
City, region	Streams	X	X	X	X	X	X	X	X	X	X	X	
City, region	Forest	X	X	X	X		X	X	X	X	X	X	X
City, region	Intensive agricultural land			X	X	X	X	X	X		X		
City, region	Unintensive agricultural land	X		X	X	X	X	X	X	X	X	X	

Table 3: Assessment of social benefits provided by green infrastructure and nature-based solutions at different implementation scales (Retrieved from Barker, A., et. al., 2019; Hansen, R., et. al., 2017)

		SOCIAL BENEFITS								
Implementation Scale	Green infrastructure and nature-based solution	Improved aesthetics	Sport and recreational opportunities	Social interaction and community cohesion	Toplumun iklim değişikliğine direncinin artması	Raising awareness on climate change and risks	Increased commercial recreation and recreational facilities	Enhancing physical health	Enhancing mental health	Improving accessibility to natural and green areas
Building, street	Domestic garden	X	X	X	X	X	X		X	X
Building, street	Rain garden	X			X	X		X	X	X
Building, street	Permeable pavement	X			X	X		X	X	X
Building, street	Green façade	X			X	X		X	X	X
Building, street	Green roof	X			X	X		X	X	X
Building, street	Green parking lot	X			X	X		X	X	X
Street, neighborhood	Street trees	X		X	X	X		X	X	X
Street, neighborhood	Sustainable urban drainage systems	X			X	X			X	X
Neighborhood	Community/food growing area	X	X	X	X	X	X	X	X	X
Neighborhood	Neighborhood park	X	X	X	X	X	X	X	X	X
Neighborhood	Urban park	X	X	X	X	X	X	X	X	X
Neighborhood	Botanic garden	X		X	X	X	X	X	X	X
Neighborhood	Fruit garden	X		X	X	X	X	X	X	X
City, region	Green corridors	X	X	X	X	X	X	X	X	X
City, region	Water channel	X	X	X	X	X	X	X	X	X
City, region	Streams	X	X	X	X	X	X	X	X	X
City, region	Forest	X	X	X	X	X	X	X	X	X
City, region	Intensive agricultural land	X	X	X	X		X	X	X	X
City, region	Unintensive agricultural land	X	X	X	X	X	X	X	X	X

ACKNOWLEDGEMENT

We thank Çankaya Municipality Director of Parks and Gardens Zeynep Özen, Gaziantep Metropolitan Municipality Parks and Gardens Section Manager Banu Gökçek, Landscape Architect Esra Kılıç from Gaziantep Metropolitan Municipality, Landscape Architect Neşe Karakaya from Eskişehir Metropolitan Municipality, Berna Ataman Oflas from İzmir Metropolitan Municipality, Çiğdem Education, Environment and Solidarity Association (ÇİĞDEMİM) President Fatih Fethi Aksoy and ÇİĞDEMİM Urban Garden Supervisor Mehmet Hikmet Odabaşı, Eurosite Project Officer Kristijan Civic, Rob van Dijk from Tilburg Municipality, Lucy Bathgate from Spoorpark Initiative, and Victor Retel Helmrich from Brabant Landschaap for their contributions in the information and data gathering and writing phases of the Examples of Best Practices on Green Infrastructure and Nature-Based Solutions in Cities book.

