

# Augustenstraße Public Space and the Ecology-Extended Analysis

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**Abstract:** Purpose-This article it's a research report, which intends to explain the specific steps and methods of the preliminary ecological investigation and analysis of the Augustenstraße block reconstruction project. Design/methodology/approach-We used some professional maps, software and SWOT analysis methodology in this research and analysis, which objectively presented the existing ecological status of the site. Then compare it with European standards to find problems. Findings -The most important findings in our research included the notion that the city, the district, and the study area have significant green spaces. Nevertheless, this greenery is disconnected from the constructed areas, resulting in the drastic reduction of benefits provided by regulating and supporting ecosystem services. Similarly, the study area has a considerable variety of green places providing benefits such as regulating and supporting biodiversity services reflected in the diversity of species on site. However, most of them are disconnected from each other and are of private use with limited access only to neighbours living around them, reducing the possibility of more people benefiting from them. Presently, Augustenstraße users are still exposed to disservices such as contaminated air, the island heat effect -especially during summer- and disconnection with nature due to its current use as a parking lot and the unbalance between hard and green surfaces. Subsequently, spaces and surfaces available at different levels could be further integrated into the green structure of the street increasing the cooling effect. Finally, determine the facades legal status to identify which are declared protected heritage. Project overview-The following is the ecological analysis of Augustenstr. Located in the district of Stuttgart-West. The analysis is divided into the research question, research methods, SWOT analysis, findings and next steps. The main research methods were Remote Sensing, GIS maps, and data collection directly in the study area.

**Keywords:** Supeblock. Ecology. Public space

## 1. Research question

The first approach to the topic of Public space and the ecology was to connect it directly with the ecosystem services assessment (Wende and Wolfgang; Mathey and Juliane, 2015) and which of those services would be the focus of our analysis. After defining those parameters, we defined the research question resulting in the following: **What is the current state of Regulating and Supporting Biodiversity Ecosystem Services in the study area?**. Accordingly, it was fundamental to define what regulating and supporting ecosystem services (Martin Jacobson, 2012) mean and what was the scope of each category as illustrated in Figure 1.

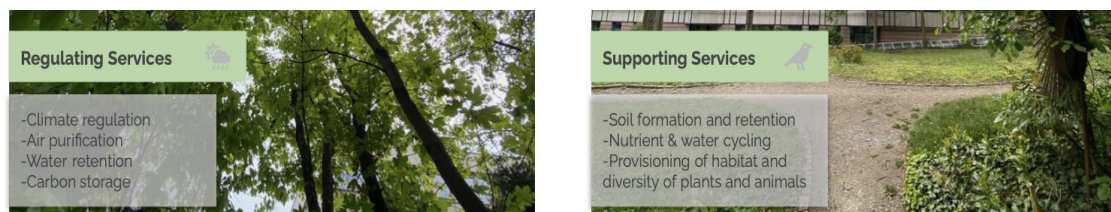


Figure 1 Ecosystem services definitions. Source: Authors

## 2. Data collection and methods

The definition of the research question and the ecosystem services allowed us to narrow down the data collection focusing on the defined core. Our first approach was to understand the main problems in

the city related to regulating and supporting ecosystem services. In effect, we learned about the city characteristics in terms of climate, development, and population, topography, environmental challenges, and green infrastructure projects as illustrated in figure 2.

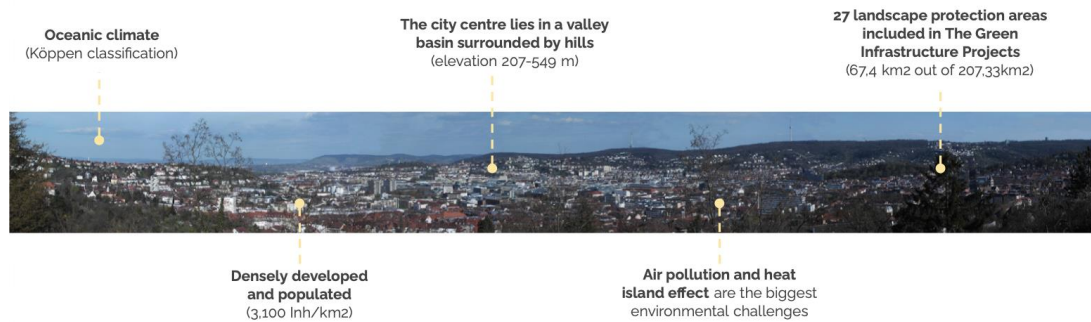


Figure 2 Stuttgart in a nutshell. Source: Authors

Hence, through the Stuttgart Maps tool, we demonstrated how the three main challenges (air pollution, heat island effect, and land-use) are measured and how these issues could affect the study area, as illustrated in Figure 3 (Rayk Rinke and Rainer Kapp et al., 2016 Sep).

The city is located in a valley basin with low wind speeds, industrial activity and a high volume of traffic making the city highly susceptible (Rainer Kapp, 2016, Jul 20) to **poor air quality** (Die Bauleitplanung Wirtschaftsministerium Baden-Württemberg, 1998), the development on the valley slopes has prevented air from moving through the city worsening air quality and contributing to the urban **heat island effect**, and the **risk for biodiversity** if biotopes are affected by housing development and increased traffic flows. Nevertheless, it was fundamental to locate the green infrastructure projects in the city; through the same mapping tool, we were able to find the projects and define which of them could be possible allies for the Superblock initiative such as the **Ventilation Corridors** providing better temperature control and the **Municipal Green Programme** promoting the greenery in streets, courtyards, roofs, and facades.

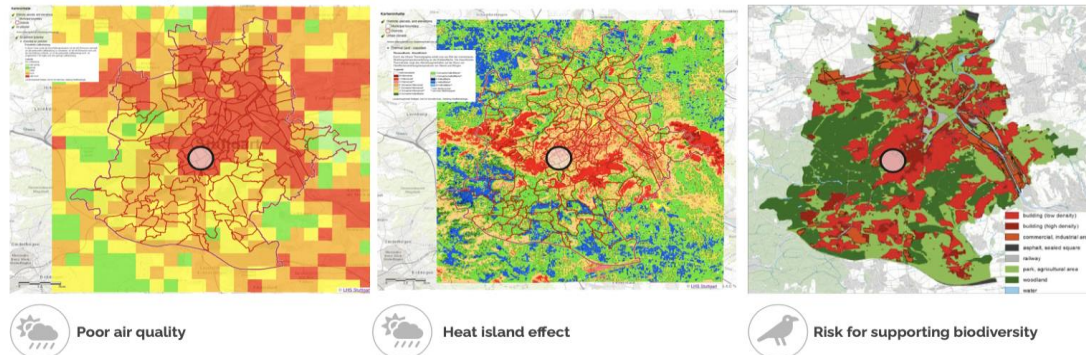


Figure 3 Ecosystem Disservices

After understanding the city of Stuttgart from a wider perspective, our focal point was to work on the micro-scale. We identified that the green areas are not entirely engaged with the urban fabric. Regarding regulating services, we couldn't encounter great benefits in the district of Stuttgart-West since the disconnection between green and grey areas is evident, resulting in decreased benefits provided by both regulating and supporting ecosystem services. However, zooming on a smaller scale, *Karlshöhe and Augustenstraße*, we discovered that regulating ecosystem services are only perceived on the south part due to their proximity to the urban greenery. Regarding supporting services, the neighbourhood proximity to Karlshöhe helps to improve the benefits provided by supporting services for biodiversity.



Figure 4 Regulating and supporting services in the surroundings. Source: Authors

To comprehend the ecosystem services and disservices in Augustenstrasse, a comparison between the streets and the courtyards was vital to show in parallel how those green and built spaces are disconnected but at the same time the great potential to create a strategy that could restore the connection between them. In regards to regulating and supporting services, inner gardens inside the blocks exemplify climate regulation, air purification, carbon storage, and supporting services such as soil formation, nutrient and water cycling, and provisioning of habitat diversity. However, it can be seen in figure 4 the streets are lacking these services as a consequence of high impervious surfaces percentage and its use as a parking site.

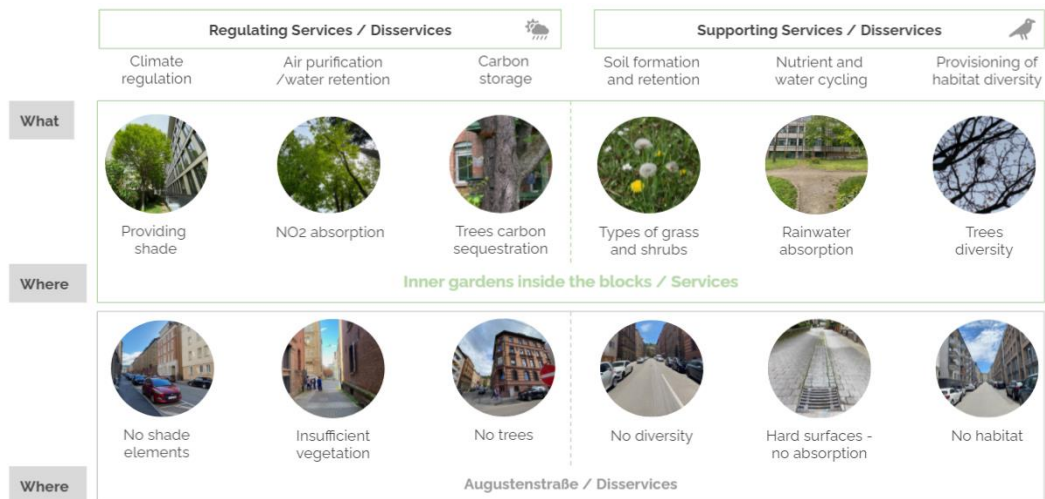


Figure 5 Regulating and supporting services in inner gardens and on the Augustenstrasse. Source: Authors

According to the data from **Umweltbundesamt** (City of Stuttgart, Environmental Protection Office Section of Urban Climatology, 2010) usually, the air quality is *good* to *moderate* following the EU standards. However, since the amount of green canopy in the street is low, increasing it could balance the high percentage of hard and impervious surfaces, and the quality of air would improve as well reaching *very well* category following the EU standards (Die Bauleitplanung. Ministerium für Verkehr und Infrastruktur Baden-Württemberg, 2012). In addition, harmful gasses such as Nitrogen Dioxide, Carbon Monoxide, Sulfur Dioxide, and Particulate Matter are mostly released by motor vehicles, leading us to the fact that the traffic and the number of cars on the street should be reduced to achieve better air quality standards for the outdoors.

## 2.1. Green spaces assessment

The main goal for the assessment of the green spaces was to evaluate all the surfaces from the ground level to the roofs including the facades, the output then was the green area's classification divided into public, private non-accessible, or private accessible. Moreover, as a second layer, we included the



location of the green roofs and we classify them into intensive or extensive roofs. Additionally, we allocated some balconies and patrimonial facades over the Augustenstrasse, however, further analysis and identification need to be carried out in this regard. Finally, we localized the trees on the site, identifying the species of some of the trees and scrubs existing in the inner gardens as illustrated in Figure 5.



Figure 6: Green space assessment, ground cover, roofs and trees. Source: Authors

### 3. SWOT analysis

Strength	Weakness
<ul style="list-style-type: none"> <li>-Existing inner gardens supply a good offer of regulating and supporting ecosystem services.</li> <li>-Diversity in plant coverage of the interior gardens promotes the habitat for animal species.</li> <li>-Regulating ecosystem services are enhanced by the green spaces contributing to air purification and carbon sequestration.</li> <li>-Connection with nature is provided by Green spaces for the inhabitants living around them.</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of public green spaces since most of GS are somehow restricted to the general public.</li> <li>-Disconnection between inter-block green spaces and the Augustenstrasse.</li> <li>-Disintegration of the study area with the surrounded green areas in the district.</li> <li>-Lack of supporting and regulating ecosystem services on Augustenstrasse.</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>-Connecting the inner gardens with the Augustenstrasse using strategic green corridors that can also help to improve the micro-climate conditions.</li> <li>-Including the available facades and balconies to enhanced the greenery in the street in different surfaces and levels.</li> <li>-Providing public green spaces for all users and actors interacting in Augustenstrasse</li> </ul>	<ul style="list-style-type: none"> <li>-Public accessibility to green spaces be increasingly reduced.</li> <li>-Increasing air pollution and temperature in the study area can affect current biodiversity.</li> <li>-Vulnerability of the existing green spaces of being built in the future by private developers.</li> </ul>

Figure 7. SWOT analysis. Source: Authors

The next step was to analyze all the data collected through the research methods in a comprehensive way. The SWOT analysis, it can be seen in figure 7, matrix allowed us to classify our discoveries into categories. Firstly, as **strengths**, we included the fact that the existing inner gardens supply a good offer of regulating and supporting ecosystem services. Secondly, the diversity in plant coverage of the interior gardens promotes the habitat for animal species such as birds and insects. Thirdly, the role that the green spaces performed in regulating ecosystem services by contributing to air purification and carbon sequestration. Finally, the connection with nature for the inhabitants provided by the inner green spaces within the blocks. Moreover, some **opportunities** were recognized. For instance, how connecting the inner gardens with the Augustenstrasse using strategic green corridors could help to improve the micro-climate conditions for the study area, how including the available facades and balconies to enhance the greenery in the street in different surfaces and levels might contribute to providing public green spaces for all users interacting in Augustenstr. democratizing the access to benefits provided by it.

On the contrary, as **weaknesses**, the lack of public green spaces is evident since most of them are private with limited access. Additionally, the disconnection between the inner block green spaces and the Augustenstrasse together with the disintegration of the study area with the surrounded green areas in the district such as Karlsh the decreasing the connection between nature and street users, and ultimately the lack of supporting and regulating ecosystem services on Augustenstrasse. Furthermore, there are some **threatens** that need to be addressed such as the limited public access to green spaces due to physical and invisible barriers, the increasing air pollution and temperature over time in the study area affecting the current biodiversity in the place, and finally the vulnerability of the existing green spaces of being built in the future by private developers.

#### 4. Next steps

The next steps include the evaluation of the Green Infrastructure Projects in the macroscale to integrate the future intervention to those located in the study area surroundings. In the microscale, the comparison between the i-tree canopy benefits assessment with the data collected from the city station and the EU goals to recognize how to achieve further benefits in terms of air quality, water harvesting, climate regulation, and land cover balance. Henceforth, how the concept of the green corridor could be applied in Augustenstraße to articulate the existing green spaces and potentialize the ecosystem services provided in the future. Likewise, the development of in-depth solar radiation and thermal simulation analysis on the plot, learning how to improve the temperature regulation and estimating where are the crucial points to intervene with special focus on the summer/winter seasons. Finally, the analysis of the nature connectedness assessment through surveys including the connection with nature, the accessibility perception from the community, and the common uses of the current green areas.

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