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Sustainable Urbanism: Research-based collaboration of intercultural and transdisciplinary student teams towards resource-efficient solutions for challenges of current urban planning on exemplary neighbourhoods in Hamburg.

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Summary

Sustainable urbanism leads socio-cultural setting and resource-efficient use of materials, water, energy and traffic to a synthesis. Aspects of sustainable urban planning are densification, mixed use, urban sprawl, green technology or human scale neighbourhoods. This can be reached by promoting diverse urban sub-centres, in a so-called polycentric city like Hamburg.

In order to apply this conceptual framework in a comparative way, seven teams of international graduate students proposed solutions on sub-centres in Hamburg, based on an in-depth analysis of those neighbourhoods. Participants have different academic and professional backgrounds in order to be able to analyse, discuss and propose in a broad, interdisciplinary way. Also, they have a diverse cultural background, which constitutes a global understanding with regards to technology, politics, culture and climate.

The aim of this collaboration is to derive strategies for the improvement of livability and sustainability of urban neighbourhoods through extensive communication among diverse perspectives. The presented outcome is based on critical theoretical discussions, case study analysis and contextualised, detailed physical interventions which shall be adapted to other locations in a useful way.

Keywords: Interdisciplinary Planning, Polycentric City, Sustainable Urbanism, Best Practice

1. Introduction

Find out what makes a neighbourhood sustainable and propose measures to make it more sustainable and livable, “to rethink where and how we live, work, play and shop” [1]. Basically, this was the task of a research-based project work at HafenCity University Hamburg (HCU) for 29 international students of the master of science degree programme Resource Efficiency in Architecture and Planning (REAP). But what makes an urban neighbourhood livable? Referring to the fact that more than half of the world's population is now living in urban areas and these areas are consuming 75 per cent of the world's natural resources and 60 to 80 per cent of the global energy production, urban and environmental planning must “apply incremental approaches as well as seeking major economic and social change with strategies that will work, to envisage and apply a new, daring and ambitious environmentalism to radically re-engineer our urban settlements” [2].

Cities need to become more compact and resource-efficient and planning requires “holistic approaches and whole-of-system thinking to deal with the entire 'urban metabolism'" [3].

Intercultural and transdisciplinary work is practical reality in planning, which requires to prepare students as the future decision makers of urban development for that too. The aspect of diverse research, teaching and practise is being integrated into planning principles, in contrast to conventional research and discussion, which tend to forget the reflection of planner’s perspective and background [9]. This paper reports of a one-term, 10 credit points course called Project 2 (P2) in the second term of REAP. It presents major outcome related to traffic, material, water and energy, which serves as an example of how to apply the concept of sustainable neighbourhoods through academic knowledge exchange. We argue that intensive interdisciplinary master's programmes have potential to transform the way Sustainable Urbanism (SU) is being transmitted and applied.

First (Section 2), this paradigm and its major principles will be explained. Section 3 describes the programme and the composition of the groups. Then (Section 4), we will go on with the focus topics the groups dealt with and give an overview of the tools which were used for the analysis and proposals. Section 5 presents remarkable outcome, both for SU and the situation in Hamburg. In the conclusion (Section 6), we will summarize and discuss how the project work may be further applied.

2. Sustainable Urbanism: Concept and Paradigm

The fact that “over half of the world’s population lives in urban areas and this proportion is expected to grow to 67 per cent in 2050” [2], in combination with climate change cause the urgent need for urban planning to set the course for environmentally responsible, socially equitable and economically viable solutions [4].

“The smart growth, new urbanism and green building movements provide the philosophical and practical bones of sustainable urbanism” [1], which is the theoretical context of REAP. It promotes widely agreed principles of how to plan a city in order to make it sustainable, meaning inclusive, resilient, prosperous and ecological. SU is the mainstream paradigm of planning in the late 20th and early 21st century in contrast to modernist planning subsequent to industrialism. Fig. 1 summarises the main principles of SU and resource efficient urban planning along one of the student team’s project aspects in Hamburg.

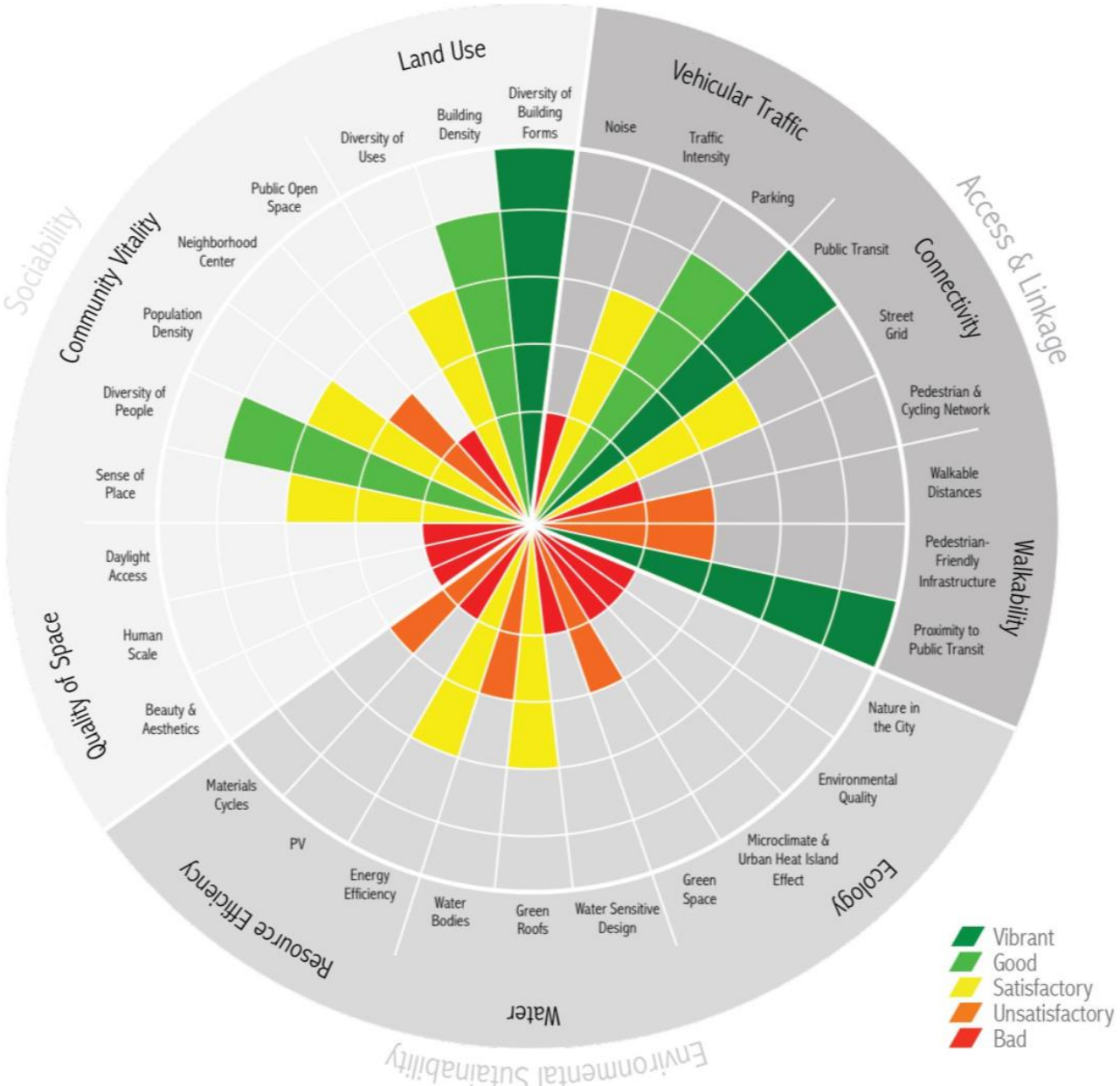


Fig. 1 Multi Criteria Analysis. Source: REAP P1 (Sievert, Schulte, Valladares, Valdenebro)

The so called compact city of high density is polycentric and human-scale with access to nature [1, 4]. This means that there are neighbourhoods within the city which provide diversity in land use and social strata, based on “the idea of the city as a mixing pot for people of different cultural, ethnic and class backgrounds” [2]. The urban layout seeks to minimize the distance “travelled per person per day between workplace, home, school, shops and leisure activities” [6] for better sociability [4] and low-carbon transportation and efficient energy supply (potential reduction of 50% [1]). While accepting urban areas being condensed habitats, SU aims to rehabilitate cities towards natural systems by incorporating green space and natural water cycles. Climate change as one of the drivers of the global sustainability movement influences urban planners with regards to adaptation to changing climatic conditions and its consequences. Embedded in this context, the architectural and engineer’s aim is to provide high-performance buildings and transportation.

According to Moore (2013), this “formation actors, practises and principles” [9] runs the risk of blind transplantation because it does not question its formation and, subsequently, the real chal-

lenges. This call for more reflected and contextualised transfer and application of SU can be solved by educating people the way REAP does; this will be subject of the next section.

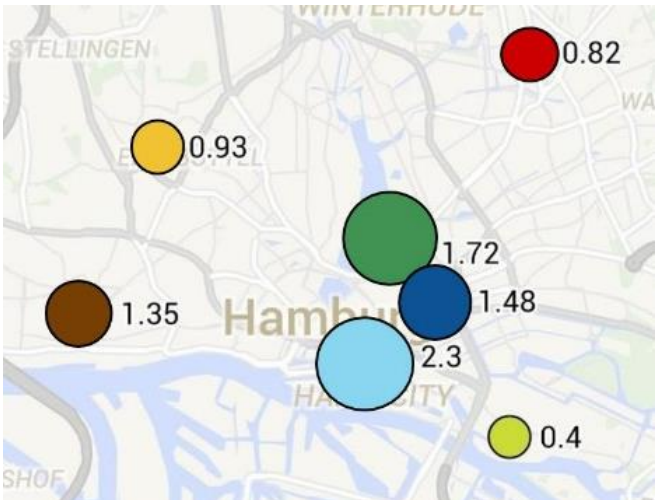
3. The REAP Master Programme and its central Project 2

The application of concepts like human scale design and compact, polycentric cities are interrelated to a complex mix of economic, aesthetic, environmental, social and technical questions and have to be dealt with likewise. This is the aim of REAP, which is intentionally diverse in two different respects: It is inter-disciplinary as it incorporates more than ten different undergraduate and professional backgrounds (engineers, natural and social sciences). This means different conceptual knowledge levels, different approaches of solving problems and different attitude to work and workload. As Bovill (2015) puts it, “architecture like ecology is surrounded and supported by multiple disciplines” [7].

Moreover, the participants come from from four continents and 17 different countries, a condition for cultural and personal diversity. The people have known each other as they study a two years programme together and they know Hamburg as expat residents. Participants formed seven mixed groups of four students and chose a quarter in Hamburg and two out of the focus scopes (SU, Water, Traffic, Energy, Materials). Those scopes are covered by parallel lectures which gave input on the topics and the lecturers were available for expert consulting. In conclusion, the diversity of REAP is not only normative, it rather challenges the participants in various ways during the team projects.

4. Scopes and Methodology

The project was divided into two parts: analysis and proposal. During the first part, the groups used a multi-criteria analysis (Fig. 1) and various indicators to analyse 1000m x 1000m of a neighbourhood. Exemplary for dense urban neighbourhoods, the floor area ratio (FAR) was used to show the relation between gross floor area and site area [8]. In order to decide upon densification measures, FAR shows potential especially in sub-urban quarters of Hamburg (Fig. 2). Another measure related to urban water cycles is infiltration potential in order to evaluate the possibilities of decentralised stormwater management (Fig. 3).



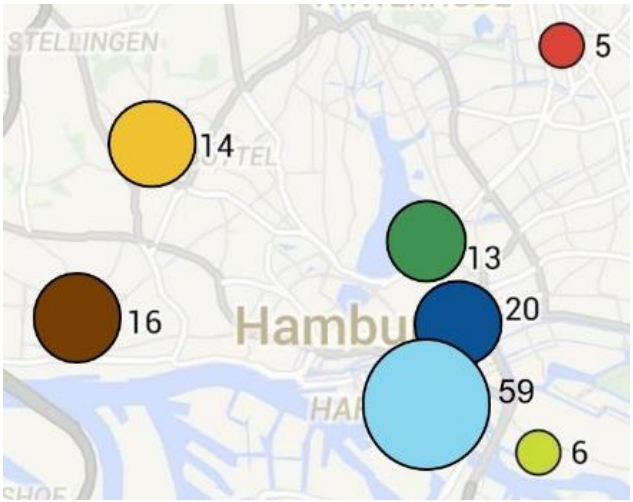


Fig. 2 Floor Area Ratio. Source: Own Compilation based on HCU REAP P2; Google Maps.
Fig. 3 Infiltration Potential [%]. Source: Own Compilation based on HCU REAP P2; Google Maps.

In order to complement water-, energy- and material-cycles as technical scopes with the socio-economic side of urban planning, SU was chosen as a cross-cutting scope by several groups. For them, this widely meant to put physical interventions in a socio-economic context. Gentrification plays a role in some of the quarters, as the rent index (Fig. 4) shows. In order to consider that, the students' proposed financial solutions for implementations, which can contribute to justice in income distribution and participation.

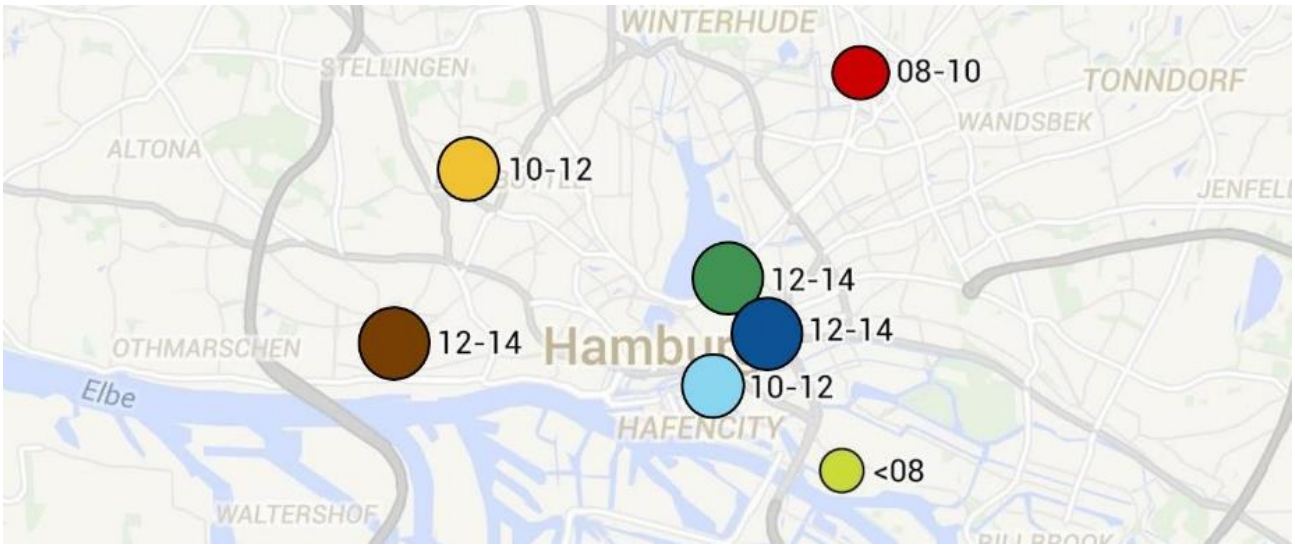


Fig. 4 Rent index in € per m². Source: http://www.hamburgportal.de/immobilien/Mietwohnungen/mietenspiegel.html

Participation also became an issue when polycentric cities were discussed. The definition of a sub-centre depends a lot on the inhabitants perception, "the ideal did not always correspond to development reality, with many self-declared 'neighbourhoods' either too small to support any land use variety or too large to be considered walkable" [1]. Some of the indicators could hardly be compared because of that. The categorisation of public and private space, for example, turned out to be very different. However, this discussion was essential due to the "legitimate role of the public sector to promote high quality design through planning, site assembly, procurement and investment" [4]. The share of open space ownership was analysed through site surveys in combination with satellite imagery, whereas the public space ratio ranges from 17% to 77% of the total open space area. Related to this interest in open space design, several proposals came up to improve the situation, which show the relevance of it, with regards to other scopes (e-car charging stations for energy, bike lanes for traffic, greenery for water, eg.).

Following the sustainability analysis, the chosen scopes lead to topics for detailed physical interventions:

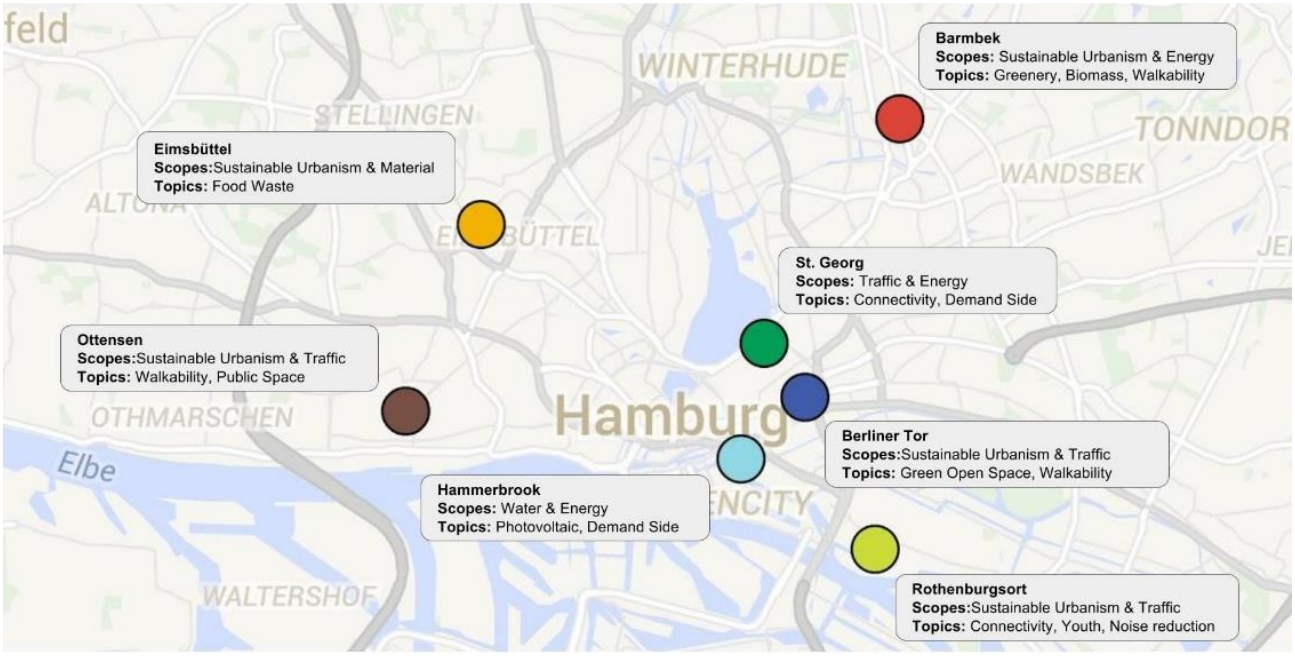


Fig. 5 Focus of groups and chosen scopes. Source: Own Compilation based on HCU REAP P2; Google Maps

Few groups combined two infrastructural sopes, like Traffic and Energy. This was caused by the specific interrelated situation of their quarter. Demand side orientation and connectivity (walkability) were topics which was dealt with in several different proposals. The highlights are subject of the following section.

5. Cases in Hamburg: Topics and remarkable outcome.

5.1 Energetical Analysis of Hammerbrook

Being predominantly industrial and commercial (2% residential land use ratio), the area shows potential for densification (only 758 inhabitants per km²) and better mix of use. Due to the low district coverage ratio, it is suitable for renewable energy production towards a self sufficient quarter (70% of district area is excellent suitable for solar power). The subsequent aim was to propose a demand side managed energy profile for the quarter involving private and public stakeholders.

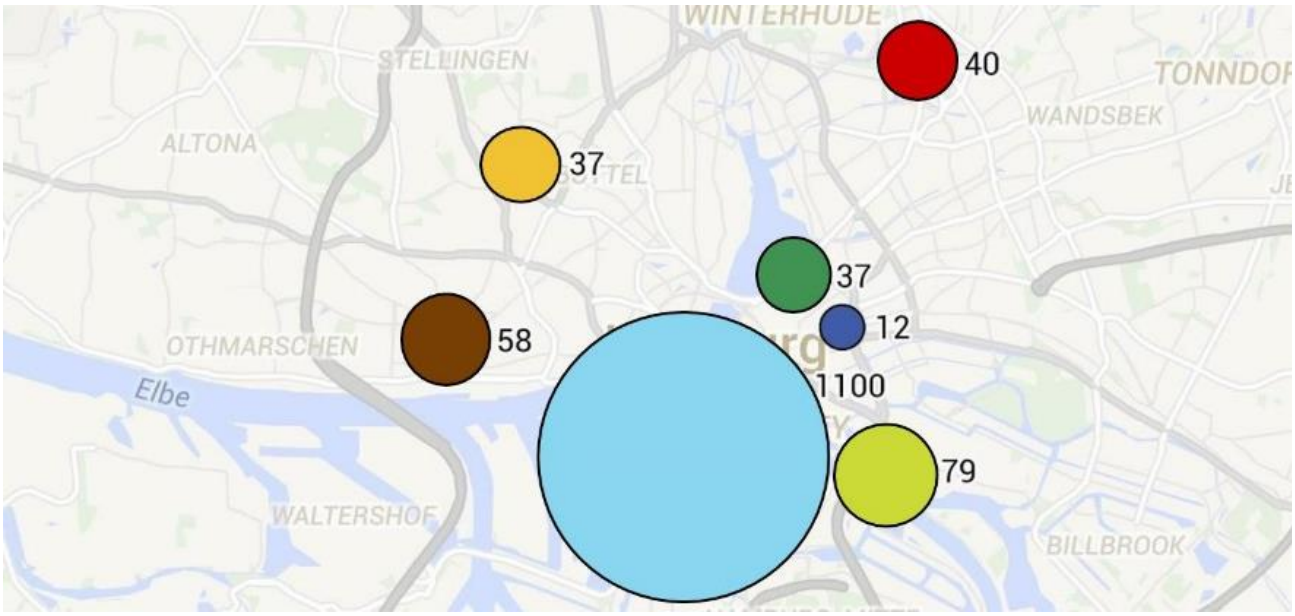


Fig. 6 PV Potential [% of power demand of district inhabitants which could be covered potentially by PV Modules]. Source: Own Compilation based on HCU REAP P2; Google Maps.

The photovoltaic (PV) potential analysis shows better results compared to other locations (Fig. 6), promising the possibility of a self-sufficient quarter in terms of energy. The following design proposal (Fig. 7 & 8) for utilising this potential uses modern PV technology in order to reach almost 20 GWh annually.

Fig. 7 & Fig. 8 Project result: Urban PV Design. Source: REAP P2 (Carstens, Kumar, Abdellatif, Shambulova)

5.2 Food Waste Concept for Eimsbüttel

In order to combine SU with urban material cycles, one team developed a concept for food efficiency. Community based organisations, which collect food waste and process it for low income residents aims to reduce food waste and its related CO2 emissions on the one hand and redistribution of resources on the other. The heart of these activities is a museum to raise awareness about food waste and its consequences.

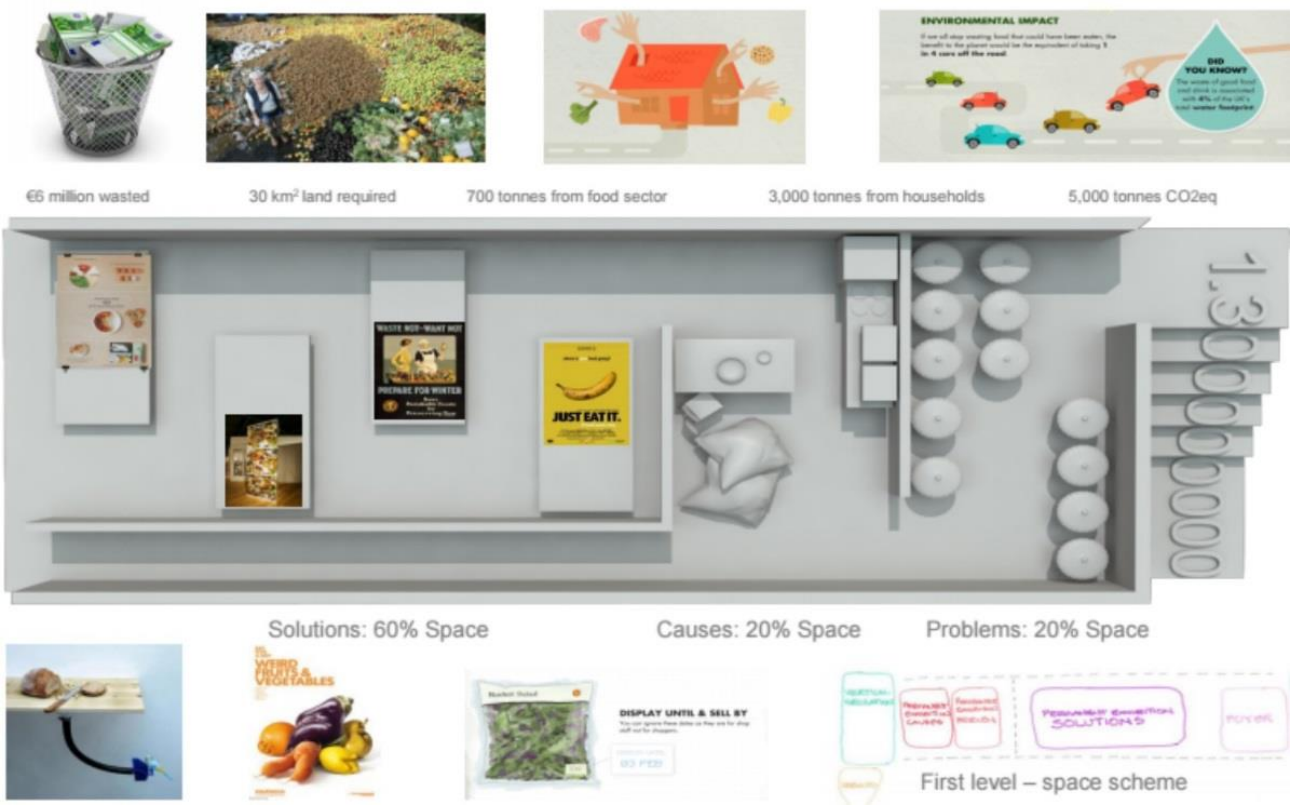


Fig. 9 Project result: Museum for participatory planning Source: REAP P2 (Arazola, Titho, Niessen, Troutman)

The proposal involved participatory planning methodology in order to “involve a dialogue with the customer, whether the existing people within an area or those likely to move in. It is a process that needs to generate and draw upon consumer interest” [4]. Additionally the group developed a concept for the exhibition to form understanding and raise awareness on food waste (Fig. 9). The proposal consists of better use of food waste which is eatable and separated waste management opportunities of biomass coming from food.

5.3 Connectivity as a cross-cutting issue

Polycentric cities are interconnected spaces, within the neighbourhoods, between them and through their regional linkages. Transporting people, providing fair access or influencing the local sense of place, “whatever their function, connections need to be thought of as an integral part of the urban fabric” [4]. Although there is relatively advanced public transportation and safe, fluid roads in Hamburg, many groups identified the need to improve connectivity. Fig. 10 and Fig. 11 give an overview of the two main indicators used to measure and compare connectivity in P2, the average distance between intersections and the cyclomatic number.

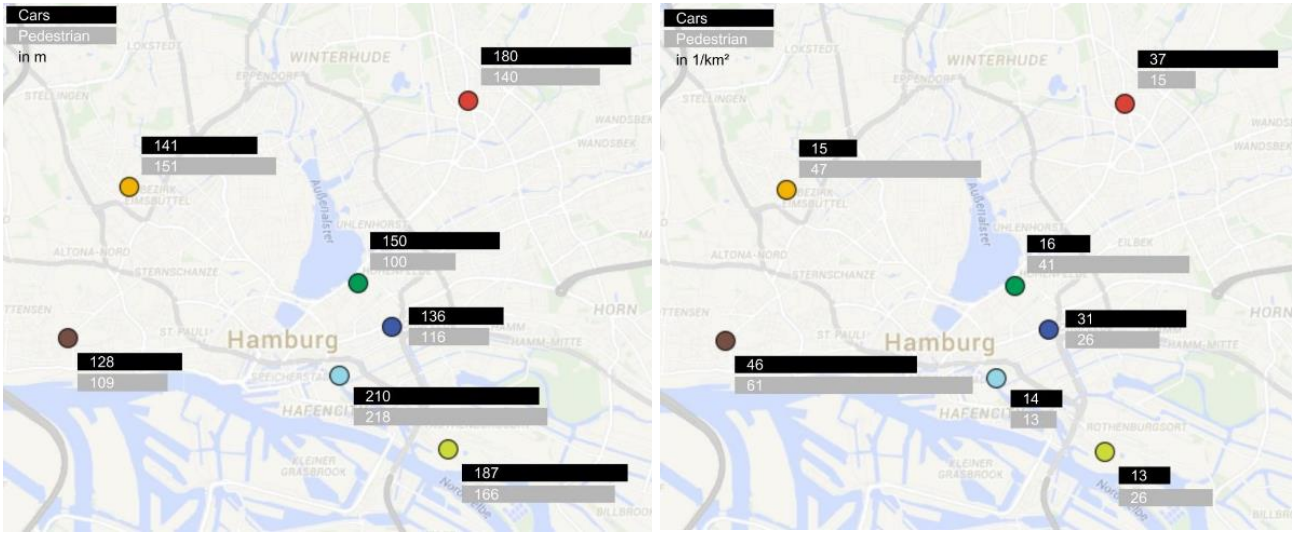


Fig. 10 Distance between Intersections in Hamburg. Source: Own Compilation based on HCU REAP P2; Google Maps.
Fig. 11 Cyclomatic Number in Hamburg. Source: Own Compilation based on HCU REAP P2; Google Maps.

Shortcomings were mainly related to bike lanes and pedestrians, which were being prioritised towards the goal of human scale urbanism and green transportation, while considering the influence of interventions on car traffic. Keeping in mind the socio-economic component, groups aimed to lower income gap by the impact of their physical interventions. An example is the revitalisation of pedestrian networks in Ottensen:

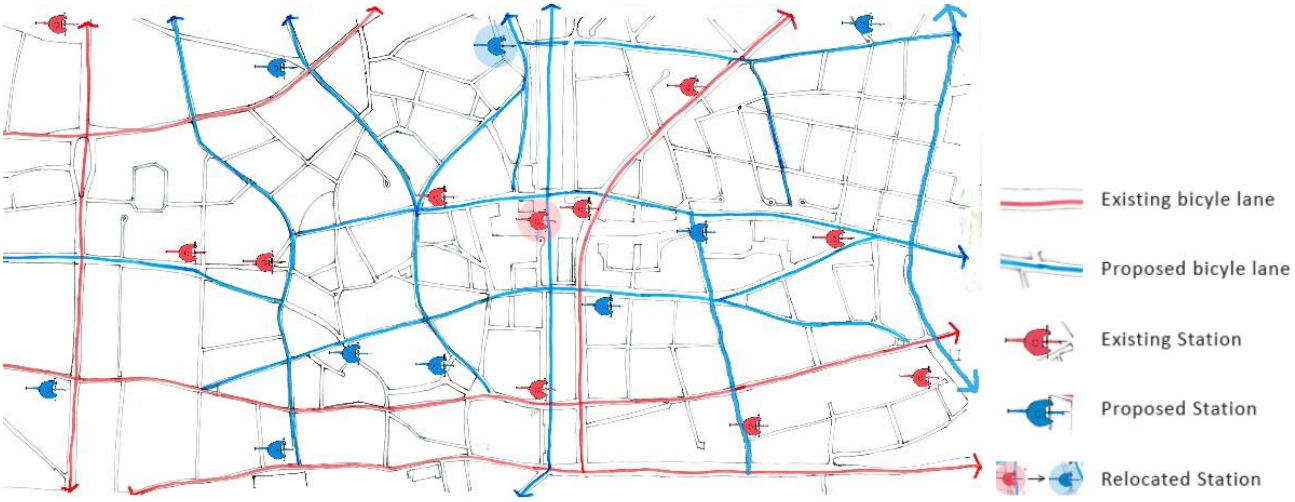


Fig. 12 Project result: Revitalizing bike networks in Ottensen Source: REAP P2 (Callaú, Biber, Netzband, Stancu)

6. Conclusion and Applicability

After a description of SU as base of planning and making clear the conditions of a master's class working on sustainable neighbourhoods, we have shown the major outcome. In order to conclude on these findings, we subsequently highlight practical tendencies on the one side and argue for intensive training of SU principles in order to apply them usefully on the other.

The energy assessment of the first example in Hammerbrook resulted in a demand side management of electrical power and decentralised, local supply through PV. Food Security as a global issue became the focus topic of the second example, which dealt with different solutions to improve efficiency in food consumption and waste management. The third example was lack of connectivity, which was identified in many neighbourhoods. All of the shown examples report of demand side related topics and show that "challenges are now on the consumer side, in the need to recognize the behavioural dimension" [2]. This echoes the need for more participatory planning and tells us the importance of bottom-up strategies as result of the projects by REAP.

Another more abstract conclusion of the projects is the question of how to disseminate and apply ideas of SU. Many interventions show that "the understanding that simply adopting new technology will not be enough; it needs to be fully integrated into the social context in order to deal with the range of complex societal factors" [2]. We acknowledge critics against SU saying that it often works with over-simplified solutions [9], but we see potential in masters programmes like REAP, because it is more broadly discussed than the common best practices culture. Participants not only learn concepts and principles, they are part of an academic process in order to reflect the challenges and opportunities of SU. In contrast to only transfer "discursive truths" [9] Alumni of REAP are able to plan in a highly situational way in their graduate destinations.

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