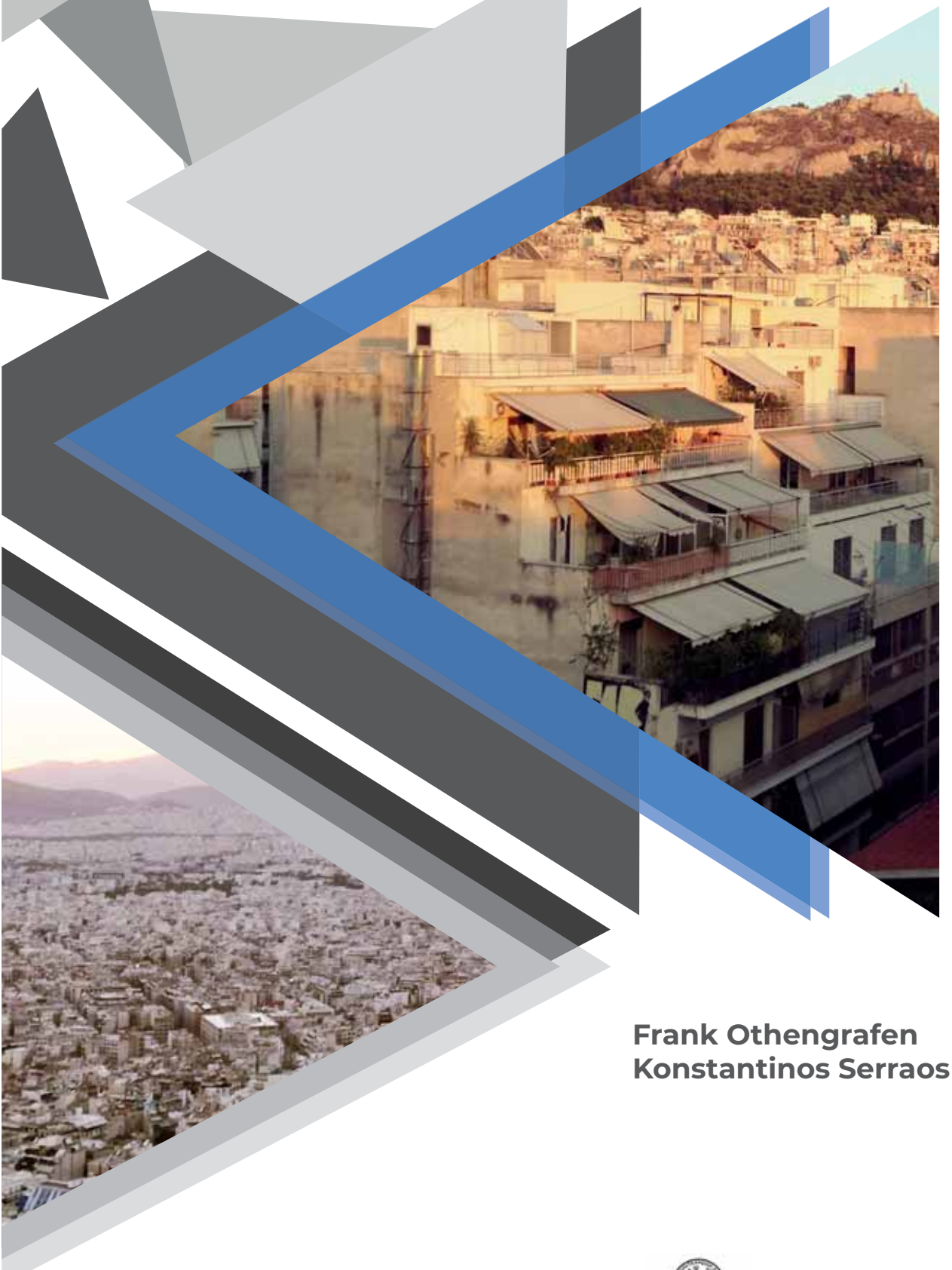
Urban Resilience, Climate Change and Adaptation.

Coping with Heat Islands in the Dense Urban Area of Athens, Greece



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Preface

https://doi.org/10.15488/5558

The development of resilient cities is the key factor for sustainable development. Resilient cities are cities that are prepared to absorb and recover from any shock or stress (natural hazards, human-made shocks such as the financial crisis, etc.) while maintaining its essential functions, structures, and identity as well as adapting and thriving in the face of continual change. 'Building resilience requires identifying and assessing hazard risks, reducing vulnerability and exposure, and lastly, increasing resistance, adaptive capacity, and emergency preparedness' (ICLEI 2017). To contribute to building resilient cities, we are very happy that the German Academic Exchange Service (Deutscher Akademischer Austauschdienst) and the German Federal Foreign Office (Auswärtiges Amt) grant our joint research project or exchange „Resilience as Challenge for European Cities (HeKris): Developing urban planning strategies and concrete projects" from 2017 to 2019. The project is based on a partnership between the National Technical University of Athens – NTUA (Faculty of Architecture) and the Leibniz Universität Hannover – LUH (Faculty of Architecture and Landscape). The main objective of HeKriS is to train Greek and German students as well as young researchers to develop integrative strategies and creative approaches for resilient cities, including new and robust governance arrangements between public, private and civil stakeholders (governance structures). This book is the result of the Athens Summer School 2017 on resilient European cities that took place from 22nd to 26th May 2017. The summer school focused on 'Urban Resilience, Climate Change and Adaptation' and asked the participating interdisciplinary student groups to develop strategies and approaches to cope with heat islands in densely populated area in Athens. This volume thus presents (1) contributions from scientists that were involved in the summer school, explaining the phenomena of climate change and considering various concepts and approaches enhancing resilience; and (2) the ideas, concepts and strategies that the students developed to adapt to climate change in urban areas. With this book we hope to contribute to the discussion on building more resilient and more sustainable cities – a discussion we will continue with the following summer schools and exchanges.

Frank Othengrafen and Konstantinos Serraos
Hannover and Athens
December 2017

Part 1

Introduction

Resilience, Climate Change and Adaptation – the resilient city as new paradigm in urban planning?

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Challenges of resilience in European cities

In Germany and other European countries, the sustainable development of cities and regions is steadily discussed in relation to the concept of resilience (Birkmann et al. 2013), especially with regard to the ongoing global climate change. Impacts on human and natural systems resulting from the worldwide climate change are less and less neglectable (IPCC 2014, 2-4). To reduce the vulnerability of biological systems, to protect communities and to strengthen the resilience of the economy, adaptation strategies were developed and set in place on several spatial levels (e.g. from a European perspective to regional approaches to urban adaptation strategies). The focus of adaptation strategies is on more planned and proactive means of adaptation, dealing with a reduction of vulnerability of ecological-social-economic systems to the impact of climate change (Smit et al. 1999, 200-202). Of course, this adaptive perspective on cities and regions is also crucial for other policy fields, as the germinal question for cities is to what extent and by which strategies they can increase their resistance successfully – with regard to the ecological capacities of cities, to the backdrop of the financial scarcity of public budgets, to high refugee numbers searching for shelter in cities and so on.

The development of „crisis-proof cities“ is thus a key factor for an overall sustainable development (Jakubowski 2013). In the events of crises such as financial crises as well as refugee influx or hazards like floods or climate related heat waves and droughts, cities should be able to fulfil their societal and economic duties in the long term. In this context and according to the ecological buffering capacity, resilience is understood as the ability of a system to maintain central functions (robustness) even under the influence of external shocks and disturbances (Holling 1973, 1996). On the other hand, resilience includes the ability to restore the system after the effects of disturbances and shocks, and the further development of lear-

ning and reorganization processes (Birkmann et al. 2013, p. 18, Lei et al 2014,p. 619; Liao 2013; Dieleman 2013, p.176). Resilience thus encompasses the ability of a system to react to crises and disturbances, a dynamic balance of self-renewal and design possibilities (self-regulation). In a transformation process, existing structures are transformed into resistant and forward-looking forms (see figure 1). This is the basis for a sustainability-oriented development in a city-regional system in which resilience structures are developed and strengthened in planned, self-designed and natural processes (Breuste et al. 2016, p. 180; Vale and Campanella 2005, Walker et al. 2006). A resilient urban system thus combines different characteristics, such as self-sufficiency and exchange, redundancy and diversity, stability and flexibility, compactness and de-centrality, and the ability to learn and adapt (Breuste et al. 2016, p. 2).

This becomes even more important as preventive measures are often related to long-term investments which compete with current problems and limited resources. As consequence, preventive solutions are often not implemented, meaning that chances for the resilient development of cities are missed somehow, including the risk that comparable measures will be significantly more time-intensive or expensive at a later stage (Neue Stiftung Verantwortung 2013, p. 13).

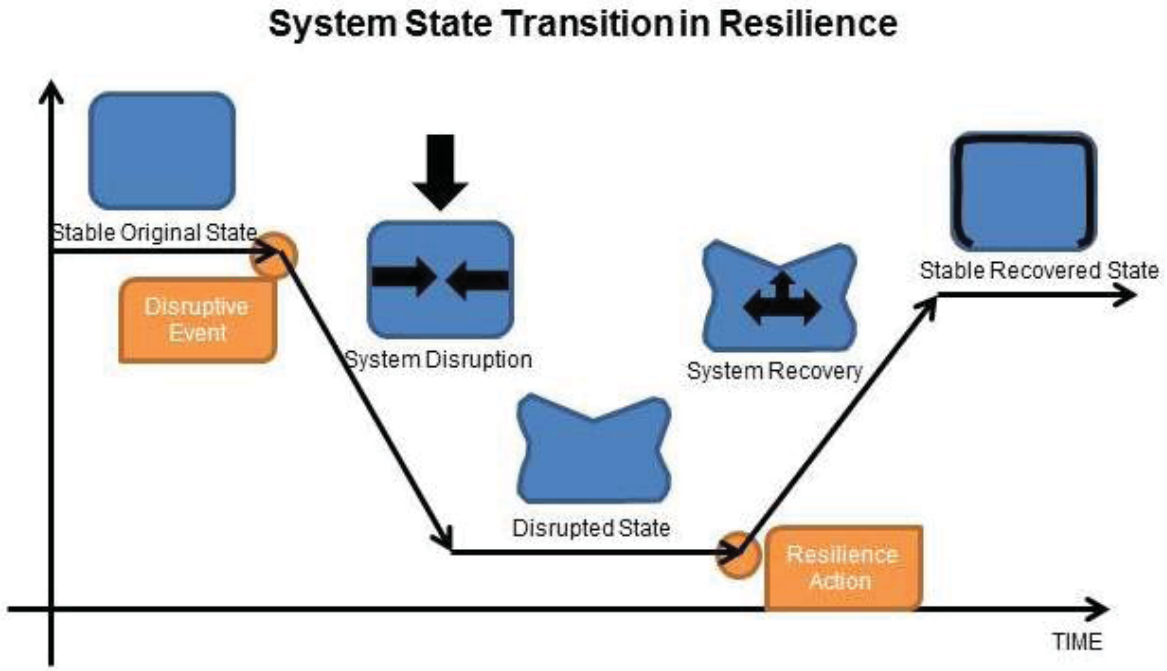

Figure 1: System State in Transition (own figure, adopted and slightly changed from Henry and Ramirez-Marquez 2012, p. 117)

Analytical dimensions of urban resilience

According to Christmann et al. (2016), the debate around resilient cities can, among others, be classified along the following dimensions (see figure 2; see also www.100resilientcities.org):

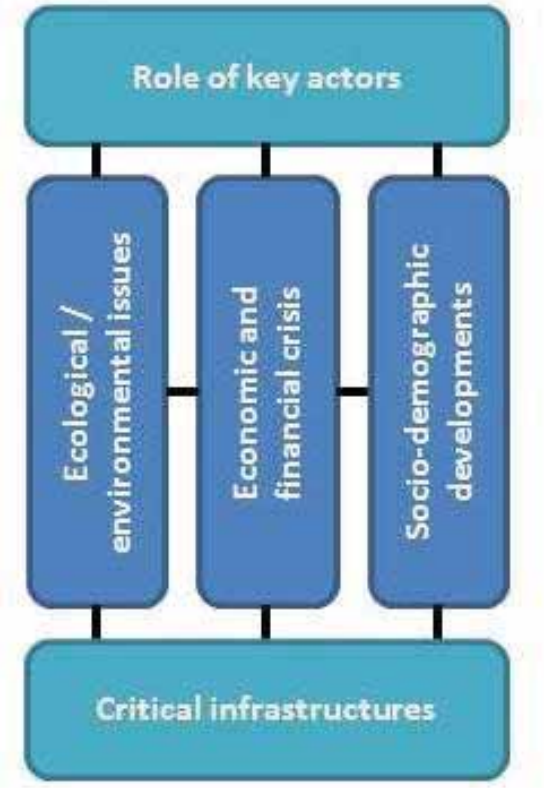

Figure 2: Dimensions of the debate about resilient cities (according to Christmann et al 2016)

Ecological or environmental issues: It is particularly the intensive debate about climate change and disaster management that considers urban development under the lens of (ecological) resilience (e.g. Birkmann et al. 2013; see also www.100resilientcities.org). Birkmann (2008), for example, looks at the vulnerability of society and that of different land uses. Greiving and Fleischhauer (2009, p. 18) see resilience and a 'resilient society' as an overall vision and guiding principle for future urban development in Germany that is related to the necessary adaptation to climate change. Ostrom (2009) constructed the research framework for promoting the sustainable development of social-ecological system through stimulating self-organization. Contamin et al. (2009) pointed out that the management decision and taking warning signal are very important to avoid the regime shift of the urban ecosystem. More recently, resilience also covers the consideration of urban ecological systems as basis for urban development (Breuste et al. 2016).

Economic and financial crises: The economic and financial crisis has hit many European countries and cities (Hadjimichalis 2011; Werner 2013). Many studies (e.g. Knieling and Othengrafen 2016) analyse, in a European context, how cities and urban regions and their citizens deal with the consequences of the recent financial and socio-economic crisis,

including effects for political local regimes, cuts in local public spending and the processes of privatization of local public assets, as well as issues related to the rescaling, recentralization, or decentralization of competencies. Attention is paid to the rise of new 'austerity regimes', the question of their legitimacy, and their spatial manifestations, and in particular to the social consequences of austerity. In the European context, the concept of resilience is furthermore used to analyse to what extent cities and regions can adapt (or not) to structural economic changes (Grabow and Schneider 2013; Plöger and Lang 2013).

Socio-demographic developments: Many European countries face strong trends towards an aging population, population decline, and dependence upon immigration for population growth (Pallagst et al. 2014). The demographic change will particularly have impacts on economic growth, the labor and capital market, housing, fiscal policy, pensions, and health care (e.g. Hamm et al. 2008). In this context, the concepts of decline and resilience are discussed with regard to their explanatory value for understanding urban and regional change in times of crisis (Lang 2016).

Critical Infrastructures: As our cities are highly dependent on technical infrastructures that are supplying the urban society with all kind of services (water, electricity, information- and communication technologies etc.) there are also studies dealing with the role of these critical infrastructures (Christmann et al. 2016). Critical infrastructures are infrastructures that, in case of a damage or breakdown, will cause long-term supply shortages, disturbances of the public safety or other consequences. It is the aim of these studies to identify the vulnerability of critical infrastructures and to develop strategies to become more resilient, based on collaboration of different actors, preparedness and flexibility (Amin 2000,p. 47-50; Boin and McConnell 2007, p. 37; p.108; Christmann et al. 2011, p. 36-40;)

Leadership and the role of key actors in and for resilient cities: To implement certain policies or strategies to enhance the resilience of cities and city-regions, the key actors and their interests have to be considered (www.100resilientcities.org). Anderson (2014) compared the results of civic leadership and expert leadership in urban green space management and puts

forward relevant enlightenment. As the development of resilient cities is subject of urban development policies it can be considered that the actors are the same as in urban development processes, including politicians, planners, economic and civic actors (Christmann et al. 2016; Selle 2013). In this context, it is discussed how cities or regions can become more resilient through fostering collaboration between the various actor groups and establishing local networks to increase the 'governance of preparedness' (Medd and Marvin 2005; see also 222.100resilientcities.org). Therefore, the cooperation between public and civic actors is crucial (Fellmer 2014). Reddy (2000) pointed out factors such as community leadership, stakeholder involvement, and local strategies and policies are important factors in the long post-disaster recovery process. Olwig (2012) discusses the construction of cooperation mechanism between local government and international organizations in the process of disaster reduction and relief; additionally, the 'governance of preparedness' and the ability to take actions with regard to resilient cities is also dependent on the willingness and problem solving capacities of politicians (e.g. Othengrafen 2014).

All different fields have in common that they use resilience to describe the relationship between the system under observation and externally induced disruption, stress, disturbance, or crisis. It is, however, more than a response to particular challenges – resilience is understood as a kind of systemic property (Lang 2011, p. 16) including, inter alia, risk and vulnerability assessment of a system as well as assessing and enhancing the adaptive capacity of the system. Assessing the vulnerability of cities, for example, can encompass issues such as climate change (vulnerability to sea rise level, urban heat islands etc.), environmental capacity (e.g. pollution, land use, consumption of natural resources), infrastructure (energy and water infrastructure, access to basic utilities, etc.) or access to housing, education, and health care (Ilmola 2017, 218-221). Enhancing the adaptive capacity of cities can consist of governance arrangements (e.g. community participation to decision-making, leadership to look at long term issues), institutions (the capacity of delivering public services by public bodies and community groups, etc.) and local planning systems (disaster planning and rehearsals, proactive thinking and acting, planning strategies, etc.).

However, an integrated spatial approach towards urban resilience or resilient cities is still lacking (Birkmann 2008; Christmann et al. 2011 and 2016) so that the research project "HeKriS – Challenges of resilience in European cities" (resilient-cities.eu), with its focus on theoretical considerations and reflections of urban resilience, can contribute to the development of theoretical (spatial) approaches and innovative solutions concerning resilient cities. The aim of this research project as well as this publication is to identify practical experiences and strategies with regard to urban crises or challenges in German and Greek cities and to develop resilient strategies and measures for implementation and to check them for their applicability to other contexts (policy transfer).

The resilient city – contributions to a broader understanding of this concept/ challenge

All five contributions aim to give the quite abstract term of resilience a more specific understanding in the specific contexts. The overall topic which can be found in all contributions is the ability to resist negative impacts of a changing environment.

The first contribution **„Lessons from local resilience planning in European cities – The case of the Smart Mature Resilience project"** from *Vasileios Latinos* introduces the Horizon2020 project 'Smart Mature Resilience' which is developing standardized approaches and tools to support the development of climate adaptation and resilience strategies. The chapter presents the most important lessons learnt from the pilot implementation process in the three cities.

"Presuming a nature in the context of resilience" focusses on the conceptualization of nature and the delimitation of our relationship with it. *Antonis Chazapis* and *Dimitris Loukos* bring the working hypothesis that recent transformations and the reorganization of institutional and social structures and political associations on a global scale, adopt and respond to the possibility of destruction as a result of unpredictable „natural" or „moral" evil into focus and deal with the climate change as a central subject of a contemporary discourse that concerns our stasis towards the environment.

Kalliopi Sapountzaki describes social risk (re)activation processes and vulnerability trajectories in the Greek cities in the economic crisis era and how they are influenced by institutional, collective and individualized resilience in **"Understanding good and bad resilience: the case of Greek cities in the economic crisis era"**. Furthermore she offers a planning perspective for what she termed as "Good Urban Resilience".

The fourth contribution **„Aspects of resilience in the reconstruction of Kalamata (Greece) after the earthquake disaster of 1986"** from *Miranda Dandoulaki* discusses the case the reconstruction of Kalamata city, Greece, after the 1986 earthquake disaster, focusing on urban resilience during the phases of response, recovery and reconstruction. A set of factors such as political and economic strategies or comprehensive urban plans are identified and features of resilience are detected.

In **„Tackling Climate Change and Urban Resilience in the City of Athens"** *Anthi Christou* and *Eleni Myrivili* present the Athens' resilience framework and explain the partnerships and collaborations with international city networks, such as 100 Resilient Cities and C40 Cities Climate Leadership Group. The Athens Resilience Strategy for 2030 and implementation of it are described.

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1. Lessons from local resilience planning in European cities: The case of the Smart Mature Resilience project

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Abstract

Urban resilience development at local level requires skills and methodologies that are often not at hand in city administrations. In order to enhance cities' capacity to resist, absorb and recover from the effects of climate change, the Horizon2020 project 'Smart Mature Resilience' (SMR) is developing standardized approaches and tools to support the development of climate adaptation and resilience strategies. The project has engaged 3 partner cities (Kristiansand, Norway; Glasgow, United Kingdom and Donostia-San Sebastian, Spain) in an iterative, pilot implementation process that presented the tools and trained stakeholders in using them, by discussing how these contribute to the overall resilience building process and how they feed into an integrated management system for resilience planning that can be transferred to the local context of other cities, regions and countries. Developing a co-creation approach has enabled to gather detailed information and understanding on what cities are expecting from this integrated management system for resilience, the so-called European Resilience Management Guideline. All the information gathered has helped cities to highlight existing challenges and associated problems regarding resilience at local level. The following chapter aims initially to present the project and the resilience-building tools it develops and to summarize and comment upon the most important lessons learnt from the pilot implementation process in the three cities.

The project in a nutshell - The European resilience management guidline

European cities face an increasing frequency and intensity of hazards and disasters, which are exacerbated by either climate change hazards and challenges or social dynamics implications, such as demographic change and an ageing population. As Europe's cities continue to grow, there is an urgent need for far-reaching and holistic approaches to enhance cities' resilience towards potentially critical effects of hazards.

Smart Mature Resilience (SMR) is a multi-disciplinary research project working for more resilient cities in Europe. Researchers and cities come together to enhance cities' capacity to resist, absorb and recover from the hazardous effects of climate change, by developing, implementing and validating a European Resilience Management Guideline, which includes a holistic approach on city resilience development, supports strategic planning and management and defines the ideal path a city needs to follow to further advance local resilience, by promoting across-sector and beyond silos collaboration between stakeholders. The project has developed a definition of city resilience, which is "the ability of a city or region to resist, absorb, adapt to and recover from acute shocks and chronic stresses to keep critical services functioning, and to monitor and learn from on-going processes through city and cross-regional collaboration, to increase adaptive abilities and strengthen preparedness by anticipating and appropriately responding to future challenges" (Bång, Rankin 2016).

Researchers and cities co-developed, updated and tested five tools that were then introduced into an integrated management system for resilience planning that can be transferred to the local context of other cities, regions and countries. Considering a co-creation approach in the methodology has enabled to gather and understand what cities are expecting from this integrated management system for resilience, the so-called Resilience Management Guideline. The European Resilience Management Guideline was co-created and co-developed by all project partners, while it was projected, tested and validated in the three partner cities. In this process, four additional cities were acting as peer-reviewers and provided collective feedback and input for the finalization of the tools and the Guideline. These cities were: Rome, Italy; Vejle, Denmark, Riga,

Latvia and Bristol, United Kingdom, while in each city, different organizations joined as partners, from the city's Energy Agency in Riga to the Center for Community Integration in Vejle.

Local planning for resilience needs to take into account commonly accepted concepts for climate change adaptation and sustainability, critical infrastructures development and social dynamics. However, a city is not just about managing sustainability or adaptation issues; the very objective of local politics is to strive for satisfying human needs and improving the citizens' quality of life. When dealing with local planning for resilience, the management of tasks and activities individually or sectorally is most often time-consuming, fragmented, and inefficient, while it may lead to increased workload and weak results. On the contrary, the re-organization and integration of existing practices and activities, plans and strategies under one steering wheel, commonly accepted by everyone working in the city –practitioners in municipal departments, decision-makers and politicians - may be able to systemize the work, boost the efficiency of resilience-related activities at city level and provide a multitude of positive outcomes for municipal practitioners and citizens (Latinos et al. 2017).

The European Resilience Management Guideline is better described as a journey with one step following the other, where cities and regions have different starting points. Local planning for resilience needs to take into account commonly accepted concepts for climate change adaptation and sustainability. The European Resilience Management Guideline directs all available resources towards well-defined goals and secures transparency and the democratic principles of decision-making. The Guideline introduces an integrated approach on resilience planning and will then move on with a training that will allow participants to implement hands-on the tools for a real-life scenario (Latinos et al. 2018).

Tools that enhance operational resilience

The five tools developed within the SMR project are: 1) a Resilience Maturity Model, 2) a Risk Systemicity Questionnaire, 3) a Resilience Information and Communication Portal, 4) a City Resilience Dynamics Model and 5) a Resilience Building Policies tool.

This sub-chapter aims to provide with a short overview of the tools and introduce their main functionalities and contribution to the resilience building process.

1.The Resilience Maturity Model (RMM) helps to identify the ideal path for the evolution of the resilience building process from an initial stage to a more advanced stage, going through a number of intermediate stages. The RMM enables, on a strategic level, the development of an assessment of a city's current resilience status identifying areas of improvement. Based on this initial assessment, a city will use the RMM to guide the definition of the strategy to increase their resilience level, based on the policies included in it. The main goal of the RMM is to provide an optimum path to increase the resilience level of cities. The RMM also aids reflection since it provides a holistic overview of the resilience building process and helps end-users to understand resilience as a multidimensional objective. While using the RMM, cities assess their current resilience status (Hernantes et al. 2017).

2.The Risk Systemicity Questionnaire (RSQ) has been developed to address the risk assessment aspect of increasing the resilience level of cities. The RSQ has been designed as an interactive set of questions, which city stakeholders typically complete in a group. The main purpose of the tool is to encourage focused, interdisciplinary conversations about those risks that are of greatest concern to the city. It focuses on ten risk areas that became significant as the data was analysed, where each risk area contains 10-12 significant risk scenarios. The RSQ considers risk scenarios as causal and vicious cycles. For each risk scenario users are asked to provide an answer with respect to the likelihood of occurrence of that scenario in their own city. Upon completion of the RSQ, the user is presented with a prioritization which may then be used as a focus for developing mitigation strategies (Howick et al. 2017).

3.The Resilience Information and Communication Portal (RP) serves as a toolbox that can complement and enhance the platforms and software that cities already have in place. It allows cities to display data internally or publicly that is already available to the city as it applies to resilience, vulnerability and crisis situations. The portal allows for different levels of

users, like city managers, critical infrastructure providers, citizens or other stakeholders to be able to contribute information as applies to a given city context. The portal offers added value not available otherwise to cities (as they self-reported), as the cities have multiple (and in Glasgow's case, dozens) of platforms in place in their municipalities for internal communication, but the wealth of information available to them is not integrated, streamlined or fully utilized (Sakurai et al. 2017).

4.The City Resilience Dynamics Tool (CRD) aims at helping city disaster managers to diagnose explore and learn about the resilience building process. They can use the tool to make decisions and be able to take the correct actions in the resilience building process. The simulation model encapsulates the most important aspects of the RMM and helps to encompass the RMM in a training environment for the cities to learn about the path towards improving resilience. The model allows the user to try different policy options, identifying the implications of each of them in the resilience improvement process (Labaka et al. 2017).

5.The Resilience Building Policies (RBP) tool is an extension of the online version of the RMM. It combines custom ways to view policies contained in the RMM with detailed information and examples from case studies detailing policy implementation in partner cities, references of sources to case studies from other cities around the world, and links to risk mitigation actions that support the policies (and are included in the RSQ). The tool provides a comprehensive reference centre for high-level strategic managers in cities as well as municipal workers tasked with implementing the policies that have been planned; comprises illustrative real case studies of policy implementation in cities; includes references to other sources that provide details of case studies of policy implementation in cities; provides a practical point of reference for cities considering the implementation of related policies; provides illustrative detail for the policies in the RMM and the CRD and can be navigated conveniently via a dedicated webpage that also includes a wiki format and invites cities to upload their own case studies and be part of a resilience culture at European level (Howick et al. 2017).

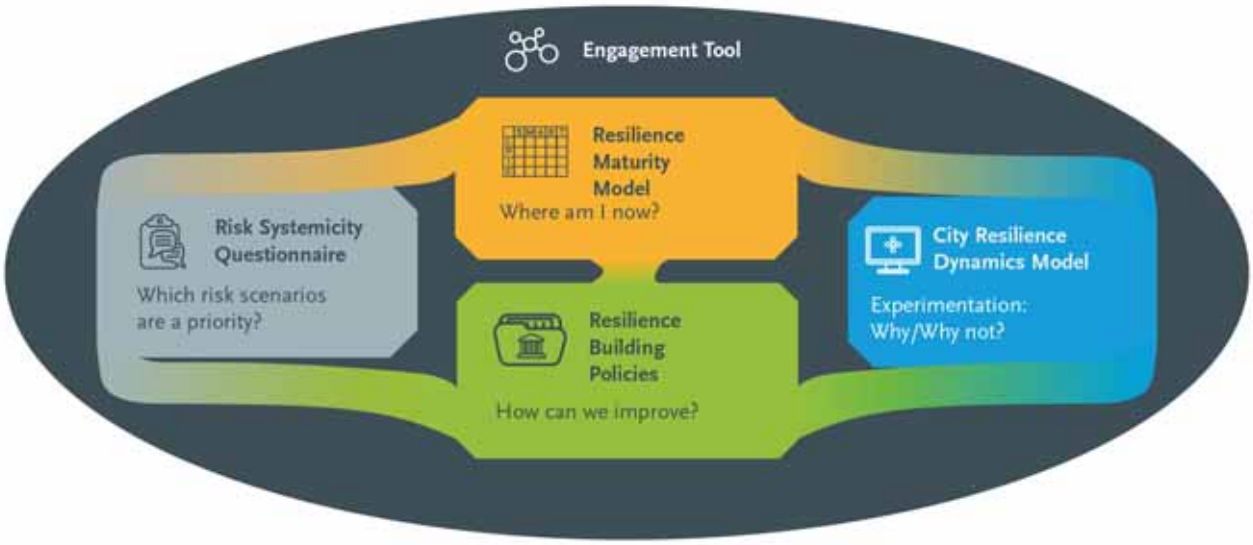

Figure 1: The SMR resilience building tools (Source: SMR PROJECT 2017)

The pilot implementation process

Cities learning from cities characterize innovation and knowledge exchange in the urban millennium. Building cross-cultural awareness and recognizing differences in local circumstances are standard practices for international practitioners; however, training lacks where different cultures encounter new information, technology and tools, and in how best to build appropriate networks of technology transfer for adaptation and resilience planning. From the beginning of 2016 to the end of 2017, the cities engaged in a facilitated, iterative pilot implementation process that aimed to test, validate and peer-review the resilience building tools that were developed by the research partners. The main elements of the iterative implementation in each city were: 1) an initiating 'kick-off workshop' in each that aimed to gather the most relevant stakeholders in the implementing cities for the selected security sector; 2) a series of webinars, together with the peer-reviewing cities that had the opportunity to ask questions and provide their insights and feedback on the ongoing tool development (external stakeholders were always invited to attend the webinars); 4) bilateral meetings with identified stakeholders, organized by the city partners to further explore synergies and collaboration potential between institutions, municipal departments and utilities and project consortium; 5) a review workshop during which the implementing cities provided feedback on the implementation process to the tool developers, while the peer-reviewing cities shared their additional feedback and summarized their recommendations for the finalization of the tool through a combination of facilitated discussion, based

on guiding questions, and conduct of interactive exercises in breakout groups; and 6) stakeholder focus groups in each implementing city, once the tools were already functional in beta version; these stakeholder focus groups mainly aimed to present the tool to the most relevant stakeholders and provide with an up-to-date and ready-to-use application that could support the city's resilience building efforts (Sakurai et al. 2017).

In preparation of each training, workshop or meeting, value was added by including considerations of environmental, economic, societal and individual interests within existing resilience networks upon planning and organization of the training session. The facilitators co-created, together with the city partners, case studies that were relevant and applicable at local city context to serve as a basis for the application of tools during the training (Latinos V., Grimes C. 2016).

The implementation activities took place with the support of the local research partners in the implementing cities, while a city consultancy network was acting as external coach and coordinator, facilitating knowledge and information exchange between partners and city officials and representatives. During this period, partners and city stakeholders had the chance to explore and validate the tool in the security sectors that were already identified and to provide input to the tool developers for the finalization of it; input that was used to constantly update the portal's functionalities and improve the tools' qualities. In preparation of each workshop, value was added by including considerations of environmental, economic, societal and individual interests within existing resilience networks upon planning and organization of the training session. The facilitators co-created, together with the city partners, case studies that were relevant and applicable at local city context to serve as a basis for the application of tools during the training (Latinos V., Grimes C. 2016).

Lessons learnt from the stakeholder focus groups

During the stakeholder focus groups that took place in the project partner cities (15 workshops in 3 cities for a period of 14 months) and with thematic focus on local planning for resilience, risk awareness, and baseline review and vulnerability assessment, practitioners improved recognition of key determinants

for local resilience planning and identify appropriate networks for innovation and knowledge exchange. Emphasis was placed on integrated network-building approaches that considered (1) cultural geographical and climatic appropriateness, (2) market and infrastructure feasibility of implementation in the recipient cities and regions (3) individual determinants like acceptance, perceived quality of life and demands. Mini-lectures introduced the resilience tools, and will aim to hint already on potential challenges and difficulties in transferring to other contexts.

Participants were able to apply the knowledge gained in scenarios explained by the instructors to plan out a mini strategy for resilience that could potentially transfer to real city processes. In most time they were encouraged to discuss this strategy with their departments and superiors and were introduced into train-the-trainer modules to be able to further discuss and introduce the tools to their colleagues. In Glasgow, stakeholders were engaged in a scenario planning exercise around a severe flooding incident, in Kristiansand some cases focused on challenges revolving from social dynamics, like social alienation, youth loneliness and ageing population, while in San Sebastian the scenarios focused around pluvial and fluvial flooding and cascading effects like energy outages and landslides. Semi-structured discussions followed the exercises centred on each tool, by improving strategies for future resilience building (Latinos et al. 2017).

One of the most important element for the success of the stakeholders focus groups was the identification of what city stakeholders require to increase the city resilience level and the barriers that still need to be overcome has been helpful to define the specific requirements that each of the five tools included in the European Resilience Management Guideline should fulfil. Additionally, invited citizens were also involved in the workshops in order to better engage with the civil society and to make sure that the tools will be as much as possible tailor made to the implementing cities' needs. Not many citizens responded to this call, something that reinforced the adopted approach that the tools are mainly targeting crisis and infrastructure managers as well as municipal staff and stakeholders engaged in strategic planning and management; in some cases though, there were a couple of citizens that joined the trainings and provided feedback on the tools.

Also, the process facilitators in collaboration with the city partners identified the existing action and master plans existing in each city on sustainability, climate change and environmental management and tried through the workshops to find how the SMR tools and the integrated ERMG process can complement the existing frameworks and also to identify gaps and potential challenges that have not been considered when developing these action plans.

The collective feedback from all cities showed that informing thoroughly stakeholders and city representatives is important and necessary in order to secure their active participation and involvement. There is need for further focus on stakeholders that are mostly affected by or interested in an issue or challenge. Especially the stakeholder training workshops were used as a direct knowledge transfer platform that enabled the project partners to take stock of the co-creation activities. During the pilot implementation and especially during the stakeholder training workshops, it became evident that most cities are already working on resilience building activities, as resilience is becoming a buzzword and provides new forms of urban governance, planning and strategy development. Although cross-sector collaboration is not the single solution to tackle all challenges that cities are facing, we believe that it can have much impact on the resilience of municipalities and that the alignment of municipal strategies will be very beneficial in this regard.

Despite the success of the pilot implementation, it needs to be mentioned that limitations of scenario building became apparent in the stakeholder focus groups. While the creation of scenarios that are suitable and useful for testing of the tools beta versions is confirmed, scenarios that are realistic depictions of incidents in cities has been said to be extremely hard. Such scenarios are not necessary for inclusion project deliverables, but it must be made clear that they for example would not serve as the basis of simulation models, simulation games, incident planning or other resilience-related city tasks that need very much elaborated details. According to the cities, creation of such scenarios would be a task that would require a higher double-digit number of hours each, and would only be realistic when including a number of stakeholders with very sophisticated roles (Sakurai et al. 2017).

Conclusions and recommendations

The European Resilience Management Guideline defines an operational framework that provides guidance and aims at training and supporting municipalities and relevant stakeholders in enhancing city resilience. But, what are the benefits for cities that have in place and use an integrated management system to monitor their resilience building activities?

The European Resilience Management Guideline and the SMR resilience tools mainly contribute to the SDG11: Make cities and human settlements inclusive, safe, resilient and sustainable and the SDG13: Take urgent action to combat climate change and its impacts. Extreme poverty is often concentrated in urban spaces, where national and city governments struggle to accommodate the rising population in these areas. SDG11 aims at making cities safe and sustainable means ensuring access to safe and affordable housing, and upgrading slum settlements. It also involves investment in public transport, creating green public spaces, and improving urban planning and management in a way that is both participatory and inclusive. SDG13 aims at mitigating climate-related disasters in developing countries and by helping more vulnerable regions, such as land locked countries and island states, adapt to climate change and integrate disaster risk measures into national strategies (UNDP 2017).

The use of an integrated management approach to be applied at city level and to support the resilience building process provides the cities that receive training on how to use it and implement it in their local context with a variety of benefits, that only some of them are listed here: 1) increased awareness on climate change adaptation, resilience and sustainability; 2) improved quality of management at local level and across the various municipal departments; 3) enhanced transparency and advanced monitoring action; 4) increased trust in local governance; 4) increased number of engaged citizens through co-creation activities; 5) contribution to a sustainable and resilient economy and, last but not least, 6) provision of better perspectives for a bottom-up inclusive EU, something that cities nowadays tend to promote and seek, especially in the outset of austerity measures and increasingly limited resources (Latinos et al. 2018). The European Resilience Management Guideline comes in the form of a toolbox, and includes

guidance throughout the various operational steps; therefore it is easy for a city to adapt it in existing mechanisms and established practices and perform the activities included in each step when needed and when the circumstances demand it. By using an integrated management system for resilience development, the effort lost in running parallel management systems and several processes that require different understanding and performance, can be turned into sustainability.

In this paper we have presented insights from a large research project on urban resilience. We have introduced the European Resilience Management Guideline as an integrated management system developed within the project and reported insights from its implementation with partner cities. Based on this, and within the project, we have proposed an extension of a framework to better understand cross-sector collaboration in the context of urban resilience and to bring all available resources and human capital into an approach that European commitment to climate change action continues to be strong and steady (Sakurai et al. 2017). However, integrating social capital into environmental initiatives – a key component of building meaningful resilience and implementing projects and actions that matter for cities – needs still work to do and integrate in existing structures and political processes that facilitate mainstreaming for climate adaptation and resilience.

Acknowledgments

This work was supported by the European Union's Horizon 2020 Research and Innovation program [grant agreement number 653569]

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2. Presuming a nature in the context of resilience

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Abstract

Over the last decades, the debate on climate change has brought back the everlasting discussion on the conceptualization of nature and the delimitation of our relationship with it. The emergence of „destruction“ has been instrumental in transforming moral evil to natural, viz the transition from the mechanistic-instrumental view of nature to a romantic one, where the superiority of “logos” over nature is now reversed. In the context of this conceptual shift, the rhetoric of „security“ was raised, and today is mainly expressed through the mechanisms of „mechanistic resilience“, namely the persistence in an ideal, almost a metaphysical equilibrium state of functioning of all biotic and abiotic systems. However, at the same time and in the context of ecological science, in recent decades, parallel transformations have also occurred in the notion of „resilience“. The latter is no longer defined on the basis of maintaining a balance, but rather adapting to lasting change (part of which is the „destruction“) which is recognized as a structural element of all natural and non- natural processes. If faith in the equilibrium tried to respond to a “revengeful nature” or a nature perceived as danger, then which nature responds to adaptation? Accepting the latter as the new state of optimum functioning means that we must accept a new notion of evil that stems from the theory of resilience but ultimately expands to the „construction“ of a nature.

Recent transformations and the reorganization of institutional and social structures and political associations on a global scale, adopt and respond to the possibility of destruction as a result of unpredictable „natural“ or „moral“ evil. Their impressive syneresis through the lens of the „apocaliptic“ threat and the effort to overcome their distinction not by slipping into the „naturalization“ of the social but highlighting the systemic nature of evil[1] reveals the importance of re-conceptualization of the very notion of nature. Nowadays, climate change is the central subject of a contemporary discourse that concerns our stasis towards the environment. This working hypothesis suggests a relationship of “resilience” to the concept of nature as both a biased and a contradictory one: the way we currently grasp nature shapes the context of the discourse on resilience as stability and equilibrium; At the same time, contemporary shifts in the understanding of resilience as complexity and change, suggest „a nature,“ and thus a society, open to the future, to contingencies, and the infinite possibilities.

Interpretations of nature through externality and sovereignty

The dualism of Logos and nature in western thought legitimized very early the supremacy of the “rational” and the instrumentalization of nature. In this sense, in the whole history of western civilization, with few exceptions, understanding of nature is filtered through the concept of **sovereignty** (Terzakis 2003). The „isomorphic“ relations of sovereignty, beyond dualism, rely on the hierarchy that characterizes the **order** of the cosmos under the Word (Logos). What emphatically comes to the foreground is the raising of human-subject displacing God Logos and claiming dominance over nature. Human as a sovereign claims and „confesses“ its externality to the non-reasonable nature at the cost of fully assuming the responsibility of evil (Bauman and Bordoni 2017, p.10).

Romantic nature is attempting a reversal that makes nature dominant and humans humble and unwieldy. From this romantic nature, that preserves dualism and externality in its core, a line of thought emerges that establishes the naturalization of evil, releases from the burden of responsibility and at the same time, legitimizes the regaining of sovereignty at

[1] For the notion of «systemic» evil and the Enlightened Doomsaying, see Dupuy, J.-P. 2008: A Short Treatise on the Metaphysics of Tsunamis

any cost. The naturalization of evil and the recovery of tooling sovereignty of techno-science form the framework of modernity and one of its fundamental contradictions. The understanding of nature in modern theory seeks to incorporate this contradiction thus avoiding its nullification. According to Horkheimer: „…*without committing the fallacy of equating* ***nature*** *and* ***reason****, mankind must try to reconcile the two*" (Terzakis 2003, p.90).

The distinction between anthropocentric and ecocentric approaches of nature is based on the human-subject externality or non-, which results to a nature of an intrinsic or extrinsic value[2]. The following schematic coding of multiple meanings of nature, nature as perfect machine or clockwork, nature as finite asset and nature as risk (Davoudi 2014), derives from and keeps the anthropocentric approach of nature. These meanings of nature are all characterized by instrumentalism and sovereignty. Although they follow the shifts in the understanding of resilience, they fail to infuse a new, resilience based intake of nature.

Nature as a perfect **machine** implies a nature governed by laws that can be scientifically studied and thus formulated and described. At the same time, holding the knowledge of these laws allow for gaining control over nature, and hence make use of it. The **demystification of nature** and the abandonment of a ruling divine economy are prerequisites for a de-symbolized nature, available for science supported and technology driven exploitation to meet the needs of progress and development. The implications of such an ethos in the human-nature relationship rapidly proved to be not manageable and gradually provoked a shift that questions nature and its „delicate balances". Culminating in the rhetoric of sustainability, what was put forth was the need for human progress to be planned in the long run on the basis of „natural" processes and ecological procedures.

In this context, **nature** is perceived **as finite asset**, and an eventually scarcity of resources for the progress suggests an urgent need to adjust the relationship of developmental mechanisms to nature. The exploitation of nature and its protection in order to secure progress itself generated a range of specialized environmental managerial practices and legislative adjustments on the one hand, and fed a whole field of advanced technological approaches ending up to the commoditization of nature on the other. Nature downgraded to "a set of environmental problems" (Davoudi 2014, p.362) prevails against a

wide spectrum of radical ecological and social movements declaring that the problem lies to progress itself and not to nature.

This promising, consensual rhetoric of sustainability, which largely internalizes and eases the tension of movements and radical ecology, is replaced by the prevalent discourse of the environmental risk. „*The first promise [of modernity] to be withdrawn was that Enlightenment idea of security, provided by the prospect of controlling nature*" (Bauman and Bordoni 2017, p.9). **Nature** reconceived **as risk**, is a concept consistent with modernity's externalities but still a surprisingly setback in relation to the extent of control provided by techno-science and its managerial practices. In fact, this seemingly retreat is a complex mechanism that establishes and legitimizes the contemporary security society. Against nature as an unpredictable threat, complex and intertwined policies of fear and security is reorganized on a global scale. What emphatically occurs is the need to shield against unpredictable dangers and threats by legitimizing political decisions and prioritizations and avoiding time-consuming, consensus-seeking planning.

From securitization of nature to naturalization of evil through resilience

Nature, in the context of risk and security, degenerates to an incomprehensible externality, equally threatening compared to terrorism, nuclear weaponry, refugee flows, pandemics, economic collapse. While all these threats are obviously socially originated, they are related to climate change and nature-as-risk approach (Jabareen 2013) sharing the same prerequisite externality. This externality allows for legitimizing our shielding against these constructed threats instead of de-legitimizing the social practices that reproduce them. At the same time, the equalization of a threatening nature to all other threats naturalizes the social constructions of evil. The issue of resilience and the relevant scientific discourse is a part of the above context with increasing interest over the last decade. Resilience is currently synonymous with „security", a mechanism that is equally constructed by the destruction and the shielding against it.

Although the term „resilience" has now been incorporated through many different scientific fields into the daily vocabulary, the plurality and semantic scope of the definitions are indicative of ambiguity and the need to identify each time the context and the conditions of its use and therefore its meaning.

The term appears initially in the context of ecology science and its first formal definition was given by CRAWFORD HOLLING: "*Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist.*" (HOLLING 1973, p.17). This definition, in the following years, has undergone several modifications and reformulations (table 1)[3], and the term was used beyond the boundaries of ecology.

Holling himself reworded this definition twice to date, once in 1986 (HOLLING 1986, p.76): „Resilience is the ability of a system to maintain its structure and patterns of behaviour in the face of disturbance", and once more in 2002 (GUNDERSON and HOLLING 2002, p.28): „*Resilience is the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variables and processes that control behaviour*". Similar definitions will be formulated by other researchers like WALKER et al. (2006), S.E. VAN DER LEEUW (2000), C. FOLKE et al. (2003).

First author, year	Domain	Definition	First author, year	Domain	Definition
Gordon, 1978	Physical	The ability to store strain energy and deflect elastically under a load without breaking or being deformed	Ott, 2004	Ecological system	Maintenance of natural capital (as the basis for social systems' functioning) in the long run
Bodin, 2004	Physical	The speed with which a system returns to equilibrium after displacement irrespective of how many oscillations are required	Walker, 2004	Ecological system	The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks
Holling, 1973	Ecological system	The persistence of relationships within a system; a measure of the ability of systems to absorb changes of state variables, driving variables, and parameters, and still persist	Adger, 2005	Ecological system	The capacity of linked social-ecological systems to absorb recurrent disturbances ... so as to retain essential structures, functions, and feedbacks
Holling, 1995	Ecological system	Buffer capacity or the ability of a system to absorb perturbation, or the magnitude of disturbance that can be absorbed before a system changes its structure	Longstaff, 2005	Ecological system	The ability by an individual, group, or organization to continue its existence (or remain more or less stable) in the face of some sort of surprise....Resilience is found in systems that are highly adaptable (not locked into specific strategies) and have diverse resources
Abel, 2001	Ecological system	The ability to persist through future disturbances	Resilience Alliance, 2006	Ecological system	The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure and feedbacks – and therefore the same identity.
Waller, 2001	Ecological system	Positive adaptation in response to adversity; it is not the absence of vulnerability, not an inherent characteristic, and not static	Resilience Alliance, 2009	Ecological system	The capacity of a system to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes.
Brock, 2002	Ecological system	The transition probability between states as a function of the consumption and production activities of decision makers	Adger, 2000	Ecological and social systems	The ability of communities to withstand external shocks to their social infrastructure
Klein, 2003	Ecological system	The ability of a system that has undergone stress to recover and return to its original state; more precisely (i) the amount of disturbance a system can absorb and still remain within the same state or domain of attraction and (ii) the degree to which the system is capable of self-organization	Adger, 2003	Ecological and social systems	The ability to persist (i.e., to absorb shocks and stresses and still maintain the functioning of society and the integrity of ecological systems) and the ability to adapt to change, unforeseen circumstances, and risks
Anderies, 2004	Ecological system	The amount of change or disruption that is required to transform the maintenance of a system from one set of mutually reinforcing processes and structures to a different set of processes and structures			

Table 1: Definitions of "resilience" (Source: COMMUNITY & REGIONAL RESILIENCE INSTITUTE 2013, p.3-9)

[3] See COMMUNITY & REGIONAL RESILIENCE INSTITUTE 2013, BRAND F. S. and K. JAX. 2007.

What is quite obvious through the extensive bibliography is the fact that there is not only one „resilience“ but many (ecological, social, urban, mechanistic, evolutionary, etc.), even within the boundaries of a particular discipline. But the way this term each time is understood is not just a simple matter of hermeneutics but it is rather related to serious theoretical oppositions and shifts on issues that deal with the functioning mechanisms of complex biotic and abiotic systems, and particularly in the case of ecological resilience, to the very notion of nature, and our relationship as species and societies with it.

Diverging “resiliences”

Equilibrium based resilience

In the first definitions of resilience, (Holling 1973, 1986), what was clearly expressed through the terms of „persistence“ and „conservation“ was the concept of equilibrium, ie the steady state of the ecological systems in times when no stresses or external forces are applied to them. In this initial apprehension of resilience also relies the main conceptual frame of later sustainability approach, which sets “equilibrium” (of natural systems) in a high priority zone in order to maintain the uninterrupted operation of the Western world‘s post-war-development course or, in other words, to preserve the natural resources.

What, however, has also been introduced in this initial approach of resilience for the first time along with the concept of equilibrium, is the existence of not a single, but rather **multiple equilibrium states** for a given system. In this case, resilience is the measure of the disturbance that a system is capable of absorbing before it flips into a new equilibrium state (C.S. Holling 1996, 2002). Both concepts, should be marked as the first turbulence in the post-war notions of nature (table 2) and in understanding of crucial issues of society-nature relationship, concerning the primacy of rational, the instrumentalization of nature, and sovereignty as a dominant value.

From another point of view, at the same time, a new notion of „resilience“, which is found in the literature as „engineering resilience“, has been born, and is the one that basically acts as the theoretical legitimation of the recently established rhetoric of „security“, as mentioned above. In this case, which is the most widespread (in fields such as engineering, risk management, economy etc) and acceptable interpretation

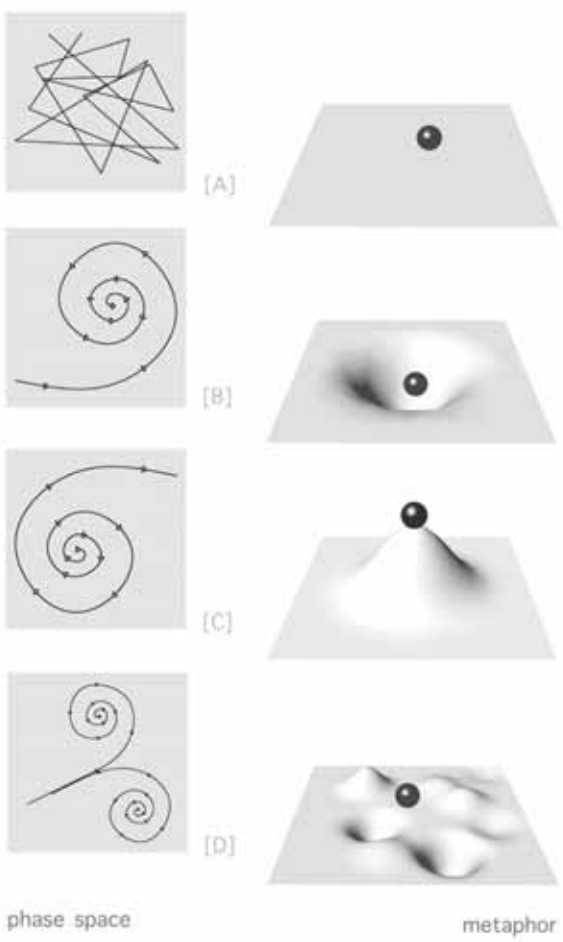


Table 2: Depictions of four myths of nature: (A) Nature Flat, (B) Nature Balanced, (C) Nature Anarchic, and (D) Nature Resillient. (Source: Gunderson and Holling 2002, p.11, Authors' redesign)

of the term, resilience is considered as the persistence at a single equilibrium state, while the resistance to disturbance and the return rate to the previous equilibrium state are the measure of resilience (C.S. Holling 1996). The use of this particular notion of resilience until today is directly related to two phenomena attached to "hypermodernity" (Lipovetsky 2013): the largely failure of sustainability approach, and the emergence of catastrophe that demystifies the future and „shrinks time into an urgent logic."[4]

Resilience through constant change

From the 1980s onwards, and mainly because of the effects of complex systems theory on other sciences, the definition of ecological resilience is reworded once again. A typical example of this shift is the definition as currently accepted by the Resilience Alliance[5]: „*Resilience is the capacity of a social-ecological system to absorb or withstand perturbations and other stressors such as that the system remains in the same regime, essentially maintaining its structure and functions*." Through this definition, three key characteristics of resilience emerge: a) the amount of change a system can absorb without flipping into another equilibrium state, b) the extent to which a system is capable of self-organization, and

[4] For the hypermodern relation with time, see Lipovetsky, G. 2013: Globalization and hypermodernity: Cosmopolitanism and western culture

[5] https://www.resalliance.org/resilience

c) the ability of a system for self-learning[6] and adaptation.

Beyond the multi equilibrium states schema and the unified approach of complex social and natural systems, it is also accepted that change is a structural component of systems, and adaptation to it through learning and self-organization is a part of the function mechanisms of each system (S.E. VAN DER LEEUW 2000). The above concepts -of multi equilibrium states and change as an inherent feature of systems- are also present in the shaping (Figure 1) of the properties of a system's resilience by B. WALKER (et al., 2004) where its characteristics determine the position of the system in its "stability landscape", ie the set of different states in which the system can be found. These characteristics are: (L) the maximum change that a system can absorb before it changes basin of attraction (its function changes), (R) the system's sensitivity to change (how easily it can change), (Pr) the distance of a system from critical thresholds (where changes that happen are irreversible), and (P) Panarchy, which deals with the interconnections of different systems[7] among spatial and temporal scales or between different scales that set one system external to another.

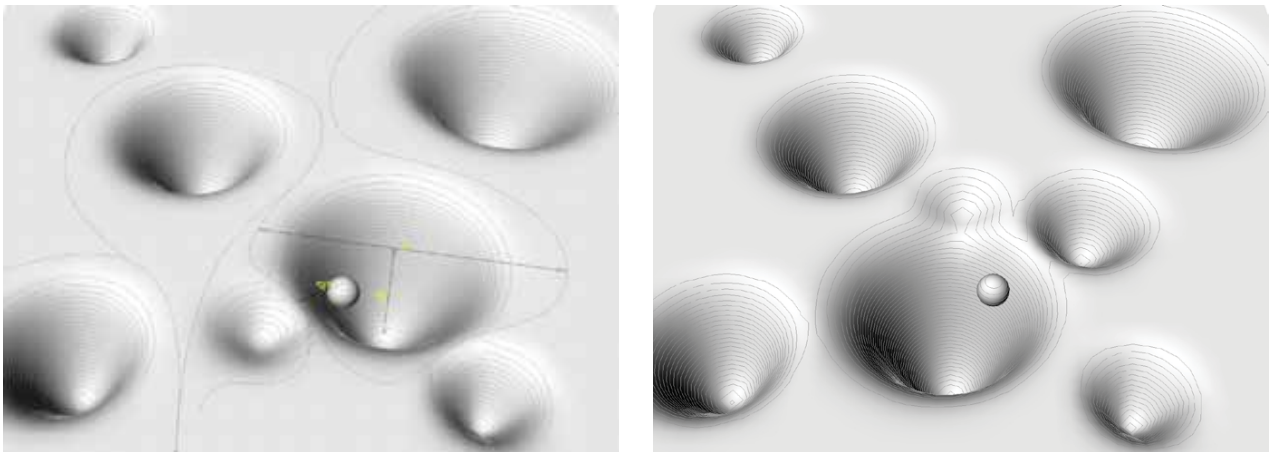


Figure1: Three dimensional stability landscape with basins of attractions: (a) system characteristics, (b) changes in the stability landscape (Source: WALKER et al. 2004, p.4, Authors' redesign).

Adaptive (or ecological) resilience – Panarchy

The latest and most contemporary notion of resilience was largely shaped by the influences that ecology science has

[6] The latter is related to the experience and the memory of a system and hence to its "identity".

[7] The concept of wholeness as introduced here implies in part the connection, or interdependence, of systems of different identity, such as physical and social. However, this critical linkage, which often leads to the naturalization of social systems (eg the elimination of human intentionality), but also to the rationalization of natural (eg, deterministic nature), has been widely criticized (DAVOUDI et al. 2012) due to emerging deductions, or even generalizations that are loose and risky to use them.

received from the Panarchy theory as proposed from HOLING (2001): „Panarchy" is the term we use to describe a concept that explains the evolving nature of complex adaptive systems. Panarchy is the hierarchical structure in which systems of nature (for example, forests, grasslands, lakes, rivers, and seas), and humans (for example, structures of governance, settlements, and cultures) (GUNDERSON et al. 1995) and social-ecological systems (for example, co-evolved systems of management) are interlinked in the never-ending adaptive cycles of growth, accumulation, restructuring, and renewal."

The main concept of this model is the adaptive circle (Figure 2), the four stages that all systems are constantly and continuously running through due to adaptation to change[8]. The adaptive circle is characterized by: the endogenous dynamics of the system available for change, ie the „wealth" of the system, the internal interconnection of system factors which determines the flexibility or stiffness of the system, that is, its sensitivity to disruptions, and its inherent adaptive ability. The four stages of the cycle are: exploitation (r), conservation (K), release (Ω), and reorganization (a). The main theoretical shift that is crucial to understanding the contemporary perception of resilience is that events and processes such as destruction and collapse (stage K to Ω) are not perceived according to their common original negative meaning but instead are incorporated into a scheme that regards them as moments of capital

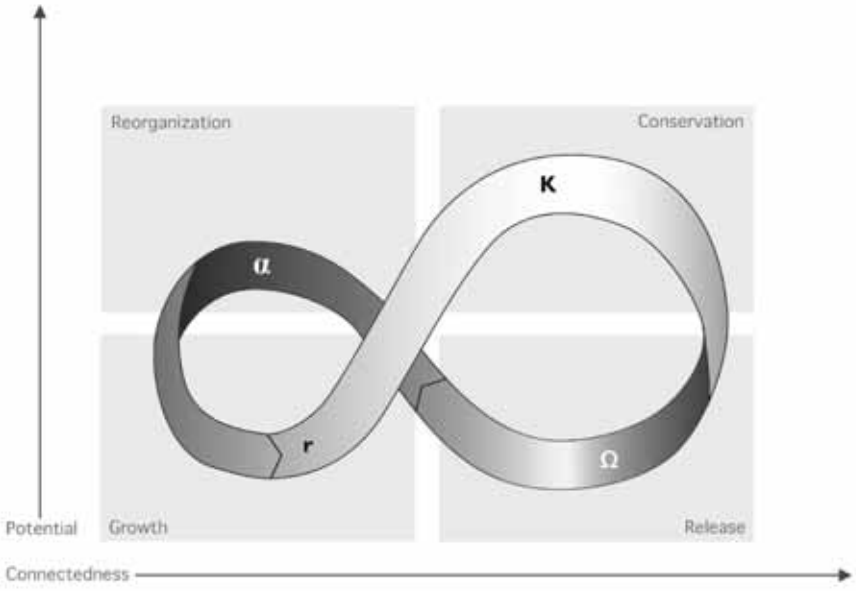
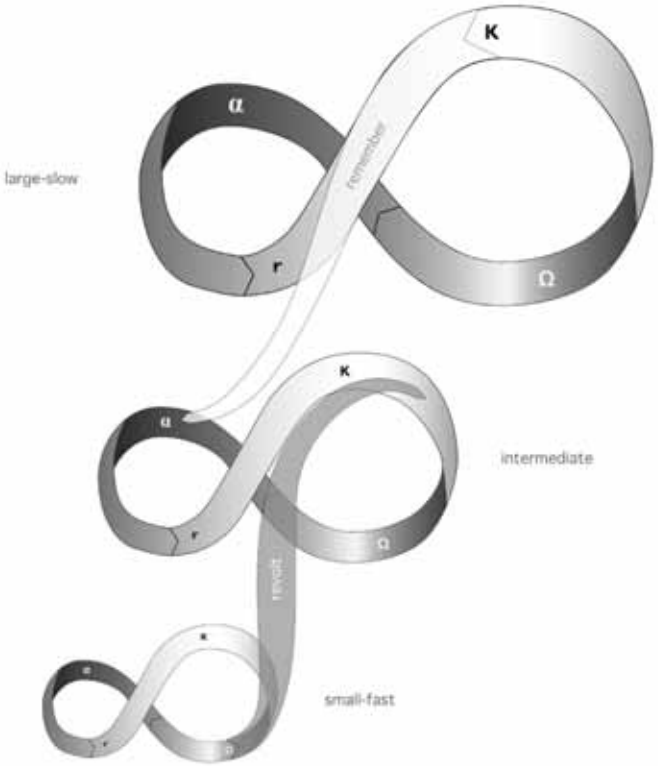


Figure 2: Adaptive cycle in 2D (Source: GUNDERSONE and HOLLING 2002 p.34, Authors' redesign)

[8] The succession of the adaptive cycle stages is neither linear nor deterministic due to the fact that external pressures, or leaks (to other such systems) interfere with it.

release and hence times when the possibilities and possible ways of a system reconstruction increases, ie stages necessary for regeneration, creation, and evolutionary heterogeneity[9].

In addition, and taking notice of the three dimensional representation of the adaptive cycle (Figure 3), is understood that the resilience of a system is greater when the available capital is free and unbound, and the possibilities and variable combinations of regeneration are maximum (in short, no fixed links between the parts of the system are attached), and continuously diminishing by the consolidation of relationships and forms, ie it passes from a liquid and flexible form into a more solid and inelastic one.



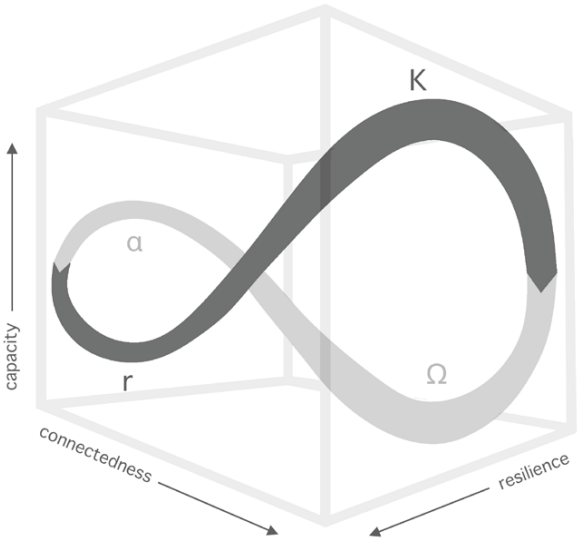


Figure 3 (right): Adaptive cycle in 3D (Source: http://www.ecologyandsociety.org, Authors' redesign)

Figure 4 (left): Panarchy in 2D (Source: https://www.researchgate.net, Authors' redesign)

The scheme of Panarchy (figure_4) is being completed with the reduction of the adaptive circle into a hierarchical structure (not only top down but also bottom-up, thus in the regular sense is a non-hierarchical system) of successive cycles accumulated in different scales and in constant communication and interaction with each other (various connections are presumed as being related to the heritage - **memory** - the spread of destruction - **revolt** - and others) thus shaping the wholeness of the ecosystem as well as its self-organizing mechanisms (Craig R. Allen et al. 2014).Thus, bearing in mind these con-

[9] The latter is considered an important feature of resilience by cultivating flexibility, and thus shaping the conditions for assimilation of the unpredictable. (Holling 1973)

temporary aspects of the Panarchy model, it is understood that the term "resilience" in this new era is conceived as the ability of a system to adapt, change, and transform, rather than to resist to disturbance and stay within the same equilibrium regime (Davoudi et al. 2012), a scheme that is totally opposed to the predominant use of the term today, and also to **the mainstream notion of nature as danger**. Summarizing the three most widespread interpretations of the term „resilience" in the contex of ecology we may conclude that it is defined as:

- The ability of a system to return –or to bounce back- to a steady equilibrium state after a shock, or disturbance.
- The magnitude of the disturbance that a system can absorb before it changes to a new equilibrium state.
- The ability of complex social-ecological systems to change, adapt and transform in response to stresses and pressure.

Nature and resilience, from inevitability to intentionality

It is evident that the use of the term "resilience" equally refers to "stability", "elasticity", and "adaptability". Apparently enough, these perspectives do not emerge out from an isolated scientific field but they are influenced, and co-shaped by neighbouring theoretical thesis and related issues (nature-man-society). Simultaneously they set the critical foundations for concepts such as sustainability, growth, development, destruction, etc., and they reflect on patterns related to linear and hierarchical relationships (in the classical sense of the term), such as evolution.

At the core of the discourse regarding the notion of resilience is precisely standing the concept of the disaster. A deep understanding of the distinctions between natural and moral evil[10], as well as of their revealing syneresis to a metaphysical evil that threatens the ‚equilibrium' of human societies and cities, reveals an urgent need to define from the beginning the nature and the way we relate to it. "*Are we in a "deep back loop" that presents the [ecological studies] opportunities and crises*?", as Holling (2004) asks.

The shift in understanding of resilience from the equilibrium all the way to change and transformation (through multi-equilibrium states) is crucial particularly as it destabilizes the political, ideological and philosophical basis on which the

[10] An overview of "evil" conceptions and origins in modern thought, see Neiman, S. 2002: Evil in modern thought. An alternative history of philosophy.

securitization is progressively institutionalized as urgent as inevitable (Coaffee 2013). Resilience as constant transformation opens up our understanding and receptivity to contingency and unpredictability. Resilience is thus providing an interpretative lens that enables us to detect a new conception of nature as a „*matrix of all possibilities or the perennially open*" (Terzakis 2003, p.26).

However, if, in the context of resilience, disaster is internalized and is only regarded as a part of the process of a constant transformation -an eventual outcome rather than danger-, translating this understanding to the social context remains seriously problematic at two levels. One concerns the naturalization of evil by relocating the systemic and institutional into natural procedures, which consequently implies that intentionality is ignored if not denied. The second level concerns the subsequent legitimization of the reshaped sovereignty relations in the name of transformation and adaptability[11]. Despite these contradictions and restrictions we need to surpass, the re-conceptualization of nature in the context of resilience as the perpetually open, assures "*the continuous possibility of recourse to something amorphous which eludes any social (and linguistic) determinations, a stock of inexhaustible freedom and creativity that, ex post, makes the historical change of the world possible*" (Terzakis 2003, p.29).

[11] As Bauman describes it: "…adaptability, the trademark of fluid modernity, an advantage for the governors and a handicap for the governed, is in fact the new strategy of sovereignty". See Bauman and Bordoni 2017, p.57

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3.Understanding Good and Bad Resilience: The Case of Greek Cities in the Economic Crisis Era

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Abstract

Government debt crisis and recession in Greece cause decline of the welfare state. This has been the result of the attempt of the Greek Government to reduce fiscal and macro-economic vulnerability to debt crisis through dismissals of public employees, cutting wages and pensions, shrinking social welfare public provisions. The state's adaptation however caused increase of human and social vulnerability and (re)activation of historical and new social risks. On their side, vulnerable people, urban level institutions and social organizations employed novel resilience attitudes to manage the unexpected risks of everyday life and amplified vulnerability, all caused by the crisis. This type of resilience at the urban level sometimes is widely beneficial, but other times harmful to the most vulnerable, the environment and the wider public interest, currently or in the future.

The paper (a) addresses social risk (re)activation processes and vulnerability trajectories in the Greek cities in the economic crisis era and how they are influenced by institutional, collective and individualized resilience and (b) offers a planning perspective for what is termed by the author as "Good Urban Resilience"

Introduction: Who can be resilient, for what purpose?

Regardless of the scientific field and context wherein the term is to be found, resilience signifies reactions toward risks, shocks, stresses and adversities with the ultimate aim of survival or persistence of the vulnerable agent (Sapountzaki 2012). In the literature resilience is defined either as an outcome (the flip side of vulnerability) or as a process. In the second case it is considered as a process of self-organization and self-change, in an attempt of the initiating agent to retain essential functions or structure under circumstances of whatever threat, stress or perturbation. This process-inspired definition of resilience is the more recently and widely adopted at least as regards socio-ecological and social systems. Dovers and Handmer (already since 1992) bifurcate resilience into reactive and proactive while Rose (2014) suggests that resilience is operative only in the response, recovery and reconstruction phases of crises and disasters.

Who can be resilient? Some scholars and authors concentrate on urban and community resilience while others on individualized forms of resilience (i.e. resilience of single persons or micro-institutional resilience, such as a household's or a firm's resilience). According to Sapountzaki (2012, p.6) resilient to risks can be any vulnerable agent who becomes a "vulnerability actor", meaning an actor capable to change own and others' vulnerability. In this sense potentially resilient agents are:

- Social agents ranging from the human individual or single household to urban, regional, national or the global communities;
- Economic agents ranging from individual firms to entire economic sectors at the regional, national, trans-national level;
- Institutional agents, governmental and non-governmental at all possible levels;
- Socio-ecological agents, e.g. social systems interacting with ecological for the purpose of abstraction of natural resources;
- Socio-technological agents, like energy networks coupled with regulation authorities and their users.

What is the purpose of resilient agents? Their purpose is their own survivability, sustainability, avoidance of and / or recovery from a crisis or a disaster. For this purpose the agent under threat develops either pro-active or reactive resilience.

Stacey et al. (2000) suggest that resilience refers to agents following their own principles and satisfying their own intentions, an argumentation which is also in line with Waldrop's (1992) suggestion that, in a dangerous environment, systems try to turn whatever happens to their own advantage. Hence, resilient agents pursue abatement of the bundle of risks they face. Resilience can thus be configured as a capacity to manage vulnerability and exposure to several simultaneous threats. Resilient agents can rarely achieve absolute reduction of their own vulnerability because:

- they are faced with several facets of vulnerability (physical, social, economic, institutional, also vulnerability to natural, environmental, technological, social risks) and when they spend resources for remedying a specific facet, they may become short of resources for curing others;
- they are territorially bounded and interconnected within communities so that the vulnerability of individual agents is affected by and affects vulnerability of others.

Therefore, a resilient agent *"utilizes own adaptive capacities to re-arrange and reset own vulnerability balance in time, space and among the several vulnerability facets versus various hazards also, when circumstances call for such re-arrangement"* (Sapountzaki 2012, p.7). In particular the options of a resilient agent (social, institutional or economic) are:

- ► To reduce own current vulnerability by shifting it to the future;
- ► To transfer vulnerability (specific facets versus specific hazards) to other agents with probable simultaneous conversion to other vulnerability facets versus other hazards;
- ► To rebalance own vulnerability facets versus certain hazards by controlling / reducing some of these facets to the deterioration of others;
- ► To manage vulnerability that is received by other agents.

Considering above options one could gather that resilience is about constant maneuvering and making of trade-offs between several forms of risk-taking and social development (Sapountzaki 2007). The resources to be tapped and utilized in a resilience process against all life risks, originating from the

socio-economic and physical environment, are included in the following forms of capital as adopted by the sustainability approach (Sapountzaki 2007): natural capital, financial (savings, income, pensions, credit, state transfers etc), human capital (knowledge, skills, health, physical ability), social capital (networks, affiliation, reciprocity, trust) and physical capital (infrastructure, shelter, transport, water, energy etc). Of vital importance are the spatial and temporal scales upon which the resilient agent appeals to mobilize and utilize above resources. In risky environments, troubled periods or post-disaster contexts new and exceptional pools of resources emerge. Such exceptional resources, under private or social control are behavioural assets, personal knowledge and experience, formal and informal social and economic networks, social knowledge, memory and ethics, place focused cultural practices, extra institutional mechanisms such as structures of illegality and exceptional funding opportunities (see also Sapountzaki 2014).

The Greek Government's Resilience to Debt Crisis: Repercussions on Social Vulnerability

According to the IMF Country Report No. 13/156, 2013 the Greek Governments have been accountable for the background conditions that triggered the crisis in 2009:

"Adoption of the euro and loose global credit conditions in 2000's allowed Greece easy access to foreign borrowing that financed a significant expansion of government spending. Robust private credit growth following financial liberalization also served to boost household consumption. Real GDP growth averaged 4% from 2000-2007, higher than in all euro area countries save Ireland and Luxemburg. …..Government debt mounted rapidly. The economy turned down in the wake of the Lehman crisis and the general government deficit reached 15.5% of GDP in 2009, up from 4% in 2001. Public debt was 129% of GDP at the end of 2009 with 75% held by foreigners. Besides, the pension system had become underfunded as a result of increasingly generous entitlements and an aging population. Furthermore, the counterpart to the decline in government saving was a sharply widening current account deficit that reached 15% of GDP in 2008".

Following the IMF (2013), the global financial crisis endangered Greece's government-led growth model and the country became soon extremely vulnerable to a stop in private capital flows. However, from the beginning of the crisis in early 2010, the Greek governments have been displaying an outstanding capacity to avoid default, i.e. resilience. After the elections in autumn 2009, the first government of the crisis agreed to a fiscal consolidation plan with the EC, but as financing conditions became progressively more difficult the euro zone decided that the IMF should be a formal part of Greece's rescue.

Following negotiations with the newly established Troika (the IMF, the EC and the European Central Bank) a programme was agreed upon to assist Greece with total financing of 110 billion euro of which the Fund committed 30 billion euro under a Stand-By-Arrangement. The bailout project (and resilience displayed) for Greece's rescue was possible due to the country's position in the euro-zone. Consequently, the Greek government was forced to adopt *"an ambitious multi-year adjustment programme to lower the fiscal deficit and public debt ratio, reduce domestic demand in line with supply capacity and increase supply and competitiveness so as to invigorate investment, exports and private sector growth"* (IMF, 2013). State adaptations for macro-economic purposes, stability and sustainability, have translated however, into heightened or new risks and exposures for the Greek society, especially the weakest social groups (i.e. the already vulnerable).

Indeed, a growing number of households in the Greek cities have been increasingly exposed to new (or re-emerging) social risks of poverty, energy poverty, homelessness, malnutrition, risks to health, psychological depression and suicide. The reasons are related to wage and pension cuts, elevation of direct and indirect taxation, dismissals and unemployment, shrinkage of social welfare public provisions and recession as a result of fiscal rationalization policies. It is obvious that this is the result of the transformation of state's fiscal vulnerability to human and social vulnerability and its transference to large social groups especially those dependent on the state's welfare system (Sapountzaki and Chalkias, 2014).

In a report by the UN Independent Expert on Foreign Debt and Human Rights (2014) it is clearly stated that *"the prospects of a significant number of Greeks securing an adequate standard of living in line with international human rights standards have been compromised by bailout conditions imposed by Greece's international lenders".* More specifically, the UN Expert warns: *"More than 10% of the population in Greece now lives in extreme poverty and unemployment amongst youth has reached the unprecedented rate of 59.3%.... Greece remains the only country in the euro-zone where a comprehensive social assistance scheme serving as a social safety net of last resort is missing"* (A/HRC/25/50/Add.1 2014, p.16). The Expert also warns that the public health system becomes increasingly inaccessible, in particular for poor citizens and marginalized groups. The Expert points out that nearly one third of the Greek population is without public health insurance mainly due to prolonged unemployment. The report makes also reference to the National Ombudsman's thesis that *"the drastic adjustments imposed on the Greek economy and society as a whole have had dramatic consequences on citizens, while vulnerable groups increase and multiply"* (A/HRC/25/50/Add.1 2014, p.12). The report furthermore ascertains that the burden of adjustment does not appear to be shared fairly as the impact has been particularly severe for the most vulnerable sectors of the population: the poor, the aged, pensioners, women, children, people with disabilities and immigrants. It is not without significance that since 2012 two more bailout projects and a whole series of austerity measures have been implemented.

Looking at the social risks (re)emerging with the crisis, it seems that the most important risks are health-related risks. The literature offers already strong evidence about the relationship between income status and health indicators such as morbidity, mortality, life expectancy and accessibility to medical care services (Mackenbach 2005; Wagstaff 2002). Economic recession increases health status inequalities (Stuckler et al. 2009), while unemployment, job insecurity and homelessness drive always larger groups to social exclusion and cause increase of cases of psychological disturbances, like depression. The unemployed and their families are at higher risk of premature death, chronic disease and disability. In the long run unemployment increases

the risk of suicide and also leads to a high alcohol daily consumption with evident long term health consequences (Maliarou and Sarafis 2012). Simultaneously, heightened institutional vulnerability of the medical care system (also due to the crisis) adds risks to human health. Public medical care organizations suffer from financial problems due to reduction of the respective public expenses. Furthermore, public deficit and unemployment cut public insurance budgets causing fluidity problems to private medical companies. At the same time that the demand for public medical care services increases (owing to loss of income and increase of disease incidences) the medical care system becomes always more vulnerable (Sapountzaki and Chalkias 2014). Indeed, publications in the medical journal The Lancet confirm increase of the incidents of suicide and contagious diseases (Economou et al. 2011) while reports in domestic and international mass media speak for health problems of the victimized social groups and disintegration of the medical care system.

Figure 1 indicates how the Greek Governments of the crisis era -in their attempt to manage macro-economic risks and debt crisis-, deprived the society and economy – especially the most vulnerable groups - of critical assets. Such deprivation caused increase of social, human and regional and local institutions' vulnerability. In essence, the Greek Governments pulled off the protective mantle of the welfare state and activated a bundle of forgotten social risks and adversities (poverty, homelessness, social exclusion, forced migration, risks to health, loss of accessibility to old age care services etc). At the same time the austerity measures deteriorated human, social and institutional vulnerability to natural, technological, climate change and environmental hazards thus intensifying the respective risks.

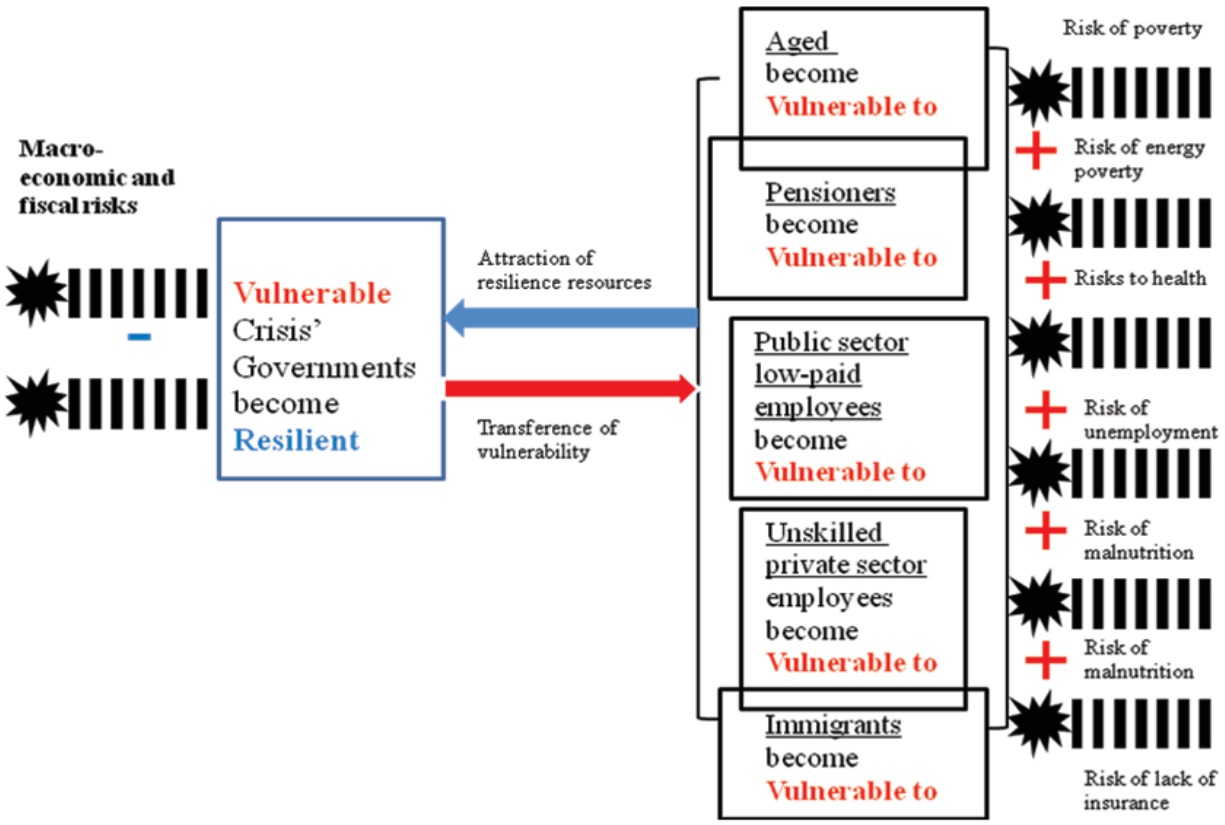

Figure 1: Vulnerability transfers (through resilience) for the sake of bailout projects – Mobilization of new and historical social risks. (Source: Author's elaboration.)

People's and Urban Institutions' Resilience versus Social Risks: Is it always Beneficial?

Sakdapolrak et al. (2008) in their article "The Megacity Resilience Framework" suggest that within cities institutions and people each have specific vulnerabilities and specific resilience and that constant interaction among these is occurring continuously. It has become already evident that with the crisis larger social groups and a growing number of public and private institutions become more and more vulnerable to new and returning risks. All these vulnerable agents attempt to activate resilience in the following ways (Sapountzaki and Chalkias 2014):

- Individuals and households make a series of re-arrangements, e.g. they change their place of residence to ensure cheaper housing accommodation, they proceed to household enlargement and unifications to minimize rents and other housing costs, they make agreements for extension of their housing loan repayment period, they change energy consumption and mobility patterns as well as food consumption patterns, they change patterns of appealing to medical care services etc.
- Social groups and communities build barter economy and other solidarity structures to boycott

costliness of essentials in the free market.

- ►Manufacturing, retail and wholesale firms cut down operating and maintenance costs, proceed with dismissals and partial employment contracts, turn to cheaper raw materials and forward low quality goods and services to the market.
- ►Local Authorities cooperate with NGOs to build structures for direct response to unemployment, poverty and homelessness, among others in an effort to rehabilitate their traumatized profile and regain political prestige.

Each one of the above practices represents a specific resilience option (see introduction). More specifically, the extension of the housing loan repayment period represents a shift of economic vulnerability to the future; moving to cheaper housing accommodation represents a way to transform economic vulnerability to physical vulnerability (due to exposure to a poorly maintained housing and urban environment); changing food consumption patterns means that part of economic vulnerability may turn to health-related vulnerability; introducing low quality goods and services to the market is a way for manufacturing retail and wholesale firms to lower their economic vulnerability by aggravating health or other forms of vulnerability of the consumers (Figures 2(a) and 2(b)). Vulnerability dynamics due to activated resilience of people and urban level institutions make some of these adaptation attitudes widely beneficial (to the environment, the wider public interest and for the future) and some others harmful to other agents or the wider public interest.

Examples of individualized/personal resilience which proves to be beneficial to collectivities and/or the wider public interest are:

- ►Turning to environmentally friendly living patterns to avoid high living costs (e.g. turning to public transportation to avoid costly fuels, limiting wastage at home, saving energy at home to avoid high electricity bills etc).
- ►Building social solidarity structures (Figure 3) to combat poverty, energy poverty, risks to health and unemployment (e.g. no pay movements, neighbourhood-based self-organized collectives, municipal vegetable gardens, social groceries, clinics and pharmacies, solidarity schools,

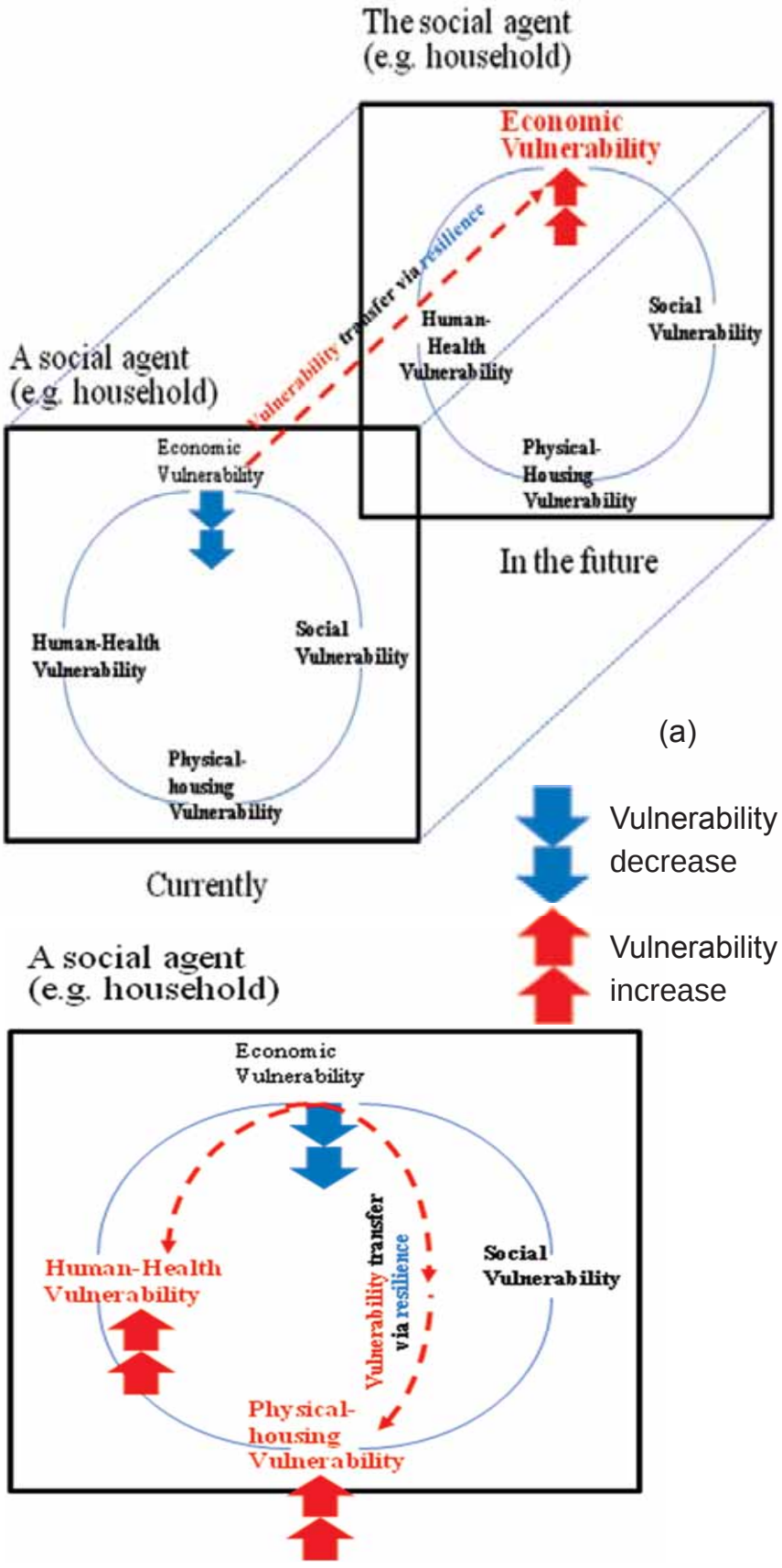

Figure 2 (a) above: Vulnerability dynamics (through resilience) in case of extension of the housing loan repayment period (shifting vulnerability to the future); (b) below: Vulnerability dynamics (through resilience) in case of moving to cheaper housing accommodation or changing food consumption patterns. (Source: Author's elaboration.)

social kitchens and food distribution, the without middlemen movement such as the potato movement, free share bazaars, time sharing banks, alternative cultural clubs and other socialized and self-managed forms of employment and solidarity economy). Up to November 2012, 93 social enterprises have submitted their papers to register in the record of the Ministry of Labour all over the country, half of them in Athens (Solidarity for All 2013)

The social solidarity structures contribute to what might be termed "social vulnerability justice". For example, it is obvious that *the without middlemen* movement causes loss of customers of the middlemen.

However, there are also examples of people's and institutional resilience which are harmful for other agents, the environment or the wider public interest currently or in the future: Turning to wood (and waste material) fuel for heating; avoiding maintenance costs of technological equipment in the domestic, transportation, manufacturing, building and other sectors (Figure 4); relaxing building and urban planning regulations to attract investments and create jobs etc. Such practices have already led or may lead in the future to heightened social, human, ecological, physical vulnerability and exposure to new or re-emerging risks: atmospheric pollution, technological accidents, urban fires, communicable diseases etc. (Sapountzaki and Chalkias 2014). In general terms, collective and individualized resilience in the cities of the crisis have been possible in cases where:

- ►Structures of self-organization and political contention were already in place or at least the possibility to build such structures;
- ►High levels of social cohesion, solidarity and networking prevail;
- ►High levels of professional, employment and housing mobility and flexibility predominate;
- ►Groups and individuals are featured by medium and high levels of education;
- ►Entrepreneurial agents are featured by high levels of flexibility;
- ►Groups and individuals have access to political parties and decision-making institutions.

Figure 3: A Social Grocery in the Municipality of Athens. (Source: Sapountzaki 2014)

Regardless of the agent developing resilience strategies it has been made evident however, that there is "good" as well as "bad" resilience. Considering social justice in terms of distribution of risks and adversities, good resilience refers to cases with no impact on or beneficial to the most vulnerable agents, the environment and/or the wider public interest because of their mitigating effect on vulnerability. On the contrary, "bad resilience" against the crisis results in others' and environment's exposure and vulnerability increase. Bad resilience may pull off safety nets, such as the "protective" welfare state, planning and environmental regulations, safety and maintenance standards. As a result, bad resilience may activate or reactivate old and new social and other risks. Sometimes, the losses out of manifestation of these risks (e.g. job losses, health losses and morbidity, loss of housing shelter, loss of safety at home or at work, loss of access to safe food, extreme material deprivation, loss of accessibility to education, medical care, old age care and other essential provisions) overstep the thresholds arising from the fundamental human rights and the basic needs (as recognized by the respective sustainability theory). From this point of view, resilience obtains a clear normative content as the basic mechanism for promoting or subverting social justice when the latter is considered as equity versus risks and adversities. Indeed, the societies of contemporary crises va-

Figure 4: Problems of building maintenance at the heart of Athens. (Source: Sapountzaki 2014)

lidate Beck's (1992) notion of the Risk Society and the thesis that today the world is concerned more about the allocation of risks and adversities than of wealth and opportunities.

Discussion

Under socio-economic crisis conditions like those faced in Greece, resilience in the cities functions as a process of reallocation and redistribution of vulnerability (social, economic, human, institutional, physical and ecological). Hence, it is both possible that resilience contributes to and/or undermines social justice, should the latter be considered in terms of distribution of risks and adversities. Resilience might be both welcome and unwelcome from the moral and normative point of view. Consequently, if planning is to be involved with resili-

ence, its mission should be to push forward "good resilience" and restrict or control hazardous or unwelcome resilience.

Resilience has been an influential concept and vision for both the procedural and substantial element of planning since the late 1990's; this is evident in the use of both terms "Resilient Planning" and "Resilient City". Resilient city has been defined as *"one that has developed capacities to help absorb future shocks and stresses to its social, economic and technical systems and infrastructure so as to still be able to maintain essentially the same functions, structures, systems and identity"* (ResilientCity.org).

However, this definition and the concept of "resilient city", are based on a series of disputable assumptions, for example:

a. …that the various social, institutional, economic and other actors in a city do not develop separate adaptation trajectories to counteract stresses and adversities; all of them have equal accessibility to and draw on a common pool of resilience assets.
b. …that there is a consensual and undivided resilience-building process and adaptation trajectory satisfying all urban actors equally.
c. … that even in case of private or collective actors in the city deciding on and following separate adaptation paths, the latter will not impact on other actors' and the wider urban system's vulnerability and resilience.

However, none of these assumptions is easy to confirm and the case of the Greek crisis cities contradict these assumptions:

- Except of urban community resilience other more individualized forms have been addressed. In dealing with paths of resilience one should respond to the query "resilience of whom to what" (Carpenter et al. 2001). Resilience is about self-(re)organization, self-reliance and self-priorities, a condition which among others facilitates transfer of responsibility for risks from the public sphere to the private. The component agents of the urban system are capable of charting autonomous (and probably diverging adaptation paths). Besides they may be encouraged or have the stimuli to do so.
- It is not only that numerous adaptation paths are followed

by a crowd of resilient agents in the city but also that interactions among them occur on a continuous basis (Vale and Campanella 2005; Sakdapolrak et al. 2008). This is because each of these agents appeals to common pools of both private and collective resources at all possible scales of time and space. Consequently, individualized resilience may lead to deprivation of others or the whole urban community of the necessary resources and hence the opportunity for resilience. Individualized resilience paths are an inevitable reality as well as the possibility of undermining or cancelling one another.

In this sense a city is resilient and vulnerable at the same time while these two properties constantly interact and change. No one can ever characterize a city as totally resilient or totally vulnerable. The term “Resilient City” may be a misleading term and the respective vision may well become a utopia. Therefore, planning “the Resilient City” is only about planning for “Social Vulnerability Justice” and a fair allocation of resilience assets.

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4.Aspects of resilience in the reconstruction of Kalamata (Greece) after the earthquake disaster of 1986

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https://doi.org/10.15488/5563

Abstract

The paper discusses the case the reconstruction of Kalamata city, Greece, after the 1986 earthquake disaster, focussing on urban resilience during the phases of response, recovery and reconstruction. In doing so, it revisits the concept of resilience as an analytical and policy tool.

A set of factors are identified as significant for the success of the reconstruction. The political and economic context in the country at the time was favourable to innovative strategies. At a local level, strong leadership at the Municipality played an important role together with the availability of external expertise and consultancy. Furthermore, the fact that a new and comprehensive general urban plan was in place a few months before made possible the key decision to set it as a guide towards reconstruction.

Numerous features of resilience are detected in this specific case, among them leadership, self-organization, innovation, knowledge and learning capacity, networking and trust, interaction between different spatial and time scales. However, if those signify at large a resilient city against disasters remains questionable.

Introduction

Resilience has earned a predominant place in a range of fields such as environmental studies, planning, psychology and economics and is seen even as a buzzword (Davoudi et al. 2012). The concept is utilised widely and extensively also in disaster risk reduction and climate change adaptation.

Scholars identify a range of essential qualities in resilience, among them robustness, redundancy, diversity, efficiency, autonomy, interdependence, speed in recovery, reflectivity, variability, connectivity, pluralism, to name just a few. For example, Folke (2006) studying social–ecological resilience pinpoints adaptive capacity, transformability, learning, innovation. Godchalk (2003) referring to resilience in respect to planning points towards diversity, redundancy, resistance, flexibility, ability to collaborate, interdependence, autonomy, efficiency. In a similar vein, Chuvarajan et al. (2006), as referred by Sapountzaki and Dandoulaki (2016), examining sustainability at a local level identify diversity, redundancy, self-organization, memory, networking, innovation, interaction between different spatial and time scales, feedback, self-sufficiency. To close, *100 Resilient Cities* initiative sees reflectiveness, resourcefulness, robustness, redundancy, flexibility, inclusiveness and integration as the seven main qualities of resilient cities.

In the field of urban planning and cities, resilience was raised from a theoretical construction to a vision and even became a regulatory tool. Together, the resilience of city in respect to disasters is studied (Vale and Campanela 2005). In an effort to enhance resilience of cities while keeping up with the five priorities adopted by *Hyogo Action Framework* 2005-2015, UNISDR has drawn up Ten Essentials for Making Cities Resilient (Box 1).

In spite of its prevalence in current discourses, the concept of resilience still lacks precision and clarity and remains elusive (Sapountzaki and Dandoulaki 2016). Moreover, critical voices argue that resilience as a policy instrument promotes neoliberal positions and shifts responsibility for risk reduction and management from the state to individuals and the society (Lentzos kai Rose 2009, O' Malley 2012). Sapountzaki (2012) claims that resilience to risks is based on „a management system of the vulnerability"; each body is developing itself adaptability to reduce its own vulnerability and in doing so affects intentionally or unwittingly the vulnerability of others.

Essential One: Organise for Disaster Resilience
Essential Two: Identify, Understand and Use Current and Future Risk Scenarios
Essential Three: Strengthen Financial Capacity for Resilience
Essential Four: Pursue Resilient Urban Development and Design
Essential Five: Safeguard Natural Buffers to Enhance Ecosystems' Protective Functions
Essential Six: Strengthen Institutional Capacity for Resilience
Essential Seven: Understand and Strengthen Societal Capacity for Resilience
Essential Eight: Increase Infrastructure Resilience
Essential Nine: Ensure Effective Disaster Response
Essential Ten: Expedite Recovery and Build Back Better

Box 1: The Ten Essentials for Making Cities Resilient Source: http://www.unisdr.org/campaign/resilientcities/toolkit/essentials

Gaillard and Jigyasu (2016) examining diverse approaches for measuring resilience to natural and other hazards raise the question whether "contemporary frantic quest for enhancing measurements of resilience may … constitute neither more nor less than the perpetuation of the dominant hazard paradigm and its neo-colonial agenda".

Given the wide range of approaches to resilience, evaluating the expected beneficial effects of resilience in vulnerability and risk is a challenge and requires deciphering the process of social adaptation. To this end, Sapountzaki and Dandoulaki (2016) propose the examination of the following key factors and process steps:

- the subject or system that is developing the process,
- motivation or initiation of the process,
- the resources deployed and the ways in which their adjustment is made,
- the spatial scales and the time span of the process,
- the end result, that is the consequences for risk and vulnerability on the subject itself but also on other subjects or systems.

In this Chapter we discuss the reconstruction of Kalamata city in Greece after the 1986 earthquake disaster and attempt to identify elements of urban resilience during the response, recovery and reconstruction phases. In doing so, we revisit the concept of resilience as an analytical and policy tool.

The case of Kalamata was selected because it is considered a success case and a benchmark and because it highly influenced disaster management policies and practices in Greece in the following decades.

Response to Kalamata earthquake disaster of 1986

The context and the city before the earthquake

Kalamata is a provincial urban centre in the southern coastline of Peloponnese (Map 1) and the capital of Messinia prefecture. According to the last population census before the disaster, the population was about 42.000 inhabitants. The city obtained all the typical characteristics of the Greek mode of urban development at the time: unplanned, disorderly expansion of towns and extensive illegal housing construction (Sapounzaki and Dandoulaki 2006). In the city centre densities were high. The infrastructure (sewage system, water system, waste treatment) was inadequate. Its economy was based mainly on services, agriculture and agro-industry. The city suffered from economic stagnation, in spite of its rich tourist resources and the fact that agriculture and agro-industry was a driving force of local development even before the WW2. It should be noted though that many infrastructure projects and social facilities for the city were foreseen in the *Regional Plan of Economic and Social Development 1983-1987*.

Map 1. Location of Kalamata

In the mid-80s, the Municipality of Kalamata had a strong leadership with a clear a vision for the city encompassing social and cultural development and public participation. Moreover, the Municipality was engaged in many activities and had accumulated sufficient human and material resources. It is indicative that the Municipality of Kalamata was staffed with about 235 people, the Municipal Enterprise of Water and Sewage of Kalamata with about 120 people and the Municipal Cultural Enterprise of Kalamata with 65 people (OASP 1987a).

About 5 months before the disaster, the General City Plan of Kalamata (Map 2) was published in the Government Gazette ending decades of planning efforts. The General Plan proposed a change of the structure of the city, allowed for a generous expansion of the city and was comprehensive in considering spatial, social and economic aspects.

At a national level, the earthquake disaster occurred when earthquake protection was recognised as a priority for the country (Dandoulaki 2007). Earthquake Planning and Protection Organisation (OASP) had already been established and the Transitional Earthquake Emergency Plan „Xenocrates - Earthquakes“ had come into force in 1984. In 1984, the Seismic Design Code of 1959 was amended so as be adjusted to reinforced concrete buildings. A proven institutional framework for the rehabilitation of earthquake-damaged buildings and infrastructure was in place after the earthquake disaster in Thessaloniki in 1978.

Earthquake consequences and emergency response

On Saturday, September 13, 1986 at 20:24 hours local time an earthquake of surface wave magnitude 6.0R hit Kalamata city. The earthquake was felt at great distances (Patras, Loutraki, Athens), but damaged mainly the city of Kalamata and surrounding areas. The strongest aftershock of Ms=5.4R occurred on 15th September at 14:41.

Twenty people (2 during the main aftershock) were killed and 330 injured (OASP 1996), while 15 people were rescued from the ruins. Many roads were blocked from debris and power was cut due to damages to power lines. The earthquake occurred on a hot afternoon in September when most people were outdoors and an estimated number of 15,000 people were on the harbour for the inauguration of a new ferryboat line, this significantly redu-

cing the number of victims (Ioannides and Dikeoulakos 2001).

The spontaneous reaction of the population was to evacuate the buildings and escape to open air as fast as possible. Thousands of people used their cars to escape from the city causing huge traffic jams. However, the panic faded away quite quickly and many residents returned to the city. This changed after the aftershock on September 15th when the uproar of the earthquake and the dust from collapsing buildings triggered severe panic the mass escape of population from the city.

In the disaster area, out of about 9,800 buildings inspected for damages, only 33% were classified in the categories *without any damage* or *with light damage*, while approximately 22% were considered as *damaged beyond repair* and 21% *seriously damaged* (Ioannides and Dikeoulakos 2001). Seven reinforced concrete buildings collapsed.

Regarding school buildings, about 70% of them were classified as *seriously damaged* or *damaged beyond repair*. Overall, half of public buildings were damaged. Masonry buildings, among them traditional and historic buildings and monuments were devastated. Out of the 200 buildings considered eligible to acquire a preservation status, according to a study of the Municipality of Kalamata, only 100 survived. The spatial distribution of damage varied significantly. In the old part of the city 60-70% of the building suffered serious damage or worst, while damage was significantly lower by the coast.

The direct economic impact in the earthquake-stricken area was high. More than 70% of buildings in the centre of the city, where businesses was concentrated, were damaged. The tourist infrastructure was severely hit and 11 hotels were classified as *damaged beyond repair*.

During the first hours after the earthquake, mainly local first responders were mobilised. Later, all local public agencies were involved along with national services and international rescue and aid teams. The Municipality was activated immediately after the earthquake although it had no institutional role in emergency management. The Mayor, municipal councillors and employees of the Municipality gathered at the Municipal Refectory, opposite the City Hall. In the first hours, priorities were the psychological encouragement of the population and a first assessment of the situation (OASP 1987a).

In the chaotic early post-earthquake situati-

on, many pressing and urgent needs arose while the priorities were difficult to set within conditions of confusion and lack of coordination between the various players.

The Offices of the Prefecture and the Town Hall were seriously damaged, so their services had to operate outdoors. Gradually, all services were relocated in emergency shelter. On order of the Head of the Prefecture, the Coordinating Prefectural Board convened.

The Municipal Coordination Committee convened and decided to set up Committees to support the activities of the Municipality (OASP 1987a). These committees (Box 2) reveal the scope of the role of the Municipality in the harsh post- disaster conditions.

■ Urban Planning Committee ■ Emergency Relocation Committee ■ School Programming and Social Welfare Committee ■ Demolition, Roofing and Debris Clearing Committee ■ Committee of Temporary Housing ■ Committee for Monitoring the Action of other Entities ■ Committee of Cultural Heritage and Buildings under Preservation ■ Committee to Support Camps ■ Logistics Committee ■ Committee on Electric Power of Camps ■ Donations Management Committee ■ Information Committee and Press Office

Box 2: Committees and areas of action of the Municipality of Kalamata during the emergency period following the earthquakes of Kalamata in 1986 (Source: OASP 1987a)

The activities of the Municipality were taking place all over the disaster area concurrently and urgently. With its fast reaction the Municipality conquered from the beginning a leading role in disaster management.

In the following, emergency activities relevant to urban resilience are presented in more detail.

Emergency shelter

The intense seismic activity and the instruction to the population not to use the buildings, even those without damage, led to huge needs in shelter for virtually all residents (about 35,000 people) (Ioannides and Dikeoulakos 2001). Tents, cruise ships and private means (caravans, vans etc.) were used.

About 400 families selected by the Municipality based on specific criteria took shelter on cruise ships for a few weeks, while about 1,000 people were sheltered on a cruise ship for two years. Around 9,000 tents were distributed to individuals by the Municipality of Kalamata while affected families formed spontaneously small-scale camps.

After the first week, the emergency response mechanism decided to set up organized camps. Organized camps were a challenge both in terms of construction and of management. The construction of infrastructure (installation of tents, water supply, sanitation, power provision, telephone connections etc.) and the provision of services (garbage collection, medical care, psychological support, entertainment, food preparation, clothing, childcare etc.) required the coordination of many services and agencies in harsh conditions. Each camp had a responsible officer and team leaders, whereas ad hoc residents' committees were formed and camp assemblies convened.

Initially, the plan was that the tents would stay for three months. However, around 5,000 people were still living in tents six months after the earthquake (OASP 1987b). The tents were removed one year after the earthquake on the initiative of the Prefecture of Messinia.

Emergency demolition of damaged buildings

The demolition of some 3,000 buildings located all over the city was a huge task and an urgent one, because of the imminent danger of collapse. Even more, control over demolitions prevented the demolition of damaged historic or under preservation status buildings. The task was undertaken by the Municipality and began immediately after the earthquake.

Paving the way towards reconstruction

From the very first days after the earthquake, while survival of the population was the prime concern, the procedures for the establishment of a reconstruction strategy and of a medium and long-term reconstruction plan began.

On 23/9/1986, a plan of immediate actions was completed with the cooperation of the Ministry of Environment, Physical Planning and Public Works, the Municipality of Kalamata and a team of urban planners who were voluntarily offering consultancy to the Municipality. A week later, the Municipality handed over to the National Representative at the then EEC a memorandum stating the necessity of a program of assistance from the EEC for „immediate" needs. A month later, the Municipality presented the "Program for the Reconstruction of the City" in a high-level meeting with the Ministry of National Economy. By mid- December, EEC

decided for initial funding of immediate post-disaster actions.

Moreover, as early as 23/09/1986 the Municipal Council decided to issue the pending decrees for the expansion of the city as soon as possible and to urgently review the Plan in order to take into account the new post-earthquake situation and the early results of a micro-zonation study commissioned after the disaster. At the end, this revision brought no substantial changes to the initial Plans (Diamantopoulos 1991).

It should be stressed that this long-term outlook is not usual and was facilitated, or even made possible, by the early decision to set the new statutory urban plan as the guide towards reconstruction. A map of the proposed location of emergency camps completed a week after the earthquake, demonstrates that the Urban Plan of Kalamata was already used as a basis.

Maintaining a long-term viewpoint towards reconstruction in the mist of the crisis and resisting "rush to rebuild", was not habitual or inconsequential; it even brought friction between the Municipality and the central administration and protests from the local population.

Towards reconstruction in three stages

The emergency phase lasted for about 40 days. Gradually life in the city began to take its normal course. The population started to use to the non- damaged building. Stores that had not suffered serious damage went back to business. Provision of free meals stopped. The roads were cleared from the ruins. City started to function more normally again, although mostly in emergency or temporary shelters. Industries and many crafts had resumed operation. After a long emergency period, the rehabilitation began and the main challenges ahead were the restoration of the housing and the revival of economic and social life.

In respect to rehabilitation of damaged buildings, the following goals were set:

- To restore the building stock both in terms of quantity and of quality, at least to pre-earthquake levels
- To support financially and technically the owners of damaged buildings in order to repair or reconstruct their dwelling and to introduce measures for increasing seismic safety of buildings
- To provide social housing through organized construction and self-housing

Going beyond rehabilitation, the comprehensive reconstruction strategy that was developed was structured around the following complementary goals.

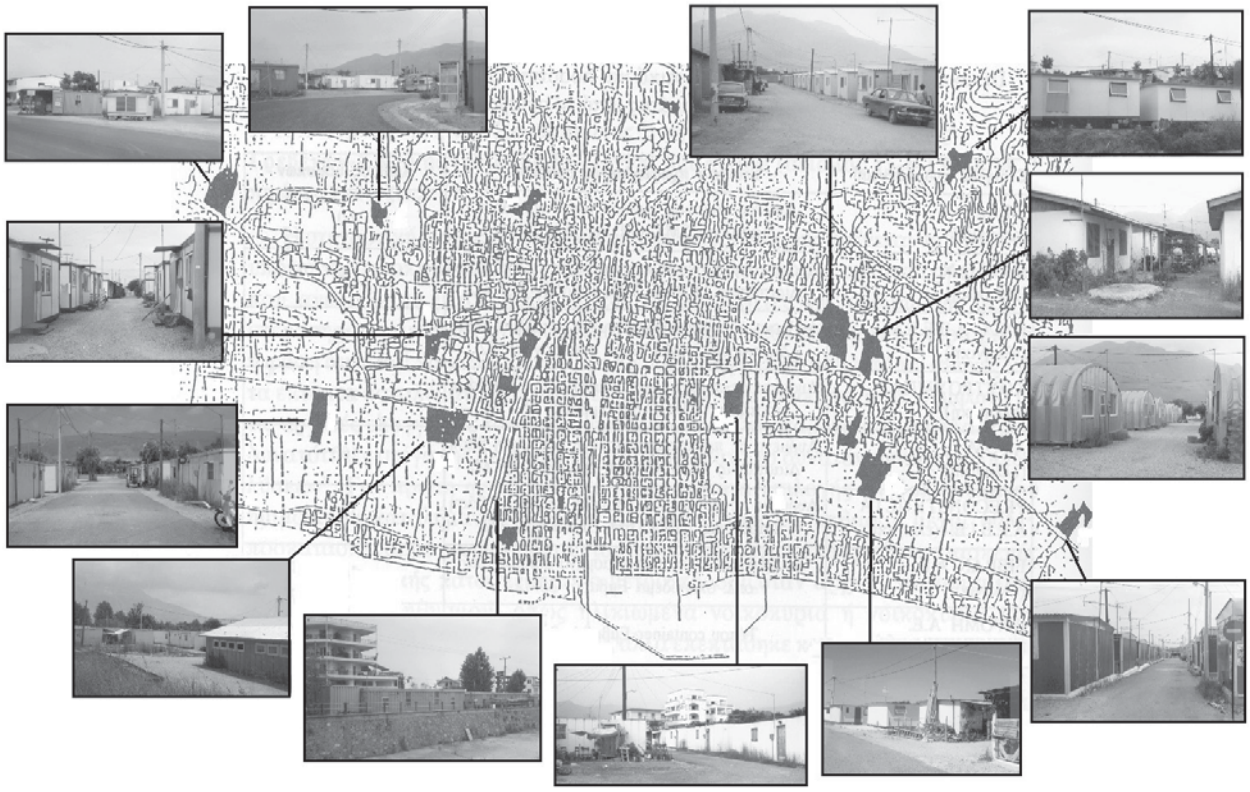
Implementation of the General Urban Plan of Kalamata and advancing urban planning: revision and implementation of the General City Plan, formalisation and implementation of plans for the expansion of the city

Housing rehabilitation: repair of damaged buildings (private and public), demolition and reconstruction of demolished buildings, measures to stimulate building activity and social housing programs, adoption of codes, rules and recommendations to increase seismic safety of new or repaired buildings and public works.

Preservation of the city's morphology: rehabilitation of monuments and historic buildings, preservation of the morphology of significant buildings and ensembles, preservation of the historical centre of the city, protecting the morphology of the area around the Castle

Stimulation of the economy and social welfare of the region: a range of benefits, incentives and low-interest loans were given to professionals and businesses in the area, additional measures have been taken to strengthen the local market.

To implement this visionary reconstruction, however, it was necessary to gain time and release pressures to build back as soon as possible. To this end, soon after the disaster it was decided to launch a scheme of temporary shelter in transportable or prefabricated dwellings (Dandoulaki 1992). Twenty two housing settlements with around 3.000 transportable or prefabricated dwellings (Map 2) were constructed, as well as 4 commercial centres with 280 temporary units and 10 schools with 200 temporary classrooms. Most temporary settlements were located in areas of the city where urban expansion was planned so that new infrastructure could be of use of the city after the settlements would be dismantled.



Map 2: Location of temporary settlements in the city of Kalamata city after the 1986 earthquake disaster (Source: M. Dandoulaki, 2008)

Viewing the reconstruction of Kalamata a posteriori

The reconstruction of Kalamata marked a turning point in earthquake policy of the country and became a reference case (Ioannides and Dikeoulakos 2001). Its legacy is the notion that a seismic disaster is not only or even mainly about buildings but may generate economic and social development; therefore, it is not exclusively an engineering issue and requires a multidisciplinary approach and, also, a long term outlook towards the future of the city even in the midst of the harsh emergency period.

The reconstruction largely achieved its objectives (Dandoulaki 2008). A first significant outcome was the implementation of the Urban Plans and the construction of the urban infrastructure and facilities that the Plan had foreseen. For instance, a park in the city centre took shape, the East and the West centres in the expansion areas of the city were developed and the transport network was improved. New economic, social, cultural and environmental infrastructure such as a marina, a courthouse, a market, an industrial park for SMEs, a waste purification and compost treatment plant, was constructed. The city‘s morphology was maintained through the protection of the identity of the area around the Castle and of the city centre and the restoration and reuse of historic and listed buildings.

Moreover, seismic safety of buildings was upgraded by introducing new seismic design specifications.

Even so, Kalamata's reconstruction had its weaknesses and failures (Dandoulaki 2008). Temporary housing remained for 10 years, far more than the two years originally planned. In spite of the urban plan and the generous extensions of the urban area, urban sprawl was not avoided (Map 3). The commercial centres created at the Eastern and Western Centre of the city extensions were not successful and gradually declined. The ring road that was considered as an essential element of the new structure of the city was not completed before 2016.

Central areas are marked in "Dk up diagonal", the urban area according to the Urban Plan of 1905 is marked in "Lt trellis" and the expansion areas according to the General Urban Plan of 1986 are marked in "Lt Grid" (lighter gray).

Map 3: The urban area according to the General Urban Plan of Kalamata of 1986 and urban sprawl in 2007 (Source: M. Dandoulaki, 2008)

Still, the reconstruction of Kalamata is a reference case and a good practice. As an indication, the city has been awarded a price by the EU for its reconstruction.

The successful reconstruction was an outcome of a whole set of factors. First, when the Kalamata disaster occurred seismic pro-

tection had already become a national priority. The establishment of Earthquake Planning and Protection Organisation (OASP) in 1983 after a unanimous decision of the Greek Parliament demonstrated the emergence of seismic protection as a central issue in the national policy agenda. The newly established OASP had a multidisciplinary orientation and advanced seismic protection in Greece taking into account the international trends in this field. A new National Earthquake Emergency Plan was in place. However, there was no institutional role for Municipalities in disaster management at the time and emergency management was entirely in the responsibility of Ministries and Prefectures.

Moreover, locally there was a strong leadership in the Municipality of Kalamata and the Mayor had built networks with the central government and held sufficient human resources and means and was actively engaged many fields such as infrastructure construction and culture.

The fact that the new General Urban Plan was published in the Government Gazette a few months before the earthquake was a positive coincidence. More significantly, the plan comprehensively combined spatial, social and developmental goals.

The urban planners from the private firm that was developing the urban plans for the city had begun its cooperation with the Municipality as early as in 1978. The same team placed itself next to the Mayer from the first hours after the disaster and voluntarily offered its assistance and consultancy. The importance of the scientific and technical consultancy at the time of the crisis proved to be essential in maintaining the long run view and the spatial outlook even in the mist of urgency and pressure.

The disaster was huge and struck mainly the city of Kalamata. The Municipality of Kalamata played a leading role in managing the disaster over and above its institutional role. The Municipality was even able to guide the rehabilitation and reconstruction of the city, setting the base for this in decisions taken during the pressing and demanding emergency phase. Having built networks, trust and knowhow before the earthquake, the Municipality with the support of the central government managed to find the financial and other resources required for implementing a visionary reconstruction.

However, the reconstruction of Kalamata constitutes an exceptional best case in Greece. The window of op-

portunity arising from the disaster and the devastation for a short time was used at a local level in order to advance urban development and sustainability. Although, many efforts of Greece cities to recover from following disasters have been influenced by this reference case, there is no example of such comprehensive successful reconstruction. Then again, the earthquake disaster of Kalamata constitutes a turning point in the earthquake policy of the country as it influenced the management of subsequent disasters. It was an opportunity to test and introduce new procedures, tools and mechanisms for dealing with disasters, to create knowhow and left a positive point of reference. Overall, it enhanced the institutional capacity of the country to deal with disasters and crises.

Discussing resilience in the case of Kalamata disaster

Reading the case of the reconstruction of Kalamata city after the 1986 earthquake disaster through the lenses of resilience is a trying exercise. A successful reconstruction in terms of reducing earthquake risk and enhancing urban, social and economic development denotes by definition a resilient city; on the other hand, the destruction and severe damages that the city suffered show low resilience. Therefore, setting a timeframe in assessing resilience seems important for the outcome of the assessment. Even so, it is practically impossible to distinct developmental resilience from disaster resilience 30 years after the disaster.

When examining the immediate and meso-phases, what constitutes an aspect of resilience is the exceptional role of the Municipality that overcame institutional barriers and gained a leading role in the critical post-disaster period. Accommodation of the Municipality within the emergency response and recovery system, no matter the occasional frictions with the central government and the Prefecture, demonstrates a certain flexibility and transformability of the formal institutional system. This was facilitated by the previous networking and trust built between the Mayor and Ministers within the political circumstances at the time.

In dealing with the disaster, self-organization, innovation, knowledge and learning capacity were evident throughout the period from emergency response to reconstruction. New schemes were created in order to deal with the situation; a temporary shelter scheme, a scheme for the organization of emergency camps, a scheme for the demolition of buildings damaged beyond repair, a scheme for finding and allocating

founding. The role of the Municipality from emergency response throughout reconstruction was itself an outcome of innovation and self-organisation, as there was no institutional outline of its responsibilities and tasks in disaster management.

Strong interaction between different spatial and time scales was present and noticeable. A long-term outlook was maintained from the first days of the disaster and measures to release "rush to rebuild" were anticipated early in the emergency phase. Ability to collaborate was demonstrated as national, regional and local level entities worked together in dealing with the situation. Moreover, the informal yet close collaboration of the Municipality with the urban planning firm that had elaborated the urban plan of the city, proved highly significant for enabling the Municipality to maintain a long-term outlook towards a comprehensive reconstruction.

Moreover, the economic and political context in the country was accommodating for a visionary reconstruction. With Greece in the EEC and a political era promoting "change", forward thinking and seeking comprehensive solutions did not seem outlandish. Nonetheless, the new approach to reconstruction was not automatically and effortlessly introduced.

Examining the broad picture, what is noticeable is how good practices from Kalamata were defused into earthquake policies and practices and effect earthquake protection in Greece up to nowadays (Dandoulaki, 2007). Changes were introduced in the institutional framework and emergency plans and know-how on a number of issues (USAR, emergency propping and removal of dangerous elements, usability and damage inspection of buildings) was spread (Ioannides and Dikeoulakos 2001). Learning capacity, memory and knowledge proved to be key elements for upgrading the country's resilience to earthquakes.

This Chapter attempted to identify aspects of resilience in this specific case. However, we must admit that our approach to the concept of resilience remains questionable, so does the selection of the suitable qualities of resilience when examining a posteriori a successful case. Even more significant, this Chapter did not manage to provide answers to the key question if resilience can in fact compensate for the deficiencies in planning and preparedness. In other words, it sidestepped the core question "Can we afford to treat resilience as more than a last resort in case planning for disaster mitigation and preparedness fails?"

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5.Tackling Climate Change and Urban Resilience in the City of Athens

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https://doi.org/10.15488/5564

Abstract
The City of Athens, a venerable yet intricate city of near 700.000 residents, part of a 3.75 million people urban area, is for several years now facing severe challenges. Those include an ongoing socio-economic crisis, large refugee flows, as well as rising temperatures and recurring heat waves, resulting from climate change. Through concerted efforts, the city has managed to survive, to adapt and to transform into a more creative and collaborative city. The struggle is by no means over. From 2016 to 2017, during a period of 14 months, calling on the insights and expertise of hundreds of stakeholders, the city drafted its Resilience Strategy. This is a set of practicable actions, which first of all strengthens what has made Athens stronger: formal and informal networks and alliances. Athens Resilience Strategy offers a set of new integrated ways to prepare and protect our most vulnerable from future shocks and stresses that the city is facing and will face. The Resilience Strategy, voted by the Athens City Council in June 2017, includes city's Adaptation and Mitigation Climate Action Plans. By consolidating power and expertise, by forming strong and diverse synergies and by opening itself to international networks and fora, Athens has managed to create an integrated framework of actions that make our City more resilient to social, economic and the significant environmental challenges that lie ahead.

Athens' resilience framework

Like many cities around the world, Athens is adjusting to the challenges of the 21st century. Hyper-connected economies are radically changing patterns in world markets and employment; the effects of climate change are increasingly apparent; social, ethnic and health inequalities are deepening; resources are becoming scarcer while consumption is growing; authoritarianism and/or ethnonational movements are on the rise. Urban communities and economies, now more than ever, as the world population is increasingly living in cities, will have to develop tools and skills to help them survive, adapt and thrive in the face of multiple and unpredictable disruptions .

Athens has experienced significant shocks during the recent past, that exposed the weaknesses of the city and the long-term stresses underlying them. The socioeconomic crisis laid bare the failings and limitations within the city. It also revealed the city's essential strengths, hidden resources and talents. The question is – how can Athens reflect, learn and proactively put in place resourceful, robust and inclusive systems that not only deal with current difficulties and shortcomings but also transform the city and make it strong and successful for a future that will bring new challenges?

The declining income, growing personal debt, and high real estate taxes, coupled with austerity measures that drove cuts in social services, hit our most vulnerable populations the hardest. Unprecedented levels of unemployment, poverty and homelessness grew in our city, exposing our lack of preparedness, together with the pressing need to have systems in place able to provide for the basic needs of the most exposed. The City of Athens rose to the challenge: through partnerships with NGOs and the private sector we built and are still building a robust system for critical relief and social services as well as a rationalized system of data collection and logistics. Moving forward, such partnerships, no less than such data collection and development systems, are being scaled up and replicated horizontally in city government, aiming towards an open and vibrant city where data-based decision making, transparency and accountability.

[1] See, the annual World Economic Forum's insight report on Global Risks – for 2017 here: https://www.weforum.org/reports/the-global-risks-report-2017

Partnerships for resilience and adaptation to climate change

In order to further address challenges that undermine both the physical environment as well as the citizens' quality of life, the City of Athens also turned to partnerships and collaborations with international city networks, such as *100 Resilient Cities* and *C40 Cities Climate Leadership Group*, consolidating methods and resources, developing capacities and knowledge. As a result, in June 2017 the City of Athens Office of Resilience and Sustainability launched an up-to-date, comprehensive and integrated action plan, under the title *Redefining the City: Resilience Strategy for Athens 2030*[2], which is also aligned with the city's operational and strategic plans. Through its Resilience Strategy for 2030 the city has already been able to attract international investments.

All collaborations enhanced the city's diversity; they thus build the city's resilience reducing its disaster risk. How does collaboration enhance diversity?

> It brings a variety of players together to work on problem solving and change. Working collectively they bring variation in resources, including financial, social and natural capital. Business can provide managerial expertise and financing streams, while civil society can mobilize communities quickly with grassroots knowledge. From collaboration, a wider range of options and ideas may emerge for responding to stresses and disruptions, including options that work at local level, closer to impacts, that may be alternatives to or coordinated with actions at higher scales (Smith 2014, 74).

But lets start from the beginning. Three years ago, in 2014, through a competitive process, the City of Athens was selected to join the 100 Resilient Cities (100RC – pioneered by the Rockefeller Foundation) network. The city engaged in an intense and participatory process in order to draft and implement a holistic, robust and realistic strategy that supports and enhances the resilience of the city for the upcoming decades. The Rockefeller Foundation created the 100RC initiative in response to growing challenges that cities around the world are facing: urbanization, globalization and climate change.

[2] http://www.100resilientcities.org/wp-content/uploads/2017/06/Athens_Resilience_Strategy_-_Reduced_PDF.compressed.pdf

The 100RC network defines urban resilience as “the capacity of individuals, institutions, businesses and systems within a city to adapt, survive and thrive no matter what kind of chronic stresses and acute shocks they experience.” By approaching cities in a systemic way and by focusing on both shocks and stresses, the resilience approach can prepare our urban centers for a wide range of challenges both known and unknown, as well as become better in both good times and bad.

Meanwhile, also in 2014, the City of Athens (an active member of the C40 cities network since 2008) requested from C40 a technical on-the-ground support to help the city develop a Climate Action Plan for reducing greenhouse gas emissions and adapt to climate change. The first step of the process concerned the development of a GPC-compliant greenhouse gas inventory. This inventory, apart from setting a baseline for Athens, permits the monitoring of activities planned or already under implementation and the evaluation of their outcomes, while allowing for corrective actions, when necessary. At the same time, equal importance has been given to adaptation; the climate adaptation action plan is used for increasing the city’s resilience to climate risks, improving the quality of life and ensuring a sustainable future for the next generations.

The City of Athens is one of the very first cities that successfully combined and consolidated the methods, guidance and resources of the two international networks/policy organizations, integrating its Climate Change Adaptation and Mitigation Action plan within a robust, horizontal and forward-looking Resilience Strategy that addresses all city systems in ways that confer multiple benefits. As mentioned before, an essential part of this whole process involved engaging effectively a wide range of stakeholders from the public and private to the third sector and the academic community. The whole process began from the bottom up.

Participation is at the core of the resilience. The Resilience Strategy for Athens 2030 was created in collaboration with city staff and elected officials, central government authorities, academics, nonprofits, entrepreneurs, and a large variety of citizens and community groups. Over a period of 18 months, more than 140 organizations and 900 citizens participated in many workshops, conferences or public events.

Athens initiated and co-hosted international meetings with fellow cities; international and local experts worked together trying to get a better grasp of the challenges the city faces.

Within the context of the 100 Resilient Cities methodology, each of the cities' resilience journey begins with a diagnostic assessment that delineates its own significant challenges: its shocks and stresses. After several months of interviewing and engaging people from different Athenian communities, including academic and administrative experts on natural and man-made hazards, it became clear that the climate change related increase of heat is one of the most important acute shocks the city is and will be facing.[3] The City of Athens is already dealing with significant Urban Heat Island effects, exacerbated by heat waves and long periods of very hot days, as well as flash floods and bad air quality. These events affect every Athenian on multiple levels including their health, economic wellbeing and quality of life. As the city's climate changes, such phenomena will become more frequent and intense. The implementation of climate change mitigation and adaptation policies should and can produce high resilience dividends[4] for a wide range of Athenians, from entrepreneurs to marginalized populations dealing with energy poverty.

Athens and Climate Change

According to the 2011 seminal study (Zerefos et al. 2011) carried out by the Climate Change Impact Assessment Study Committee for the Bank of Greece, „Athens has undergone particularly acute climatic changes over the past decades, due to the combined influence of various —mostly anthropogenic— factors, including:

- intensified urbanization, leading to a greater 'urban heat island' effect;
- global climate change, due to the greenhouse effect;
- loss of peri-urban green areas to forest fires; and
- natural climate variability."[5]

[3] The other shocks that were prioritized for the city are: earthquakes, civil unrest, and cybercrime, while the stresses that our residents highlighted are: the depressed macroeconomic conditions, migration flows, aging infrastructures, and mistrust.

[4] As Judith Rodin claims in her 2014 book The Resilience Dividend: Being Strong in a World where Things Go Wrong, catastrophe is not always preventable, but the degree of destruction and devastation can be mitigated, and cities are increasingly recognizing the need to invest in foresight and innovation no less than in diverse and redundant systems that will allow them to better "bounce back." Building resilience is also a key economic development strategy: the benefits can be seen in the city's budget lines, its economy and in greater opportunity for the residents.

The same study asserts that the average annual temperature in Athens has been steadily increasing since the 1970s. From 1970 to 2011 there has been a 1.3 ° C increase, while climate models show that for the Athens area an average peak summer temperature increase of 2 ° C is projected for the period 2021-2050 and 4 ° C for the period 2071-2100 (Zerefos et al. 2011).

Another major study on the "The Impact of Climate Change on the Greek Economy" (Kartalis et al. 2017) indicates that by the middle of the 21rst century the temperature is expected to rise by 2.5 degrees Celsius on average in relation to the period 1961-1990. Regionally, during the summer months, the increase may reach up to 3.8 degrees, with dramatic consequences for the urban areas. Heat wave days (with temperatures above 35 degrees Celsius) are expected to increase by 15-20 annually by 2050. By the end of the century, „tropic days" (more than 35 degrees Celsius during the day and more than 20 degrees Celsius during the night) are expected to number more than 50 annually in most areas of the country (Kartalis et al. 2017, 86-95).

The primary effects of the above on a city like Athens will be: depletion of groundwater and water scarcity, drought and intensification of heat waves. The secondary effects will be: intensified Urban Heat Island effects, increased energy demand for cooling, increase of energy prices, and serious impact on public health[6]. The impact will be severe in the tourism sector, also increasing the vulnerability of archaeological sites, forests and peri-urban agriculture. Extreme weather events will be much more frequent, thus the occurrence of flooding, fires and of material damage will be mounting (Kartalis et al. 2017, 182-205).

All climate change scenarios indicate that extreme heat events are expected to typify the city's future. Since 2010 we have already observed a sharp increase in the length

[5] See section I.14 Climatic Trends in the Athens Region, pp 50-58 http://www.bankofgreece.gr/BogDocumentEn/chapter_I.pdf

[6] During hot summer days, the temperature in the center of Athens is usually 6-10 degrees Celsius higher than the temperature in the northern suburbs – the Urban Heat Island phenomenon (Santamouris, 2007; Santamouris M., et al. 2015). As close to 80% of the buildings in Athens are vulnerable to heat stress (constructed before 1980), the cost of the energy consumed for cooling in the center of Athens during the summer months is already double the corresponding cost in its most remote suburbs. And it is expected to increase rapidly affecting predominately the most economically vulnerable neighborhoods of the center of Athens ((Santamouris M and Kolokotsa D, 2015; Santamouris M. et all, 2013).

and level of high temperatures, the frequency and intensity of heat waves, the UHI effects, as well as forest fires and flash floods. The density, anarchy and bad quality of our built urban fabric, as well as the lack of green open spaces, are supporting and exacerbating the problem.

The risk of extreme events, undermine many of the assumptions we've used to plan and develop our city. There is insufficient climate protection of existing buildings, while, in the vast majority, public works and new building construction disregard local climate conditions. In addition, the lack of updated legislation on energy and environmental protection for buildings and other urban infrastructure, have contributed to an increase in the urban heat island effect, the social and economic decline and desolation of the city center, the socio-economic squeeze of the lower income brackets, as well as pushing 24% of the population into energy poverty (Vatavali and Chatzikonstantinou 2016; Santamouris et al. 2013 and 2015).

Why a Resilience Strategy

The Athens Resilience Strategy and more specifically the Climate Change Adaptation Action Plan outline concrete steps for improving the urban quality of life in the face of increasing temperatures, flash floods and bad air quality. The Climate Change Mitigation Action Plan, being compatible with the objectives of the Global Covenant of Mayors for Climate and Energy, sets the target for cutting GHG emissions by 40% until 2030, which is translated into approx. 2,000,000 t of CO2eq. The main activities concern the energy upgrade of the city's very old building stock, public lighting and promotion of sustainable mobility options.

Climate Change Adaptation is fundamental to our city's resilience. The use of green and blue infrastructures in the city and the adoption of nature-based solutions for cooling the city are crucial measures, with multiple co-benefits and a potentially very high resilience dividend.

Addressing climate change requires an "unprecedented level of cooperation, not only between countries, but also between different levels of Governments and the private sector" (De Boer, 2009, p. 1). The participation of the Municipality's core administration is considered of high importance during

the process of drafting and implementing the plans. Almost all municipal departments and agencies participated in meetings and discussions as well as workshops and conferences and provided key input regarding the everyday management of the city and the current legislative and regulatory framework of Greek local authorities. Moreover, municipal officials with relevant expertise and authorities participate in internal monitoring teams which overseeing the implementation of the Athens Climate Action Plan and Resilience Strategy.

By including and activating municipal directorates and employees, the Office for Resilience and Sustainability is working towards the integration of resilient goals and performance indicators to the Municipality's annual technical plans and budgets. Thus, the City can effectively address climate change as well as other resilient challenges in a horizontal and sustainable way.

The Athens Resilience Strategy aims towards a city that is open, green, proactive and vibrant, setting forth concrete actions that address issues of maintenance, safety, efficiency and accountability, crisis preparedness and management. It presents a series of distinct yet connected actions with a clear vision of how the city can best cope with the increasing interdependence of shocks and stresses. This can be reached though eco social policies that elevate the role of local government and give it its rightful place as an important player in economic development, social welfare, environmental adaptation and technological innovation.

Athens Resilience Strategy Implementation: the First Year

If we take into consideration the plethora of research evidence regarding the rising temperatures and the recurrence of flash floods, it is puzzling how low a priority Climate Change Adaptation is for most political leaders in Greece. In such an adverse political environment the Office for Resilience and Sustainability in Athens has prioritized crucial actions from its Resilience Strategy addressing this challenge that can be implemented within the year. Those actions include the measures for awareness raising and the protection of the most vulnerable populations, the creation of a master plan for the resilient management of a landmark large green area (Lycabettus Hill) in the city, the implementation of a pilot project regarding food waste and circular economy, as well as the establishment of

renewable energy production in roofs of our public buildings.

In 2016, within the framework of the European project TREASURE, the National Observatory in partnership with the Athens Municipality developed and launched a mobile phone application with personalized information regarding real time heat related health risks for Athenian residents, including a map with cool spots for their protection during heat waves. Athens is developing an integrated communication, awareness raising and capacity building campaign targeted directly to vulnerable populations as well as the city administration staff.

Moreover, together with the Deputy Mayor for Children the Office of Resilience and Sustainability implementing a program funded by the German government to Inform, educate and raise awareness in school communities regarding energy saving. The main aim of the project is to change the culture of energy consumption initially in 80 participating schools and raise awareness regarding climate change issues.

Finally, already established successful municipal initiatives such as the *synAthina* network of civil society initiatives and *Schools Open to Society and the Neighborhood* are part of our resilience building in Athens as they are supporting citizens' participation and engagement in several municipal and other climate change related projects and initiatives. Adaptation to climate change and urban resilience in Athens are now addressed through horizontal, multi-stakeholder and dynamic resilience-building projects. New ones as well as modified or adjusted existing efforts, are going forward, producing data, new procedures, new ways of thinking with the active participation of our urban communities and our municipal staff, who've proved to be effective and resilient during times of crisis. Slowly but steadily the culture regarding data-driven, forward looking, resilient policies is changing in the City of Athens.

In conclusion

Adaptation to climate change and urban resilience in Athens are now addressed through horizontal, multi-stakeholder and dynamic resilience-building projects. New ones as well as modified or adjusted existing efforts, are going forward, producing data,

new procedures, new ways of thinking with the active participation of our urban communities and our municipal staff, who've proved to be effective and resilient during times of crisis. Slowly but steadily the culture regarding data-driven, forward looking, resilient policies is changing in the Municipality of Athens.

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Part 2

Introduction

Coping with heat islands in the dense urban area of Athens, Greece – Five concepts and integrated needs of action

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https://doi.org/10.15488/5565

Global climate change creates new challenges for urban and regional development all over the world. Adapting to a changing climate requires dealing with multiple uncertainties and complexity in order to allow proactive action. Therefore, cities and regions around the globe face the challenge of exploring flexible and innovative forms of governance which have to address specific local vulnerabilities and build capacity to accommodate future change – the resilient city as planning goal.

From 22 to 27 May 2017 the first out of three Summer Schools within the research program “HeKriS – Challenges of resilience in European” cities took place in Athens, Greece. The topic „Resilience to Environmental Challenges in European Cities“ focuses on extreme weather events in the urban area of Athens, especially urban heat islands and their consequences for humans, the built environment as well as all kinds of infrastructures and services within the city. The germinal question to be discussed during the Summer School is how to handle climate change induced extreme events as planners or architects to aim a resilient, liveable city even for future generations. The task to come to an integrated perspective on the phenomenon of urban heat islands in several neighbourhoods of Athens was realized by five mixed working groups of German and Greek students. The concepts to be developed should not only include aspects about the built environment (like density of housing, fresh air corridors etc.), but, furthermore, questions about planning processes and awareness-rising on the local level, about dealing with uncertainty and complexity and reflecting on the roles of different stakeholders should be raised.

The scope of work for the Summer School

Urban heat islands are one of the major challenges in Athens during summertime and will even get more problematic with the ongoing climate change (see Founda et al. 2015). The participating students had to identify these heat islands within a specific neighbourhood, to develop a concept how to tackle this challenge and to describe in detail what this could look like, how the process of implementation can be organized or which stakeholders can be integrated in their concept. The outputs are three posters from each group, including analyses, concepts and detailed plans encountering the above mentioned challenges. These are presented and discussed at the end of the summer school in the auditorium of the participants and keynote speakers.

The neighbourhood the students work with verge on the “Larissa Railwaystation” in the west and the places “Karaiskakis Square” and “Omonia Square“ in the south. In the central of the neighbourhood there is the „Viktoria square“ and the „archaeological museum Athens“ next to the National Technical University of Athens. One of the largest public parks „Pedion tou Areos“ is located in the east of the studied neghbourhood.

Figure 1: Studied neighbourhoods in the summer school (Source: Google Maps 2017, changed)

Five student groups started their analysis of the areas by literature reviews on urban heat islands and make fieldtrips to get to know the neighbourhood on-site. This was part of in the first poster: Where is the neighbourhood situated? What characterizes the local context (built environment, societal dimension, and environmental aspects)? How is the surrounding affected by heat islands? What are the main challenges

for you? The second poster should illustrate the main idea of a concept responding to the challenges analysed in the first poster: Which solutions should be realized for preventing the consequences? What visions can change the built environment as well as planning process designs as part of an actor-centred approach? By means of the third poster the students give a closer view through one or more details of their case study. Some of the concepts focus on a large scale, others worked out detailed aspects of their concept either spatially-bounded or facing on spatial relations. Furthermore the time horizon of the concepts differs quite a lot: some concepts play on middle-term effects, others focus a long-term implementation.

Figure 2: Participants of the summer school (Source: Frank Othengrafen)

Five concepts and some integrated needs

It is interesting, that starting from international literature and having included the local circumstances all concepts emphasize on so-to-say green solutions. Greening the neighbourhoods plays an important role, especially where the built environment seems to be very dense and unrealistic measures like changing the built environment are not taken into account. Another aspect worth to mention is that in most cases the scope of action doesn't end with environmental issues, but instead tries to find multi-layered solutions to several challenges like social, financial or economic issues. So, an integrated perspective on the challenges climate change increases on the local level is presented in all of the five following concepts:

The concept **Green Networks Exarchia – Resilience Strategy 2050** wants to create a greener, safer and more resilient neighbourhood with more leisure areas, more pedestrian zones and pittoresque streets while improving the overall air quality. For the implementation the concept consists of seven steps (1. Information of the public, 2. Emerge self-awareness,

3. Introduction of an intelligent guidance system for traffic, 4. Implementation of incentives to increase multimodality, 5. Implementation of green corridors, 6. Implementation of pocket parks, 7. Connection of spaces and corridors by creating the “green network”). Important condition for a successful realization is the willingness of the local community and the possibility of financing it.

Transforming heat islands to neat islands focuses on three main goals to reduce air temperature and as side-effect to improve the quality of living in generally. The goals cover economic, societal and environmental issues. By reducing heat islands, increasing resilience of the study area and in the long run of the whole city of Athens as well as defining an ‘environmentally friendly development’, the concept contains an action and monitoring plan.

On a residential, district and city level with short- and log-term aims the concept **Inclusive Green for Tackling the Urban Heat Island Effect in Athens** highlights mental and physical health, economic, social and environmental benefits. Through different actions and measures such as transforming Atriums as Miniature Parks, implementing Awareness Raising Campaigns, opening public spaces and a long-term Pilot Project “The Public Park-Station”, the integrative approach by including private as well as public spaces establishes an overall turn of the district in terms of resilience.

With the help of the App “Greender” the concept **The Victoria Square Neighbourhood** tries to create social and environmental resilience through neighbourhood networking. The aim is to plant and share food in community Gardens as well as to reduce traffic and emissions through car sharing. Greender helps to coordinate the network and sensitize people in the topic urban sustainability.

Wind of Change consists of short-term actions such as temporary measures and a launch event to empower the residents to get involved in their neighbourhood‘s development. By discovering dedicated persons and informing relevant actors and groups in events and working groups, ideas will be collected and different projects were launched, implemented and monitored. This will lead to a change of mindset.

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Green Networks Exarchia

Resilience Strategy 2050

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https://doi.org/10.15488/5566

Introduction

The phenomenon of urban heat islands (UHI) in Athens is well documented (Livada, Santamouris and Assimakopoulos 2007; Mihalakakou, Santamouris, Papanikolaou, Cartalis and Tsangrassoulis 2004). Studies range from descriptive research on the phenomenon and its development for the last decades to impact studies and adaption measures (Santamouris et al. 2015). However, the relevance of this topic is shown by this year's temperatures of over 40°C in the inner city and its densely populated districts accompanied by increased ozone levels (Eurometeo 2017, www). Impacts are of environmental, economic and social nature (ibid.).

The "Green Networks Exarchia" is a plan on how to tackle the problems of urban heat island in the city district of Exarchia in Athens. The "Green Networks Exarchia" describes the idea of connecting parks and micro-parks by transforming the streets into green corridors. The overall goal is to reduce the problems heat islands by exceeding green spaces and reducing traffic. The steps to develop this idea were to determine the problem in general, to identify the problem in the district of Exarchia, to assess the goals and to elaborate ways to improve the situation.

To conduct these tasks, a variety of knowledge and different points of view were necessary. This included, on the one hand, the views from different academic fields such as architecture, environmental planning and urban planning and on the other hand considers the different scales of the problem. Each field played an important role to achieve the results. Environmental planning, for instance, played a huge role in identifying the problem and designing the ways of how to green the spaces. The field of architecture contributed a lot in terms of concrete measures and how to implement them in the city district. The field of urban planning was important to coordinate the project and to plan the network itself. Although the project focused on the district level, all scales were important to observe. While the likelihood of heat waves will be influenced by the global phenomenon of climate change, the measures to react to the increase of heat days and UHI must be implemented on the local level.

Figure 1: Location of Exarchia District in Athens (Source: Google Scribble Maps 2017)

Methods

The process of strategy building was accompanied by several methodological steps that helped to develop a tailored strategy for the city district Exarchia.

The first step is the landscape planning stroll through the district where the aim is to get an impression of the research area, make first observations and to formulate theses. This method derives from landscape planning and helps to understand an area's history and prevents from making false presumptions that originated somewhere else (Hülbusch 1988, 1). Observations and first theses were logged to integrate them in the next steps.

The scientific input by experts and stakeholders on the topic during the week was extended by a profound analysis of literature and geodata. Especially geodata on topics of local heat islands in Exarchia, traffic density, public green spaces and amount of sealed surface were considered.

With this knowledge basis, visions were formulated on how the district of Exarchia needs to develop to tackle UHI. The backcasting method was used to formulate desired future conditions and to define steps to attain those conditions. Developed in the 1990s the method works "backwards from a particular desired

end point to the present in order to determine the feasibility of that future and what policy measures would be required to reach that point" (Robinson 1990, 823). The outcomes of that process are presented in the third chapter: *Seven steps to create a Green Network*

The District Exarchia

Athen's district Exarchia is located between Panepistimiou Road, Alexandras Avenue, Patision Road and Lykavitos Hill. Characteristic landmarks are the National Archeological Museum, Strefi Hill, the University and Exarchia Square. Its residents consist mainly of students, immigrants and older people. The district is known for its young and alternative character, as a centre for protest actions and demonstrations as well as for neighbourhood initiatives such as Parking Parko, a former sealed parking space that has been turned into an urban gardening project (Parko 2015, www; Parking Parko 2009, www).

Figure 2: Parking Parko - From Non-Place to Common Good (Source: Wordpress 2017)

Seven steps to create a Green Network

Based on the basic principles of heat islands, urban resilience and the insights collected during the summer school in Athens, the project of “Green Networks Exarchia” was developed by the group. In order to develop the idea, different methods were used and targets were set. The aim was to form an overall strategy that should target the problems of the area. This strategy was based on three different goals and is designed to be implemented in seven different steps.

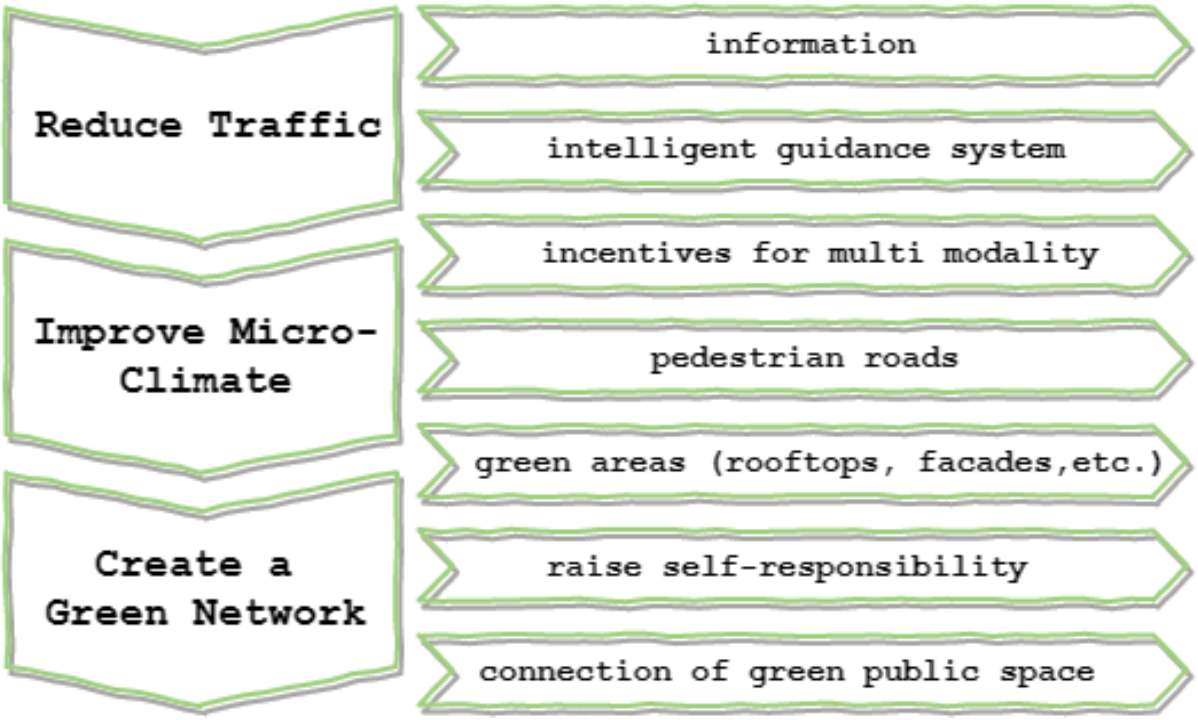

Figure 3: Green Networks Exarchia.png (Source: Own Depiction)

Since the goals and steps of the project had to fit to the district of Exarchia, the first step was to develop an idea of how Exarchia looks like, how the area is constructed and how it is used. From the side visit and the information of the Greek colleagues, it became clear that Exarchia is a dense area with some free spaces and a high attractiveness for young people. The neighbourhood seemed to be very vital and was full of people by day and night. One of the problems of this well-frequented neighbourhood is that due to the narrowness of the streets, the number of visitors is too high to allow an easy traffic flow. An additional factor that hampers the traffic flow is the number of parked cars, which exacerbate the problems of the narrowness. Part of the problem is the violation of no-parking zones (see Figure 4).

Figure 4: Solomou street, Exarchia (Source Google Street View n.d.)

Based on the central observation of these traffic flows and the fact that traffic is one of the main anthropogenic factors of heat within a city, it became clear that traffic should be one of the main targets of the project (Founda et. al. 2015, 1). The idea was to reduce the car traffic and to promote other forms of transport. The reduction of traffic was set as a general goal of the project, besides this, the idea was to create new green spaces. Green spaces are in general recommended to cool down an area and are factors to improve the microclimate of an area (Kleerekoper, van Esch, Salcedo 2011, 31f). The idea to improving the microclimate in that area was set as a second goal. In order to connect the first two goals a combination of these goals was created, which became the title of the project. The creation of a “green network” was set as the third goal. The main idea of this “green network“ is to connect the existing green spaces in Exarchia by green roads. These roads should be pedestrian zones and should provide enough green spaces to have a cooling effect on the streets. Furthermore, the hope is that the connection of these green roads with the parks can help to create aisles for fresh air.

In order to establish such a “green network”, seven important steps were set out. All of these should be implemented to successfully transform Excharia in a resilient neighbourhood and to establish the “Green Networks Exarchia”. These seven steps are:

1.) To inform the public about the connection between their personal behaviour and the heat island, especially in regard to their mode of transport. This raises the self-awareness of the people.

2.) Emerged from this self-awareness, the people should be incented to green their streets and roofs on their own, for instance in a district-wide competition for the greenest streets. Furthermore, the self-awareness raises the acceptance of the changes that should be done in the district.

3.) The first major change that need be done is the introduction of an intelligent guidance system for traffic. This will help to bind the traffic on a few major roads and helps to decrease the traffic in the smaller streets. The idea is to create a system in which fewer streets are needed and major roads are used. The concept behind is the creation of a system with fewer crossroads and intersections.

4.) In addition to the intelligent guidance system incentives to increase multimodality will be implemented. This will help to further reduce the traffic and will make more roads dispensable for cars.

5.) The dispensable roads will be transformed into green corridors. These green corridors can be a mixture of green spaces, walkways and biking paths. The mixture depends on the size of the street and the wishes of the residents of the area.

6.) Parallel to the green corridors, green spaces and pocket parks will be constructed on empty spaces within the area. The green spaces will be implemented on the larger sides, while the pocket parks are planned as an alternative for smaller sides.

7.) The final step of the idea is to connect the green spaces with the green corridors and by that to create the “green network”. The extension of the network can be done step by step and neighbouring districts can be connected to it as well.

As a start for the “Green Networks Exarchia”, the focus is set on connecting the existing parks such as Lofos Strefi, Exarchia square and National Archaeological Museum of Athens. The creation of new parks and the decision on which roads will be transformed should be decided in consultation with local actors. A first draft was developed by the group (see Figure 5), this draft was based on the results of analysing the data on heat problems, street infrastructure, existing green spaces and the structure of the built-up area. In terms of an extension of the project, different neighbourhoods are suitable. Especially a connection with the Pedion Areos would be desirable.

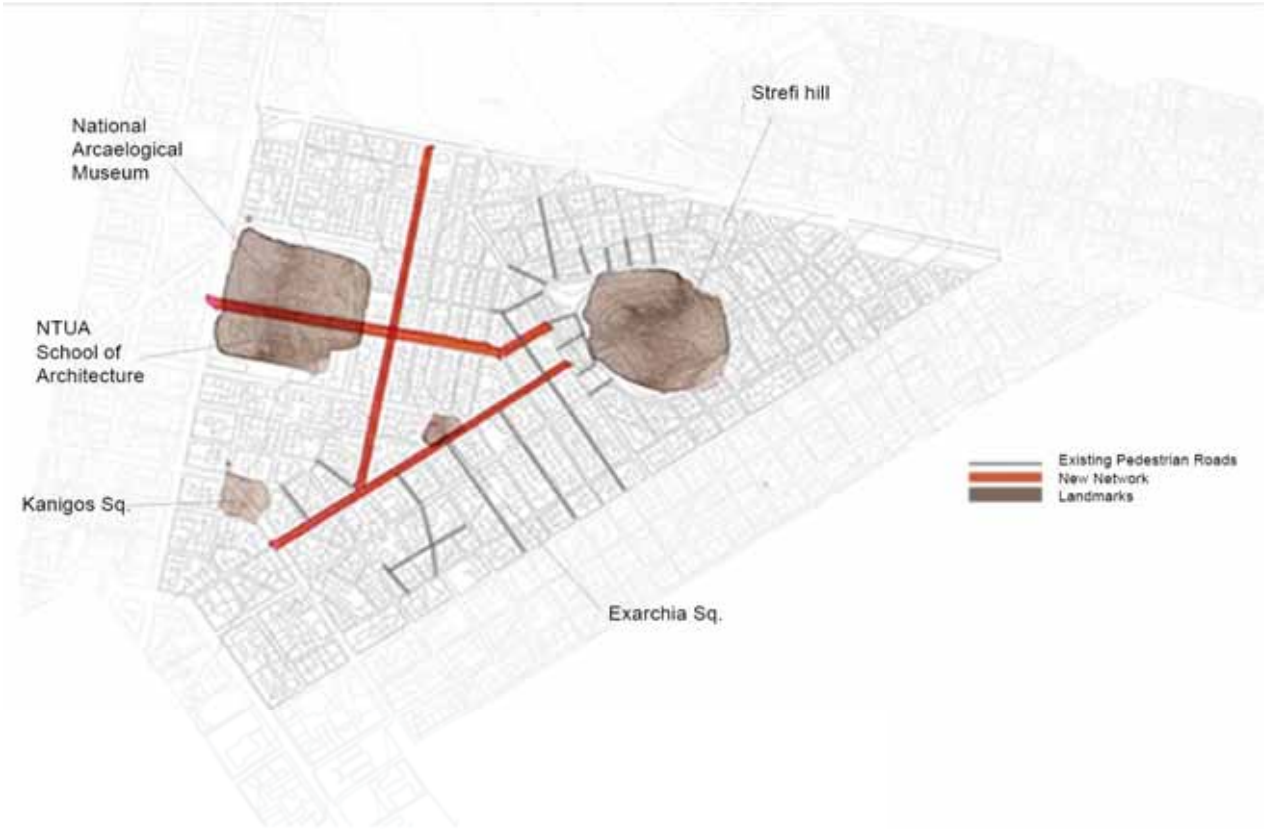

Figure 5: Green Networks Exarchia Darft (Source: Own Depiction)

Besides the large steps in implementing the network, some small-scale measures can be implemented to support the network. These measures include ideas like green rooftops, vertical gardens and sunshade sails. In order to react to the fact, that the “Green Networks Exarchia” cannot completely get rid of the heat island problem, the network will also include measures in order to react to the problems caused by the heat. Therefore the parks of the „Green Networks Exarchia“ have an additional function.

The parks also function as the hubs of the network and are used as meeting places in case of an external stress, such as a heat wave. In order to fulfill this function, the parks should be equipped with a first-aid station, which should include a defibrillator, mineral supplements and other medicine. The idea of pocket parks is not a new concept and already exists in several cities around the world such as Copenhagen or New York (DAC 2017, www). Not only does it influence the openness of city districts it also fosters the identity process in communities (ibid.)

Figure 6: Paley Park, NY (Source: Flickr, n. d.)

Figure 7: Possible locations for First Aid Stations and Pocket Parks (Source: Own Depiction)

There are different challenges related to the „Green Networks Exarchia“, which will have to be investigated before the project can be planned in more detail. The first question to be addressed is how the local actors will react to the idea. Especially since Exarchia is one of the most controversial neighbourhood in Greece. Exarchia has a long history of alternative and youth lifestyle and has been discussed in media since the 1980s for its problems (Vradis 2012, 28). The district is sometimes referred as “the heart of European resistance to capitalism” and home to the anarchists of Greece (Pilic 2015, www). Fights between anarchists and the police happen on regular basis until today (Taz 2017, www). To avoid more conflict potential the consultation of the people inside the area needs to be considered. This consultation will not be easy or maybe even impossible, considering the fact that the driving powers of the district seem to be groups of the neighbourhood and not the local authorities. The question is if the arguments of a greener, safer and more resilient neighbourhood can convince the anarchist groups to allow a government led project in the area or if the crack between these groups is too dominant. Without the local support the project has no chance to be implemented at all.

The second huge challenge of the project is the question of how to finance it. The financing of the project will be difficult due to the financial status of Athens. The Greek financial crisis and the austerity measures have also influenced Athens financial possibilities. Until lately the situation was getting worse for the people due to the austerity measures (Davidson 2015, www). Though the credit rating of the city by Moody‘s has changed in June 2017 from Caa3 to Caa2, which indicates a positive outlook (Josifov 2017, www), the financing of any nonessential measures will be tough to negotiate. Therefore, Exarchia might not be the first district to benefit, especially considering the circumstances of anarchist groups in the area. The problem of financing was considered during the design process of the project. Some parts of the network, like the pocket parks can be implemented by the residents of the area and are not relying on public spending. Further measures are designed to be implemented step by step and over a longer period. This would allow financing the project in small payments. Yet the whole network will be quite expensive both in construction and in maintenance.

One other challenge of the „Green Networks Exar-

chia“ is relying on the idea of networks and deals a lot with traffic. Therefore it is unrewarding to just take a look on one neighbourhood. In order to make the „Green Networks Exarchia“ a success, it needs to consider the neighbouring area and even more areas, for instances the area of origin of the people who commute to Exarchia. The in and out commuting of people need to be considered for the traffic guidance system in order to create a functioning system. These problems could not be considered during the development of the project due to the limited time. Therefore the described and developed project can only provide a first draft for a “green network”.

Conclusion

The project of „Green Networks Exarchia“ shows one possibility of how a city district can be transformed in order to create a greener, safer and more resilient neighbourhood. The project deals with one of the major shocks, which can strike a city like Athens. The chosen focus is the problematic of heat islands, one of the most urgent ones in Athens, considering its impacts today and the fact that climate change will make the problem even worse.

The idea of „Green Networks Exarchia“ was designed to implement resilient measures for the future, by making the people benefit from its design today. The „Green Networks Exarchia“ would create more leisure areas, more pedestrian zones and nicer streets while improving the overall air quality. The network can improve the health and the way people enjoy their neighbourhood from its implementation onward. These are only the side effects of the overall aim of improving the resilience against a possible shock. But today this brighter future for the neighbourhood depends on a community that is struggling with other problems.

The main factors which will determine the future of the area and the future of the „Green Networks Exarchia“ are the willingness of the local community and the possibility of financing it. The circumstances today do not seem to favour the project. But if the local community can be convinced by the project and a financing can be ensured, the „Green Networks Exarchia“ will not only help to decrease the likelihood and the impact of heat islands, but furthermore will give the district a greener, safer and more enjoyable design.

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Transforming Heat Islands into Neat Islands

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https://doi.org/10.15488/5567

Introduction

The resilience of cities has become an important topic to be considered by authorities in planning (Myrivili 2017, oral). Nowadays, many cities need to face various problems caused by environment, such as earthquakes, heat islands or floods (ibid.). The case study takes place in the centre of the city of Athens, to which the main emphasis has been paid during the research. This place also has to fight the shock of heat waves that occur during summer seasons on a daily basis (ibid.). It is not only a challenge for planning authorities, but most importantly it affects people who live in such areas.

Therefore, the heat waves have a significant impact on Athens' neighbourhoods, as its occurrence makes those areas barely liveable for people (Papaioannou 2017, oral). It is mainly burdensome for the inhabitants of such districts, where the surrounding areas have not been improved in ages, have not followed the newest and more socially friendly standards, which could reduce heat islands and therefore provide inhabitants with more liveable places to live in, like the researched one (ibid.). The proposal of transforming the heat islands to neat islands in the central district of Athens focuses on the creation of new green and clean places, where people could gather together, but at the same time, these areas would be efficiently reducing the phenomenon of heat islands.

Analysis

To establish a concept and further possible actions, there is a necessity to conduct a detailed analysis of the designated area. The designated area to be analysed is located in the central part of the city of Athens (see Figure 1). Centrally located districts, such as the researched one, are more exposed to occur as a heat island, because of very densely built, crowded and highly populated areas (Papaioannou 2017, oral).

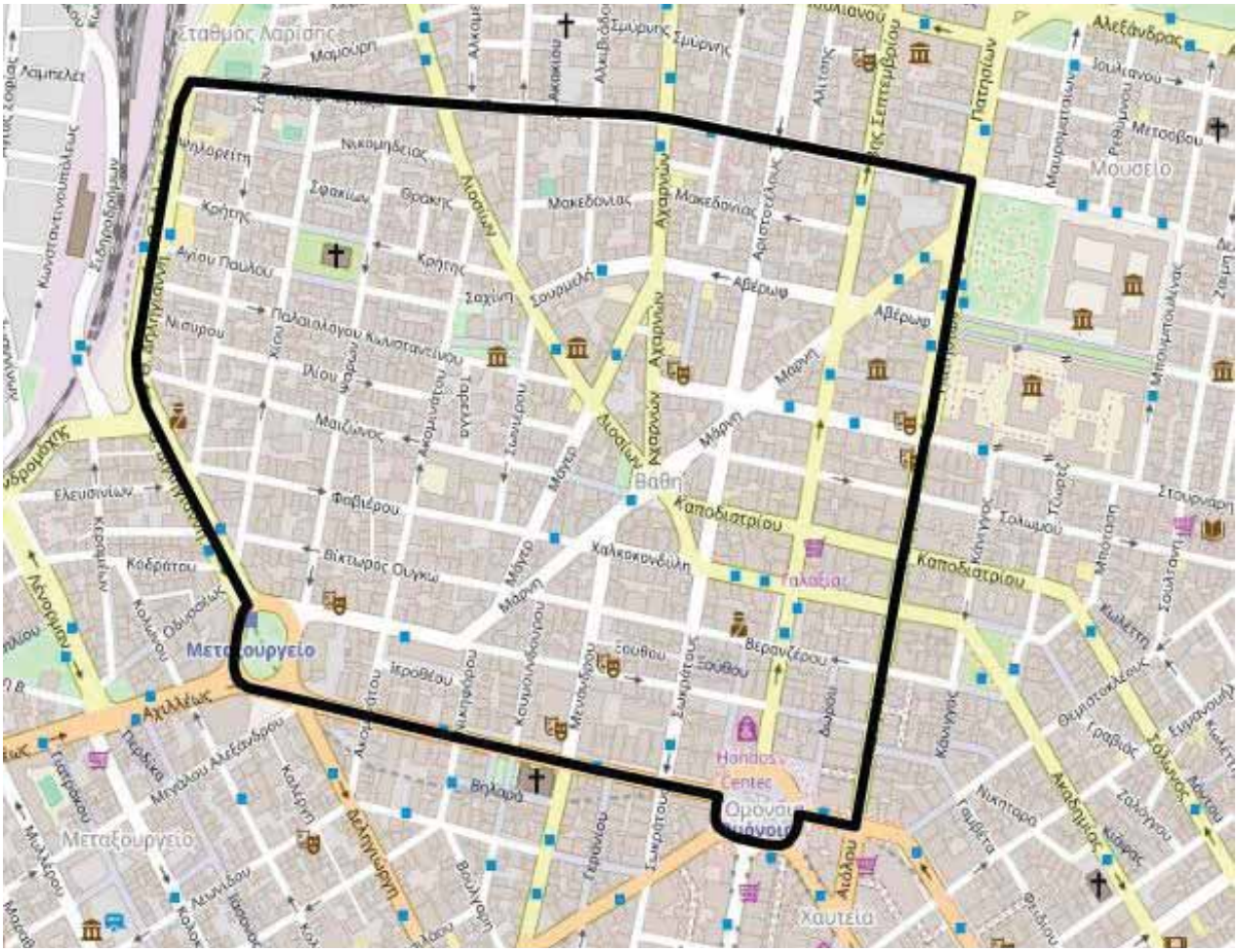

Figure 1: Borders of the Athens area (Source: Own Depiction based on Open Street Map 2017)

It is bordered to the south by the city center of Athens, where the Omonia Square is located (see Figure 1). It is a historically important place for Athens, because it was a crucial part and the final point of the famous visionary plan of Schaubert, that formed the new parts of the city of Athens in 19th century (Andriopoulos 2015, www). During the site visit, the Omonia Square appeared to be a vibrant and crowded place, where people of different social background could be seen, such as immigrants, business people as well as tourists and locals. Therefore, the place seemed to be the so called central part of the analysed area.

The Omonia Square, as being the main point, where five important thoroughfares meet, is always busy and full of car traffic (see Figure 2). Without a doubt, it has a significant impact on the occurrence of heat islands in this place.

Figure 2: The crowded streets of Omonia Square in May 2017 (Source: Own Photography)

To begin with the analysis, the necessity of designation of places with different characteristics appeared as the main step to move forward, while working on the resiliency against heat islands. During the site visit, the authors decided to divide the district into three “heat zones” - hot places, warm places and moderate places (see Figure 3)(see Table 1). The division and affiliation to the before-mentioned zones were based mainly on the existing crowd, car traffic, the occurrence of green areas and others.

Hot areas	**Warm areas**	**Moderate areas**
• High pressure on the area • A significant need for action! • Mainly primary roads are affected	• Medium pressure on the area • The existing squares, gardens and open spaces are affected	• Low pressure on the area • No need for a comprehensive change • Mainly secondary roads

Table 1: Determined division of the Districs and its characteristics (Source: Own Depiction)

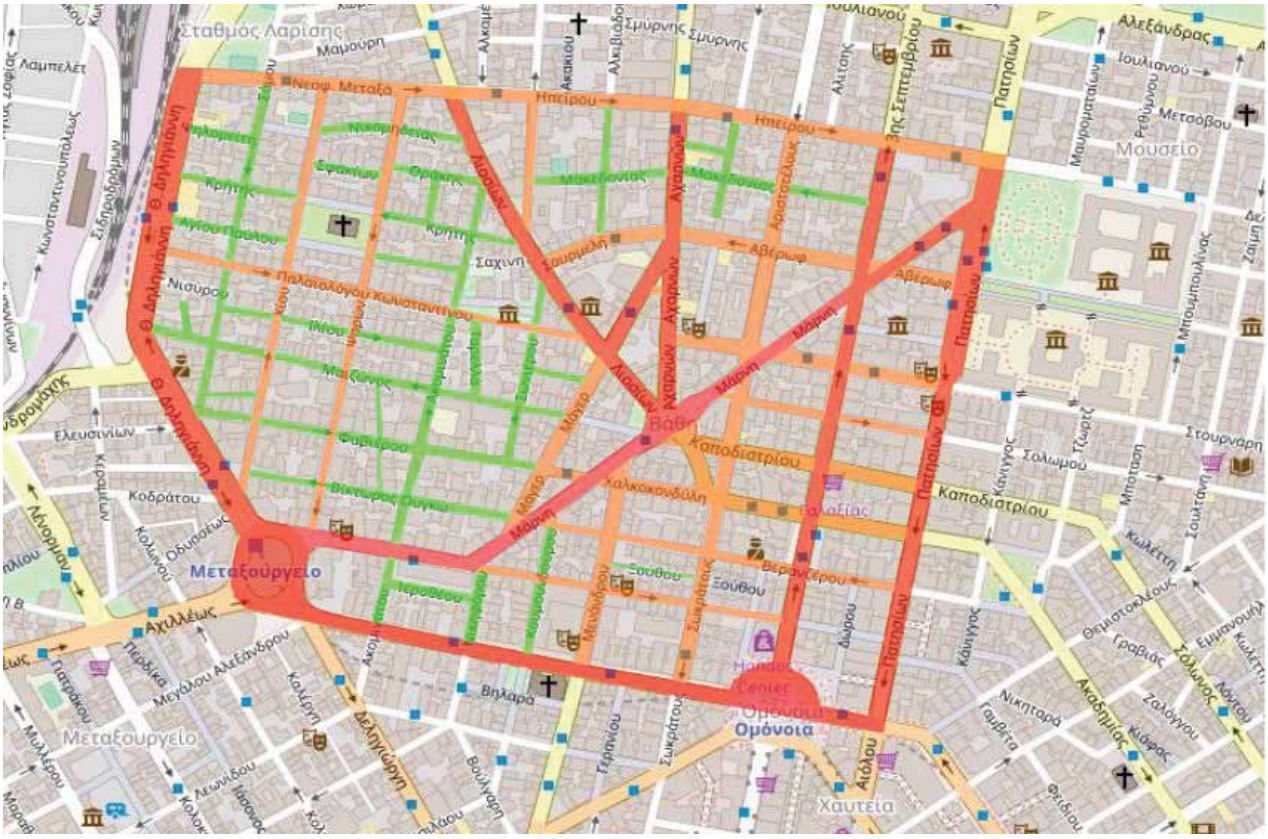

Figure 3: The distribution of hot (red), warm (orange) and moderate areas (green) in the analysed district (Source: Own Depiction based on Open Street Map 2017)

The so called hot areas include the above mentioned central place of the district – Omonia Square, but this is not the only area to be considered as vibrant and crowded. The streets Agoiu Konstantinou (southern border of the area), 28s Oktovriou (eastern border of the area), as well as Marni, Acharnon and Liosion streets (main streets in central part of the area) (see Figure 3). If it comes to the main topic of the work, vulnerable places, as the above mentioned, are at the highest risk to be affected by heat waves. Not only the fact of being crowded and busy is taken into consideration, but also a low amount of trees and any other kinds of greenery, as well as its high and densely built streets. Therefore, crowded pavements, constant car traffic, lots of exhaust fumes, no greenery and low air circulation caused by the existing architecture favors the emergence of heat islands.

Moreover, many parts of the researched areas have been introduced as warm places, to which such areas like highly important side streets of the main thoroughfares in the eastern, northern and central parts of the districts are included (see Figure 3). Less busy streets and more green areas are the characteristics that create places friendlier for the inhabitants and

at the same time reduce the vulnerability to heat waves (see Figure 4). Nevertheless, it does not negate the possibility of formation of heat islands. The warm areas are less vulnerable than hot areas. However, the authorities have to pay as much attention to them, so that the situation there does not get worse and eventually prevents from a higher risk and vulnerability to heat.

Figure 4: The so called warm place located in the norhtern part of the district (Source: Own Photography)

The least exposed areas are the so-called moderate places, which include all side streets in the western parts of the researched district (see Figure 3). They are characterised as places with low car traffic and a high number of trees that creates shadow, which is considered as necessary to limit the heat (see Figure 5). These streets do not need as many comprehensive changes as, in contrary, hot zones and some of the warm zones, because the pressure on them is much lower. Many abandoned and degraded buildings in the western part of the analysed area seem to have a crucial impact on the traffic situation, which notably contributes to the issue of heat islands.

Another important and final part of the analysis was determining the key characteristics of the district. As city resilience, and more specifically resilience to heat islands, is a complex term, therefore the key characteristics include various aspects, such as the current situation of the district‘s urban structure, social milieu and green infrastructure (see Table 2).

Figure 5: A side street in the western part of the analysed district: a moderate area (Source: Own Photography)

Key Characteristics

Urban structure	Social milieu	Green infrastructure
• Dense urban structure • Multi-story buildings • Primary and secondary roads (main roads in one way streets) • Low quality of public space.	• High number of immigrants • Shaped by working class • Inhabited mainly by elderly people (a little number of children)	• Partly green infrastructure • Conflict between green elements and public transport infrastructure • No connection between green spaces

Table 2: The key characteristics of the district based on conducted analysis (Own Depiction)

The key characteristics of the district have been divided into the three above mentioned aspects that should be taken into consideration to create the further concept of a resilient city. The urban structure on the analysed area varies a lot from each other. Nevertheless, the whole district is densely structured, especially along the main thoroughfares and Om-

onia Square. Most of the area is built by multi-storey buildings, except of some parts in the western of the district, where many buildings are degraded and of lower quality.

Another covered aspect is a social milieu, which has a significant impact also the case of city resilience to heat islands. It is the society, who might need to change their habits to obtain predicted results. During the site visit, the authors established an average profile of the inhabitants, which is an immigrant from a working class. The central and western areas were mainly inhabited by elderly people, which might need more effort from authorities to change their habits during the process of introducing proposed actions.

The third aspect to be considered is the existing greenery. The district is quite well equipped with green areas. However, there is no link appearing between the existing ones. Nevertheless, there is a big potential for authorities to create a network of green spaces, which would have a positive impact on the perception of the area, as well as it could powerfully delimit the occurrence of heat islands. Currently no green infrastructure, such as green roofs or green walls, exists in the district, but the multi-storey building at the main roads could be a good base to start such investments.

The completed site visit has led to a meticulous analysis, which helped with understanding the covered area and eventually to achieve better results during the further work on concept and action plan. The researched area has a lot of potentials that are deeply hidden by now, but some actions might actually completely change the reality in central Athens.

Concept

A change of urban structures to reduce heat islands can have multiple effects. While the main goal is to reduce the air temperature, the quality of living can be generally improved. For instance, the implementation of green infrastructure primarily has a positive effect on the temperature. Furthermore, it has a very positive influence on the quality of public space in general. Improved microclimatic conditions result in better air quality. Trees and other plants create a more liveable environment. Therefore, it is more likely for inhabitants to spend time outside their buildings. As a result, the new urban environment is not only cooler than the old one, but also more attractive to use – a heat island is transformed into a neat island.

Planning with a scenario is a successful way to prepare urban neighbourhoods for the future (Schoemaker 1995). As increasingly urban heat islands are predicted in the case of neighbourhoods in Athens, the authors of this chapter defined three main goals to achieve improved living conditions in the case study area. These goals cover the three dimensions of economy, society and environment to achieve a comprehensive and inclusive concept.

The first goal is to reduce heat islands. According to the International Panel on Climate Change surface air warming will reach figures between 1.1 and 6.4 °C on a global stage until the end of the 21st century (IPCC 2007). Athens, in particular, is suffering from increased urban heat. As the optimal outdoor temperature to prevent temperature related deaths is defined as 17 °C (Hoyois et al. 2007), a change of the urban environment is required. Several actions are targeted. Opening the built environment towards existing green spaces can improve the flow of fresh air into the neighbourhood. Creation of 'green infrastructure' like green walls and roofs can have a positive influence on the local climatic conditions. Cities like Paris and Rotterdam are already successfully implementing large-scale green infrastructure in certain neighbourhoods (Mairie de Paris 2017, www; City of Rotterdam 2017, www). Several studies executed in cities with different climatic conditions such as Tel Aviv, Gothenburg, Bucharest and in several Japanese cities provide valid data concerning the effects of green infrastructure.

In a range of 100 up to 1000 meters, green infrastructure can force a cooling effect of 1-4.7 °C (Schmidt 2006). Especially trees are very effective (Rosenzweig et al. 2006). Data shows that a single tree is able to replace more than 10 air-conditioning units, which is equivalent to 20-30 kW power saving (Kravcic et al. 2007). Within research areas in different cities, green infrastructure was able to cool down the local air temperature up to 5.9 °C (Upmanis et al. 1998). Cooling effects resulted in energy savings up to 40% (Yukihiro et al. 2006). Additionally, the implementation of water springs and fountains is an effective tool to cool down urban heat islands. Due to the absorbing function of water, it functions as a heat buffer. "Water has an average cooling effect of 1-3 °C to an extent of about 30-35m. Water applications, in general, are more effective when they have a large surface, or when the water is flowing or dispersed, like from a fountain" (Kleerekoper, Van Esch, Salcedo 2012).

The second goal is an increasing resilience of the study area and in the long run of the whole city of Athens. From a governance point of view, the promotion of political willingness towards an active participation is necessary. Green measurements need to be supported. Funds must be given. The creation of a green economy must be supported proactively. Last but not least, the public, as well as nongovernmental organisations should be involved.

The third goal is defined as an 'environmentally friendly development'. It includes green education as well as different forms of incentives for environmentally friendly actors in the neighbourhood. As pointed out by Yukihiro et al. (2006), urban heat is related to a higher energy consumption. Therefore, solar panels and alternative modes of transport should be implemented. Several proposals for a new environmentally friendly public transport are proposed by the authors of this chapter. Main tools can be the introduction of electric cars, the development of the existing public transport network and the implementation of a comprehensive and connected bicycle network. Overall concepts are provided for example by Carlow and Yeon Wha (2016). A visual example is given in the following chapter.

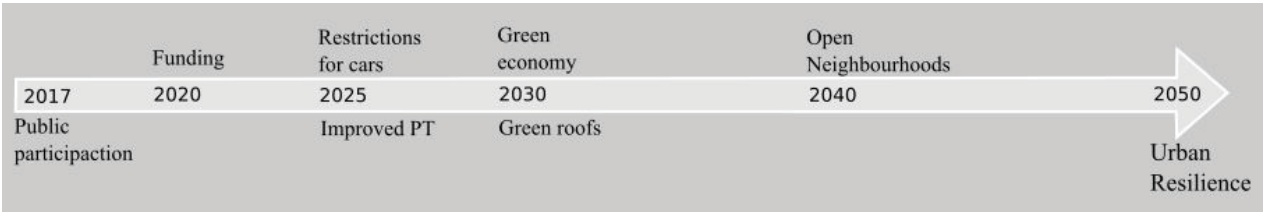

Figure 6: The timeline of predicted and planned actions (Source: Own Depiction)

Monitoring is an important tool to ensure the success of long term projects (see Figure 6). Schedules can help to ensure that certain steps are executed in time. In the case of the heat island strategy, public participation must be ensured from the beginning of the project. Funds must be created in the initial phase as well. Nevertheless, its implementation might be finished after three years. Transforming the built environment takes, even more, time and should be totally implemented after 25 years. The main goal for 2050 is a district that is totally resilient to urban heat islands. Impacts of climate change are lowered. Green spaces prevent high temperatures in public spaces. In the following subchapter, an example for the implementation is given.

As pointed out in the previous subchapter, economical, ecological and social framework conditions have to be mentioned when fighting urban heat islands. Nevertheless, the transformation of the built environment is the core action for changing heat islands to neat islands. The central area of the district, where warm and hot zones meet has been chosen for the introduction of the authors‘ action plan. It is an area, where busy car traffic throughout the day and one remotely is located and hardly reachable green space can be observed (see Figure 9). Moreover, within such a small area, three big sized parking places can be observed, whereas two of them are located on brownfield sites, which could be easily redeveloped (see Figure 9). Therefore, the authors decided to include the redevelopment of above-mentioned parking lots into a network of green areas in their plans (see Figure 8). Within the actions, the already existing green space should be upgraded by using local flora and is connected with the newly established ones.

A best-practice example is the Baana Foot- and Bikepath in Helsinki, Finland. Formerly used as a railway line, it is nowadays accessible for pedestrians and cyclists (see Figure 7). Opened in 2012, it provides a link between two major parks in the city centre of the finish capital (City of Helsinki 2017, www). The new urban space is equipped with local flora and fauna. Due to its different altitude, it is separated from car traffic. Compared to the road level, heat, noise and air pollution are effectively lowered.

Figure 7: The Baana Foot- and Bikelink in Helsinki, Finland (Source: Own Photography)

As seen in Helsinki, transformation of brownfield sites into urban green spaces can unlock a lot of potential. Small retail units like kiosks can compensate the loss of income formerly generated by brownfield sites functions. An additional incentive can be proposed by local authorities: costs for the brownfield owner can be demolished if the authority is in charge of the green space maintenance.

A creation of green infrastructure like corridors of trees between green spaces leads to a green network that covers the whole neighbourhood (see Figure 8). Last but not least, the installation of springs is an effective way to prevent heat islands and to lower its effects by decreasing temperature.

The proposed concept includes the upgrade of existing green spaces, the transformation of brownfield sites, as well as the connection of all relevant spots with green infrastructure. All these actions are based on and supported by governance actions that were explained in the subchapter before. They can lead to a decreasing urban vulnerability to heat and eventually reduce the risk of an occurrence of heat islands in the area proposed for the action plan.

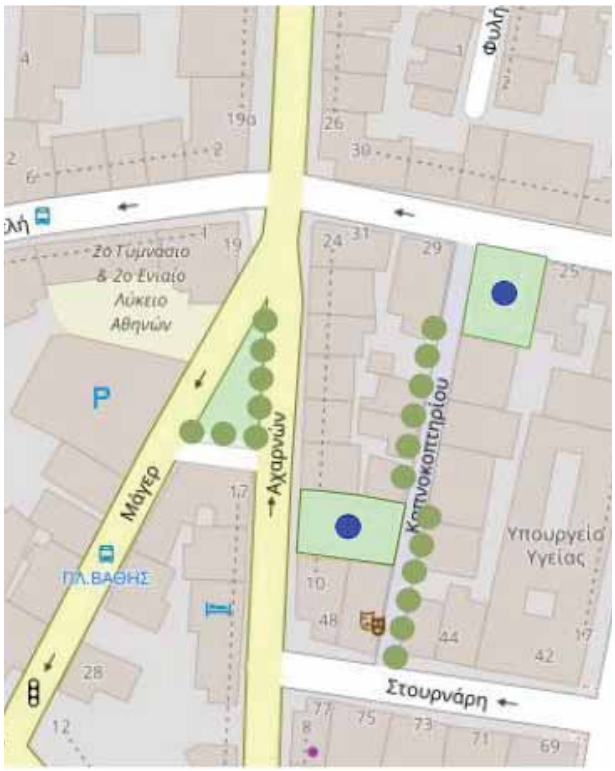

Figure 8: The vision of the central part of the analysed district (Source: Own Depiction based on Open Street Map 2017: www)

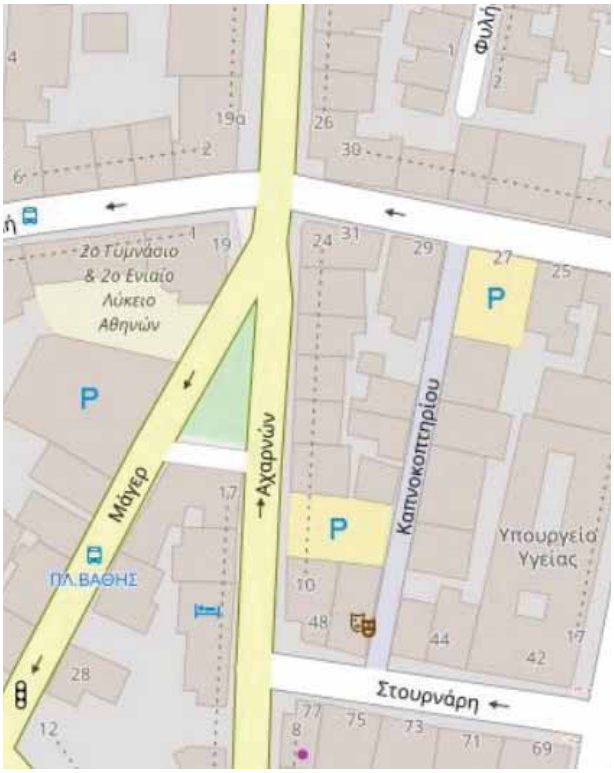

Figure 9: The current situation in the central part of the analysed district (Source: Open Street Map 2017: www)

Conclusion

The analysed district of the city of Athens is a vibrant and busy place that has many imperfections on different spheres. All, the economic, environmental and social situations, lack some stabilization, which would eventually lead to the full resilience of the whole area. To achieve it, there is a rapid necessity for actions from the authorities side. Nevertheless, it has to be followed by a detailed concept, participation and approval of local inhabitants.

The researched area has big potentials for changes, especially for those that can decrease the vulnerability for heat. Many degraded plots could be easily redeveloped into some more liveable places, but the ownership might be a tough issue to be solved during planning processes. However, as mentioned before, offering incentives for owners could potentially terminate problems that arose. As seen (see Figure 3), currently approximately half of the area is strongly exposed to the heat. Therefore, without any undertaken actions, the situation in the district regarding the heat islands will most likely deepen. The solutions proposed by the authors, if brought into reality, could diametrically change the perception of the areas and the heat that appears every summer in the Greek capital city. To achieve this, some drastic changes, high capital expenditure, and the determination of the authorities and citizens are needed.

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Inclusive Green for Tackling the UHI-Effect in Athens

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https://doi.org/10.15488/5568

Introduction

The city of Athens is characterised by urbanisation and migratory waves. In relation to the changing climate with an overall increasing temperature and a significantly higher amount of extreme events, the city is especially vulnerable to the urban heat island effect. Spacing and orientation of buildings as well as outdoor spaces influence the microclimate of cities in a strong way (Kleerekoper et al. 2012, 30). The city of Athens is challenged by high temperatures within central city districts, because the high rate of dense construction is dominating and leaves little space for free and green areas. The urban heat island effect represents a serious danger for inhabitant's health and well-being (Kleerekoper et al. 2012, 31). Thus, the need for new solid solutions to develop the city in a more resilient and climate-proof way arises. A major challenge is to create policies and measures that meet the demand for more green 'lungs' in the city.

Within this research project, strategic solutions to tackle urban heat were developed on a small scale. Therefore, a central part of Athens was analysed to create a concept with detailed measures to mitigate and adapt to urban heat. With the help of further research and observations, the concept of 'Inclusive Green' was developed based on the conditions and problems in the study area. Different measures are proposed in order to deal with the grave situation of urban heat with which architects, planners, environmentalists, and civilians are confronted.

Background: Green Cities to Tackle Urban Heat

Urban heat islands are globally one of the most documented phenomenon of climate change (Santamouris 2012, 682) and can worsen social isolation as well as mental health issues and cause people's death (Australian Department of Infrastructure and Transport 2013, 189). Especially Mediterranean countries have the highest potential vulnerability to climate change in Europe but the lowest capacity to adapt to it (ESPON 2014). In July 2000, 10,000 people have been treated in hospital and at least 100 have died as a heatwave, which has seen temperatures of up to 48 °C, swept across the Mediterranean. Temperatures up to 44 °C have caused 31 deaths in Athens. More than 3,000 heat victims have been taken to hospital with breathing problems caused by dangerously high smog levels (Smith 2000). Apart from the social impact, heatwaves have significant impact on cities' productivity and liveability and more often affect the most vulnerable countries. When those also face a dramatic economic crisis like Greece, the capacity to adapt is very limited. With this increasingly severe heatwaves, caused by climate change, it has been widely understood that urban greenery has a growing importance for maintaining city's liveability as one of the most effective ways to address and reduce the urban heat island effect (Kleerekoper et al. 2012, 32). To understand those challenges in more detail and to develop 'green' solutions, a study area in Athens was the object of investigation.

The Study Area - Evidences for a High Vulnerability

The study area is located in the northern central part of the city, including the church of Ekklisia Agios Pantaleimona as well as the train and the bus station Stathmos Isap Attiki (see figure 1). The district is a residential area and characterised by pedestrian streets (see figure 1) and a comparable low traffic volume.

Many small streets are serving as parking areas for cars (see figure 4). The inhabitants are mainly immigrants (National Center for Social Research and Greek Statistical Authority 2017) and the income in the area is rather low. Over 30% of inhabitants have an annual income of less than 8,804 Euro. In the year 2008, the district was one of the poorest in the city (Bloomberg Associates and Athens Office of Resilience and Sustainability 2008). The microclimate is high in the part of the city, not only due to the high density of buildings but also because of the low amount of open spaces.

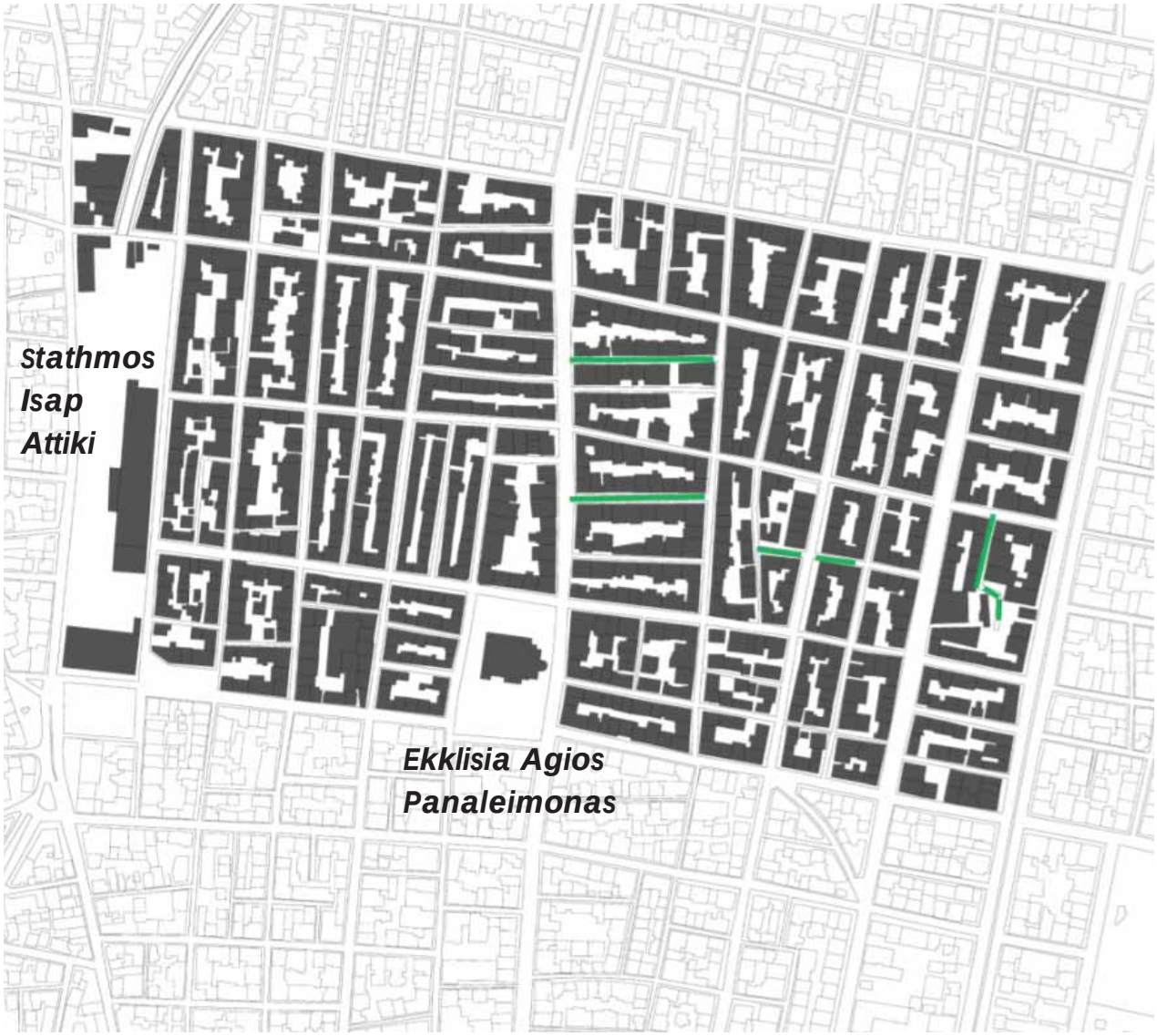

Figure 1: Study area with pedestrian streets (marked in green) (Source: Own Depiction)

Areas around larger green spaces show significant lower temperatures than the study area during heat waves (Bloomberg Associates and Athens Office of Resilience and Sustainability 2016). These statistical evidences underline the vulnerability to the heat island effect of the population in the district. Consequently, the danger for the health and well-being of residents is high.

Due to low-income in the study area, buildings lacking insulation measures, like double glazing or external walls (National Center for Social Research and Greek Statistical Authority 2017). Some buildings are still existing from the construction period before 1946 (National Center for Social Research and Greek Statistical Authority 2017) and were not restored. Those structural conditions are even decreasing the low resilience to urban heat of the area.

Figure 2: Green balconies (Source: Own Photography)

Figure 3: Unused spaces (Source: Own Photography)

In general it seems like buildings are often in a poor condition or only partly inhabited. Some shops at the ground floors of building blocks are operated by residents even though the majority seems to be vacant for a long time. Moreover, buildings were removed at some places but have not been reconstructed. These empty and unused spaces are fenced and not accessible (see figure 3). An essential factor for that development might be the economic crisis in Greece which began in 2010 (BBC News Services 2017) and has influenced politics in a strong way until today.

Residents in the study area cover balconies with greenery by the use of different kinds of potted plants and also roof tops are often green (see figure 2). People seem to be willing to cover their city with greenery and thus, favour to live in a green environment. Additionally, many small streets are planted with trees on both sides, affording a lot of shade (see figure 4) when walking under the trees. In those streets, the temperature is constantly cooler. The church of the area is placed at a public square where some palm trees are planted and a public playground is implemented. However, the majority of the floor is sealed or covered by sand and stones. Grass grows around trees but is also fenced, so that it is not possible to access the greenery. The square is busy even during the day for people to meet and to do some sports, for example football, due to the fact that no other open place exists nearby.

Figure 4: Small streets (Source: Own Photography)

Cooling centres are mostly more than 400 metres away and recreation opportunities for residents can only be found in neighbouring parts of the city (Bloomberg Associates and Athens Office of Resilience and Sustainability 2011). Consequently, there is a strong need for mitigation and adaptation measures that help to cool down the temperature in the area.

The Concept of Inclusive Green

"A climate adaptation plan can only be successful when it is also addressing social, economical and spatial aspects." (Kleerekoper et al. 2012, 37). Based on this approach and on the theoretical evidence about the potential of urban greenery to tackle heat, the concept of 'Inclusive Green' was developed. The aim is to provide better access to open green spaces with fresh air and water as well as cooling centres. Eco-friendly transport opportunities including pedestrian and cycling infrastructure for inhabitants need to be implemented to promote a low-carbon economy.

The social approach of the concept considers not only improvements of the area but also aims at involving residents in greening policies. Many different people "have a stake in what happens in a place" (Healey 2010, 13) and thus, inclusive governance cultures are needed (Healey 2012, 18) to create 'better'

places. This can be reached by collaboration between planning competencies and local residents. Following that, it is ensured that implemented measures are accepted by locals and that innovations are used for the purpose they were implemented for. Moreover, one important goal of the strategy is to make greenery open and accessible for everyone. The concept aims at raising the well-being, health and social cohesion of residents to strengthen liveability (Bush et al. 2015, 1) in the area. The term of 'Inclusiveness' therefore conects the idea of people's participation in greening policies with the creation of accessible green.

When considering the economic situation in Greece, measures to achieve impact at low costs are needed. It was agreed on selecting a concept that is likely to be economically the easiest to develop in terms of implementation and maintenance costs. Therefore, spatial characteristics of the area need to be used in their existing form and redesigned in a way that supports social and economic activities. The increase of greenery in the district leads to sustainable adaptation and mitigation to climate change in an affordable way. The different benefits of urban greenery will be explained in more detail in the following.

Benefits of the Inclusive Green Concept

A city's vegetation, its urban green space, provides a wide range of benefits for the city's residents and workers, in terms of mitigating and adapting to the urban heat island effect. The growing pressure on cities caused by climate change is affecting many dimensions such as human well-being, economy, society, and environment (Fryd et al. 2011). Research has identified and quantified many of the benefits provided by urban green space. These include:

Mental and physical health benefits: especially because the residents of the case study district are mainly immigrants with limited income and health access disadvantages. Therefore, they are more vulnerable to heatwave consequences. Greenery has a positive impact on human's psyche and can even prevent depressions (Kleerekoper et al. 2012, 37). Moreover, a green network of streets shaded by trees would cool down the temperature and offers, for example, more comfortable conditions and incentives for employees to get to work.

Economic benefits: including increased economic activity at a local level. The attractiveness of the area (associated with a cooler climate and shade) could be increased which would lead to an overall improvement of image (Kleerekoper et al. 2012, 37). It has been shown, previously, in the analysis that the income of the area is very low. Consequently, raised attractiveness would lead to more economic activity.

Social benefits: because open green spaces serve as recreation opportunities for residents and become consequently areas of social interaction and leisure activities. The analysis of the case study district showed that recreational areas are barely existing, relatively social isolation was evident.

Environmental benefits: including reduction of air pollution and improvement of urban air quality. Green produces oxygen and filters ozone out of the air (Kleerekoper et al. 2012, 37). Furthermore, green routes would promote the use of carbon-low transport like bicycles.

Actions and Measures for Inclusive Green

Heat Islands are a consequence of climate change but also of insufficient city planning. Therefore, actions and measures were identified to improve liveability within the city district. The concept of 'Inclusive Green' is based on three intervention levels which connect the social and environmental benefits of green. Different actors were identified to participate in the measures.

Residential Intervention Level – Atriums as Miniature Parks

The first case of the concept refers to the transformation of open spaces that appear inside the housing blocks in order to function as atriums. Those are a characteristic of the morphology of the Greek region of Attica. These spaces are normally either empty or used as parking lots. The atriums' floor consist of sealed soil and is not greened in any kind. Due to the cooling effects of vegetation these spaces could be developed as private inside gardens for the block tenants (see figure 5). One may say that those could be transformed into miniature central parks. Those would be accessible on a short distance at any time and support community-building.

Street trees, green roofs, green facades, and vegetation can help to reduce urban heat island effects by shading building surfaces, deflecting radiation from the sun, and releasing moisture into the micro-atmosphere as well as offering an ambient cooling effect (KLEEREKOPER et al. 2012, 31). Overall, vegetation can have a cooling effect of up to 4.7 °C (SCHMIDT 2006) and is consequently a good option to decrease the temperature at low costs in buildings without insulation.

The actors involved in that action are the residents of the district. First and foremost, it is essential to encourage, inform, and sensitise inhabitants of buildings who live in the district to take action in order to green these spaces. As those are private spaces that can only be changed by their owners, inhabitants need to become active themselves. An evidence that such an approach could have a high acceptance among citizens is the shown willingness to green the city as explained in the analysis. In this context, the research group believes that the first step to take is to unify atriums instead of keeping them as separate lots. This could be done by removing fences and making atriums more accessible as well as more attractive for recreation. The second step is to cover the area with more green and make it accessible for other uses, like urban agriculture. In this way a network of green private spaces, connecting to the public streets, would be created (see figure 5). Utopic as it may sound, the ground floors often host commerce stores that could very much profit by those new attractive spaces. Considering the prospected increase of visitors, a greater local economic activity will, relatively, acquire. In addition, the residents of the area who are predominantly immigrants and low income families will get a free access to recreational facilities that promote social interaction and foster inclusive and vibrant communities. The green spaces could work together for the better maintenance of the project, for instance there could be an annual rotation of products cultivated in the gardens. As a very high percentage of families live in the area, these open but still private spaces could be used for amusement and recreation, by addressing children as well as adults. For the completion of this project a low budget is required. The estimated time is five to eight years, but for spreading motivation across citizens to participate, pilot projects with an exemplary function should be started as soon as possible. By

implementing one green space after another the creation of an urban green network within the district would be the result.

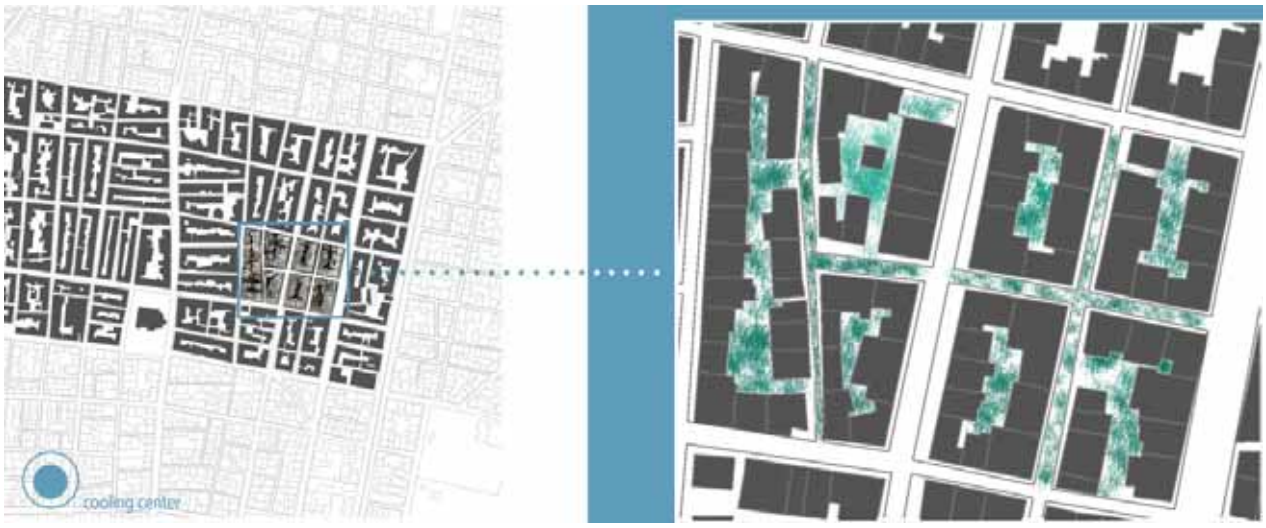

Figure 5: Transformation of atriums to miniature parks (Source: Own Depiction)

District Intervention Level - Awareness-Raising Campaigns

A collaborative joint effort between the district authority and engaged residents is required at this level to ensure sustainable effective actions. A high level of awareness among the local population about the dangerous impacts of heat islands, not only on the urban infrastructure but also for the well-being, is necessary to increase participation in actions and to support a selfprotective behaviour during heat waves. The creation of joint responsibility towards climate change is important to create win-win solutions for everybody (Gram et al. 2016, 312). Therefore, at the district level, measures could include: Planting trees and other vegetation, even though space in the urban district might be limited. Small green practices could easily be integrated into barren vacant and abandoned lots between the buildings which are clearly spread almost everywhere in the district. This measure covers two dimensions, on the one hand, it will offer a meeting area for the residents and will subsequently minimise the impact of social isolation caused by heat islands. Especially if the residents are involved themselves in implementing necessary actions and in taking in charge the future required maintenances, such measures are more likely a concept of public participation. Allowing public participation will give incentive for changing the area by residential engagement.

Examples for awareness-raising projects could be information and communication events about the urban heat island effect but also long-term projects like urban gardens shared by diverse users on open plots. Those projects could serve as pilots and should be started in the short-term as soon as possible to pave the way towards the acceptance and awareness for other planned measures.

City Intervention Level – Open up Public Spaces
Athens‘ municipal authorities can initiate several actions to minimise the city’s vulnerability to the effect of urban heat islands. Measures should seek to retain the existing green cover and to identify opportunities to increase green cover along public roads which are denuded from trees. Fortunately, in the case study district, only one, but major road, with a high traffic of economic activities in comparison to the rest of the district, has no vegetation. This road is adjacent to the train and bus station. Subsequently, it is more likely to be a subject of congestion, traffic and of a high carbon emission and pollution. Thus, the measure required is to increase the area’s total vegetation rate, mainly by planting trees along the road. For that cooperation with shop owners might be important to find the right distances between trees without blocking the view on window displays. To deal with this kind of perils, it would be the best to use planting compatible to the Attican microclimate. This kind of planting would be consisted of deciduous trees that allow the light to enter the houses in the winter and at the same time protect them from intense sunlight during the summer season.

Furthermore, the redesign of barren public properties, mainly the square in front of the church which is located in the heart of the district, is important to open up public places for recreation. The square represents a meeting place for social interaction for the local residents and does not look to be offering any recreational urban infrastructure or shade to be esteemed or attended by the neighbours, with fences around each parcel of ground endowed with a couple of trees (see figure 6). Increasingly, the effectiveness of urban greenery interventions on the square will depend on incorporating consistent sources of water, including urban design elements such as fountains. To implement water infrastructure might be difficult due to the high costs, but fountains represent a good cost-benefit

option and a high use, especially in busy places (Kleerekoper et al. 2012, 32). The average cooling effect is 1-3 °C and has an extent of 30-35 m (Kleerekoper et al. 2012, 32). Greening the square with trees and vegetation along with building incorporating fountains will help to boost cooling and shading inside the square as well as in the surrounding areas. To reduce the social isolation caused by heat islands, the supply with urban equipment will motivate the residents to attend the square, subsequently it will reinforce the social aspect.

To build green infrastructure improvements into regular streets, such as integrating pedestrian areas along the secondary roads surrounding the central church, is useful for recreation. Especially due to the fact that streets mostly serve as parking areas and have a comparable low traffic volume, this approach seems to be feasible. Moreover, by implementing more pedestrian roads, the use of bicycles would be encouraged and the possibility would be given to offer bicycle sharing, for example located on the public square.

Figure 6: Public square (Source: Own Photography)

When giving more space to pedestrian's recreation and social life, the effect can only be a positive one.

Another strategic point is to build pilot projects to ensure continued investments in heat-reducing practices and to test new approaches for a resistant green infrastructure in the district. The research group developed a concept to transform the bus/train station into an open central park, especially because it appears to be a sealed reservoir of heat waves and pollution emitted by buses. The project will be explained in the next chapter.

Pilot Project – The Public Park-Station

As a last and most costly action in the long-term, the demolition of the old bus and train terminal station is suggested to turn it into an eco-friendly station. The station is three blocks wide and currently serves very little purpose as a high wall (see figure 7). The construction blocks the connection between the areas of every side and also reduces the whole ventilation of the streets that are adjacent to the wall. The area lacks a cooling center as well as green pathways that lead to the existing cooling center, located further away. It is safe to say that the location is of a strategic importance to the goal of reducing the effect of urban heat islands. Therefore, the research group suggests the conduction of an architectural competition where the redesign of the bus/train station is asked. The new station should be open to the public and a hybrid construction that balances an effective amount of green with the urban infrastructure needed. This new creation will allow better ventilation of neighbouring streets and residences. As a result the microclimate of the whole area will improve. Water elements could be added, such as fountains. This will help to reduce the local temperature and to provide cooling sources. Tall trees should be planted in order to provide natural shade to pedestrians. Turned into this hybrid construction, the station will resume the role of a cooling center and of a green pathway connecting to other recreation opportunities. The timeframe for this project is estimated from eight to ten years.

Figure 7: Bus/Train station (Source: Own Photography)

Conclusion

To conclude, the research group developed a strategy for the study area to raise resilience, considering economic, environmental as well as social values. Referring those values the measures of the total open green space of squares with surrounding pedestrian areas, the public park-station, the access to greening projects, open for everyone willing to engage, and the green atriums used by building inhabitants, were explained. The plan of all actions is shown in figure 8.

The concept of 'Inclusive Green' has an integrative approach by including private as well as public spaces for an overall turn of the district in terms of resilience. The overlapping time frames of the different measures are important to increase acceptance among citizens and to underline an integrative approach. The actions will strengthen a further exchange between neighbours and communities and as an effect high potential for the creation of a more flexible and social – and with that a more resilient – neighbourhood is given.

Nevertheless, for some suggested measures, full participation of the citizens is required. If the residents do not act as a unit to achieve a better function of their community, less to nothing will be achieved. Thus, it is of vital importance that individuals are informed about the grave situation in which the city is as well as about the steps they should take to prevent and improve it. The collaboration between citizens and the authorities is urgent to implement measures to their full extent on different levels of administration. The city of Athens needs to start actions immediately from which awareness of citizens will raise and redesign important public places in a sustainable and resilient way. A multi-level governance approach regarding adaptation and mitigation is important to implement measures on all scales. Even though, planting of streets is really common in the area of study, it is not enough to fortify the city against extreme heat. Through this proposal, the city´s chances for resilience in case of a heat wave shock multiplies.

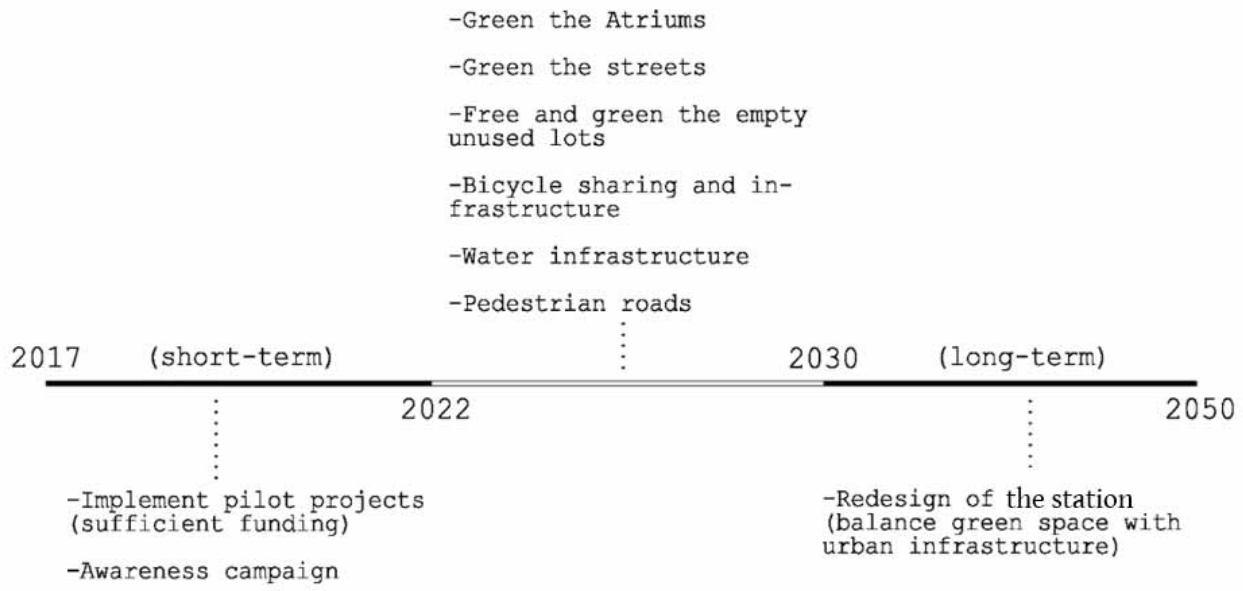

Figure 8: Action Plan of the concept (Source: Own Depiction)

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The Victoria Square Neighbourhood: Enhancing Resilience by Social Networking

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https://doi.org/10.15488/5569

Introduction

Athens is climatically characterised by a Mediterranean climate with mild and rainy winters and warm summers. In the summer the average temperature is 35°C, with many days exceeding 40°C. Athens is often struck by heat waves, meaning at least 3 consecutive days with air temperatures above 36.5°C. Since the 1950s the number of heat waves has increased substantially: in 2007 14 days have been recorded in comparison to only 6 days in 1955 (Founda and Giannakopoulos 2002, 229) Inappropriate building materials, the lack of green and open spaces as well as high volumes of traffic contribute to the increasing temperatures in Athens (Founda and Giannakopoulos 2002, 229). Some places within the city are easily prone to high temperatures, which is called the urban heat island phenomenon. The urban heat islands describe "the excess warmth of the urban atmosphere and surfaces compared to the non-urbanized rural surroundings" (Stathopoulou and Cartalis 2007, 358). The development of urban heat islands is influenced amongst others by construction material, vegetation, emissions, circulation and topography (Stathopoulou und Cartalis 2007; Katsoulis und Theoharatos 1985; Hassid et al. 2000). The vulnerability towards natural hazards and risks, including urban heat islands, are multidimensional: human, social, economic, institutional, urban and ecological. Social vulnerability is defined as "the exposure of groups or individuals to stress as a result of social and environmental change, where stress refers to unexpected changes and disruption to livelihoods" (Neil Adger 1999, 249). It depends on various factors, such as the lack of social cohesion, social exclusion, poverty, gender, age, unemployment, housing condition and the access to health and medical services (Cutter et al. 2003; Neil Adger 1999, Sapountzaki et al. 2015). Athens is especially vulnerable, as many residences do not have sufficient insulation and thus the buildings heat up in summer (Bank of Greece 2011). The Victoria Square neighbourhood is characterised by low-income households and various ethnic groupings. The transformation of the neighbourhood to a more resilient one towards heat islands, is not possible without major state and private

investments. As the inhabitants have other, more dominant problems to cope with, than being bothered developing a sustainable neighbourhood, we have decided to use the already existing grouping to create a neighbourhood which is connected among each other, for example by creating neighbourhood gardens and making use of the roof tops among others. The idea is to develop a mobile phone app named ‘Greender’, which aims at encouraging people in the district to help each other. In the following, the neighbourhood will be analysed along social structures and the built environment. Then, the concept of neighbourhood networks will be explained in detail, which will then be applied to the idea of ‘Greender’.

Analysis

The investigated district is located between the Street of the 28th October and the main railway station, whereby the Street of the 28th October can be considered as a hard border between the neighbouring districts to the East (see figure 1). This road, as well as Acharnon Street and Liosion Street run through the district, connecting the city centre of Athens with suburbs in the North. These streets carry a large amount of traffic, creating emissions which make the micro-climate of the neighbourhood highly polluted and increasing the risk of heat islands.

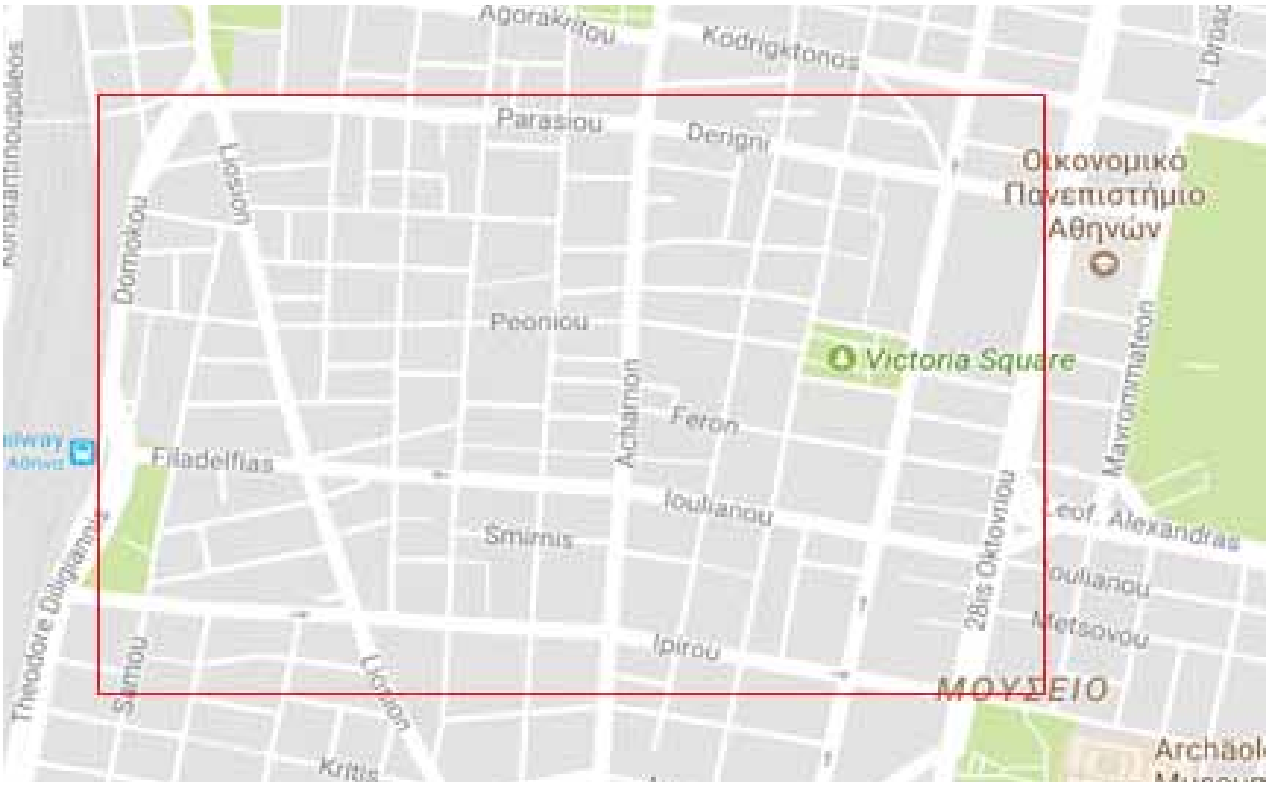

Figure 1: Investigation area (Source: Google Maps 2017)

The district is characterised by a diverse, multi-ethnic residential structure with high percentage of immigrants (see figure 2), mainly from the Middle East, Africa and Eastern Europe. Victoria Square, although located at the very West of the district can be regarded as the heart of the neighbourhood, being a central meeting place for the residents. In the past two years the piazza has been home to an ever-going number of migrants, mostly from Afghanistan, and thus has become a synonym for the migrant crisis which is affecting Greece (McVeigh 2016). Although Victoria square has become a shelter for many people, the square seemed tidy and organised, there were hardly any hard evidence of people housing there. It rather looks as if the different minorities keep to themselves and have formed groups in which they interact. According to Gaglias and Seferoglou (2015), there were very little problems with the refugees settling in Victoria square and the residents of the neighbourhood. In fact, the residents have been helping the migrants out with food, water and clothes. Furthermore, the district is characterised by a low income household, that receive state-aid. Simultaneously, the neighbourhood is home mainly to residents mainly up to 50 years old (see figure 3).

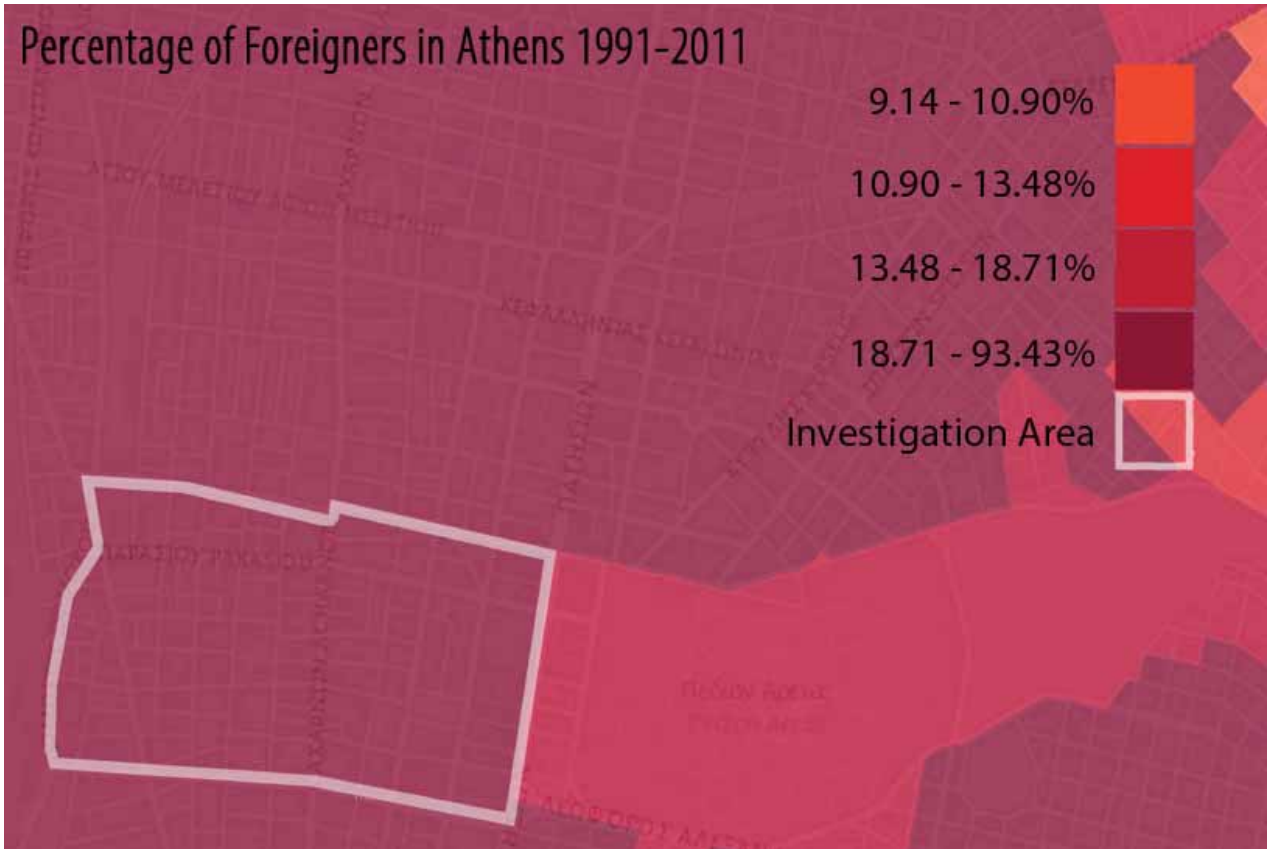

Figure 2: Percentage of foreigners (Source: National Centre for Social Research,2015)

Victoria Square is also the entrance to the metro station 'Victoria' (see figure 4) which serves line 1 running from Kiffisia to Piraeus. The station was connected in 1926 and redesigned in 1947 after German role model (Attiko Metro 2017, www). Hence, the square is often frequented by numerous pedestrians passing by, as it lies between the main train station and the rapid transit network. Due to the passing-by pedestrians and the people frequenting this place, it can be characterised as a vibrant and lively open space.

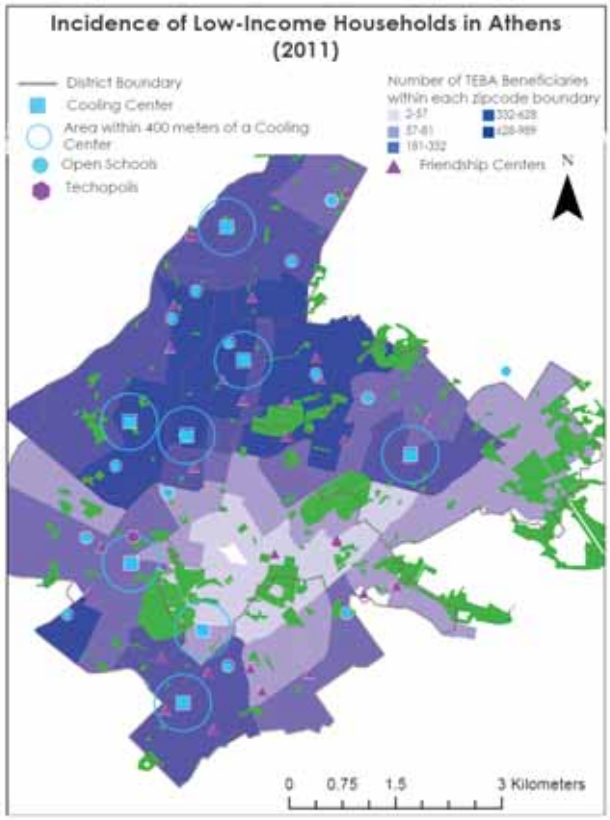

Figure 3: Number of low-income households (Source: Athens Office of Resilience and Sustainability 2011)

Figure 4: Entrance to Victoria Station (Source: Wiki commons 2007, www)

The entire neighbourhood is densely built up with hardly any open spaces but Victoria Square. The built environment is mainly characterised by old and poorly maintained buildings, showing once again the low incomes of the inhabitants as well as the lack of public investments. On the one hand most of th buildings seem to have accessible rooftops, which appeared not to be used and bare. On the other hand, the balconies look as if the people frequently use them and have taken the initiative to place plants on them in order to create a slight cooling effect and to create a homely atmosphere. This leads to the

assumption that people are feeling at home where they live as well as the willingness to green spaces. The bad state of the buildings is also projected on the pavements. As is major parts of Athens, the pavements are very narrow, making it very hard for a single person, let alone for several people next to each other, to use them. Furthermore, many sidewalks are destroyed due to the roots of trees. The sidewalks are mainly used as parking spaces and the few non-built up spaces in the neighbourhood have been converted into unofficial parking lots, which is necessary due to the large amount of cars and the little space to park them. It was quite outstanding how many cars were parked on the side of the roads, taking into account that the field visit was conducted in working hours. This stresses the assumption that the public transport offers are widely used.

Figure 5: Peoniu Street.(Source:Own Photography)

While investigating the area, the impression was made, that it is already quite green. At first this was surprising, as the district is crossed by three major roads and carries a heavy load of traffic and there is only one open public space within the neighbourhood. This impression was supported by the plants on balconies as well as by the many small roads which are lined by trees (see figure 5). Yet these trees, which are very beneficial for the micro climate are closely surrounded by pavements counterbalancing the positive effects slightly. Noticeable was, that the streets which were lined by trees were mostly those running from North to South, while the East-West corridors were mainly dominated by concrete. Although many streets were lined by trees, the air was sometimes very stuffy which can be seen as a result from the heavy traffic on the three important axes crossing the neighbourhood.

In general, the heat island effect was noticeable when there were no tress offering shade.

Victoria Square, being the central meeting point of the residents, is lined with tress and squares of grass, offering shade and a few green specks. Nevertheless, it seems as if the piazza, which actually is the heart of the neighbourhood and quite lively, does not belong to the residents due to the small fences which line the green spaces (see figure 6). Yet, it is used and welcomed by the residents, as Victoria Square is the only organised and openly accessible open space in the districts. The open space would gain attractiveness, if the green spaces and trees were not fenced in.

Figure 6: Victoria square (Source: Own Photography)

All in all, the convergence of two crises – the refugee inflow and the economic crisis that has been plaguing the country for the last years – is well represented in the neighbourhood and mainly on Victoria Square. The district is already quite green and it seems to be difficult to undergo any further improvements of the micro climate without major interventions, whether infrastructural or financial. The residents seem to be organised within ethnic groupings, which keep among each other. Thus, in order to combat the risks of heat islands, it is important to approach the residents, raising awareness, so that they take the issue and make it one of their own, for example by using their roof tops and greening them.

Concept

As the analysis of the neighbourhood has shown, the investigation area has a great number of immigrants, refugees and low-income families who have to deal with other problems rather than climate change effects. In addition, Greek people lack in trust for governmental structures (Smaghi 2017, www) and big environmental projects like parks seem hard to be realised. Even if the Greek government tried to solve environmental issues, and measures against climate change impacts (Nanou 2015, 49), the problem was a lack of willingness to implement those, due to more important economic and political discussions (Nanou 2015, 57). In order to overcome the mentioned issues and still find a solution for the urban heat island effect, this concept tries to find a bottom-up approach that establishes green infrastructures as a side effect of social structures which are only beneficial for household budgets but also increase community strength. To achieve that, the concept focuses on creating resilience strategies by incorporating social and ecological measures into a complex "socio-ecological" one (Holling 1973, 6; Walker and Cooper 2011, 1ff). Those practical, decentralised bottom-up strategies can complement high-level policies and find cost-effective strategies against climate change issues.

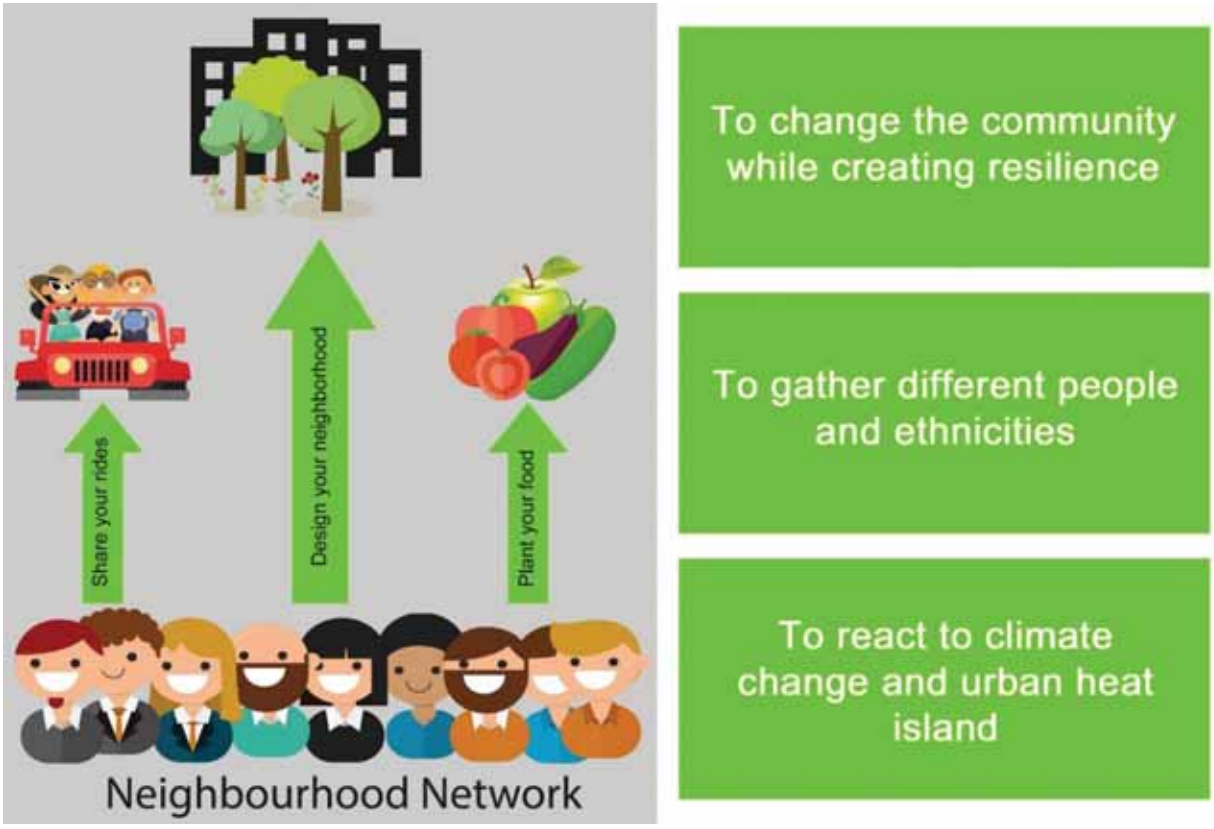

Figure 7: Concept overview (Source: Own Depiction)

Creating “social networks contribute to increased socio-ecological resilience, as communication, adaptive management, and good governance are central in fostering adaptive capacity in communities” and will help to establish the ability of self-organising as an important factor for resilience (Westerman et al. 2012, 89f). The neighbourhood network is based on two main pillars: community gardens for growing own produce, and carpooling for reducing traffic and costs. The idea is based on self-organisation of the inhabitants with little outer influence. The aim of the neighbourhood network is to create a more resilient and tight community, to gather the different ethnicities which will both lead to more resilience towards climate change and urban heat (see figure 7).

Planting and sharing food in community Gardens
Encouraging the people of Victoria Square‘s neighbourhood to establish community gardening will lead to many benefits for both social and ecological aspects. As people grow their own food in abandoned lots, on their balconies or rooftops, they will save costs for vegetables and fruits, they would normally have to buy at the grocery store (Wakefield 2007, 97). This will be an important incentive but will also provide a better access to healthy food which is an important issue for people with low incomes (Wakefield 2007, 95). It gives opportunities to learn about nutrients, induces people to eat less junk food and therefore increases the overall physical health (Allen et al. 2008, 431). In addition, it can enhance economic self-reliance of the community and can provide food security (Kobayashi andTyson 2010, 14). As community gardens are free to participate, there is no economic exclusion of participants (Quayle 2008, 19), which makes them an opportunity for social connecting and therefore not only increase their physical but also their mental health. Interacting with nature creates a feeling of relaxation and calmness. Community gardens are seen to provide recreation in a densely populated city - but social aspects seem to be as important as offer of a therapeutic environment (Quayle 2008, 77), as the “community health” can be enhanced by connecting people (Wakefield et al. 2007, 97). Some cases were showing that there is a strong bonding between people who participated in community gardening projects which improved their feelings of loneliness and isolation, because the projects offered a place

to meet new people and topics to talk about. "Look, if you don't do stuff like this there is no way of meeting those other people […], let's say you live in your own little world […], you may have your own friends but they are all the same […] and you don't get to experience anything else" (Kingsley and Townsend 2006, 530f). Furthermore, programmes linked to gardening "have been shown to reduce children's involvement in alcohol, drug, and tobacco use […] which may improve the quality of life in their neighbourhoods" (Allen et al. 2008, 431). Building up a strong community-feeling force people to interact, this creates relationships and prevents and reduces crime (Herold 2012, 45). Sharing and even selling their own produced vegetables and fruits were noticed as a satisfying activity and people developed pride and a local identity at an individual level. The empowering process and the feeling of "having something in life ‚work out'" can help people, especially those with low incomes (Wakefield et al. 2007, 97). Also neighbourhood beautification will benefit from plants and new, strengthened social structures (Kobayashi and Tyson 2010, 15). Another financial benefit is the reduced energy use caused by planted roofs and balconies. Cities heat up twice as fast as the rest of the world, because of the concrete environment absorbing heat very well. To deal with these problems, people tend to cool their houses more, air conditioners run harder (Harris 2012, www). Planted roofs act as insulators for buildings, reduce heat transfers, improve indoor comfort and even can lower heat waves in general. "[...] vegetated space […] helps water evaporate throughout the day. And evaporating water carries away heat. Like sweat, it's nature's air conditioning, but we've managed to interrupt that process in cities. The result is called the urban heat island effect, and it's adding to our warming woes" (ibid.). That means that energy costs for both cooling in summer and heating in winter will be lowered by planting activities (EPA 2017, www). Installed little green spaces combined with community gardens create islands of calm to offset the heat that builds up between concrete cities. As a side effect of encouraging locals to act more socially and developing stronger ties, the environment will improve. It strengthens environmental understanding which creates a link between local actions and the global issues of climate change, bringing positive change to both.This means to their own liefs and the liefs of their neighbours (Quayle 2008, 77).

"If we're talking about social justice it has to encompass the food that we eat, the people that grow the food, how they're treated, their health benefits, their wages. How hard they're living. Are they living in substandard housing? Do they have heat and hot water? What about the children? Are they getting a good education? Is it quality in terms of schools? So for me, the movement started about growing food but then blossomed into this social justice conscious." (Storycenter 2017, www).

Reducing traffic and emissions through car sharing

The second part of this concept is to encourage people use car sharing and carpooling systems. Owning and driving a car is one of the major household budget expenses which can be a burden especially for low-income families. "Households that share rather than own a car can reasonably save $500 to $1,500 per year" (Litman 2015, 5).

Besides financial benefits, car sharing reduces emissions like CO2 by using less fuel which will have a positive effect on the progress of climate change and the air condition of Athens. In addition, traffic and parking pressure can be decreased. The parking lots that are not needed anymore can be reorganised by local planners with the involvement of the public and offer more open space for gardening projects, improving the quality of life in the neighbourhood (Loose 2009, 3f).

As explained, community gardening and car sharing can have a positive influence on socio-ecological resilience, combining community creation and actions against climate change issues like the urban heat island effect. But how to install those ideas in the neighbourhood of Victoria Square?

In order to really encourage people to participate in the mentioned activities, the first step is to inform people about their possibilities and then to connect people who are willing to implement them. The best way to achieve these goals is through social media. Social Media provides not only a good way to present ideas (Neti 2011, 6), but also "an accessible and powerful toolkit for highlighting and acting on issues and causes" while supporting their users working, thinking and acting together (RO 2017, www). It gives the best opportunity to connect people with the same interests through simplified, instant communication (ibid.). As 77% of the world's population is online and many people use smartphones and tablets in

their daily life, this concept tries to implement the ideas through a social media mobile app. Mobile Apps have many benefits such as they can be used right away from any place in Athens and most of the time are free to use (Vidious 2017, www).

Greender – creating your little green neighbourhood

Overview:

Greender is an application that combines all good aspects that social networking can offer to a society directly with co-operative economy. Its main aspiration is to create a social network that directly connects people within a specific radius that spatially is defined by the area of a neighbourhood. It consists of two main branches that will be further analysed: the Urban Green Network and the Carpooling part. *Greender's* mission is to form a network of people willing to collaborate in a march towards a greener urban sustainability locally. Its mission is to promote and encourage small initiatives that help people with a common goal interact and work together towards a greater cause. The investigated district will be very suitable as a functioning neighbour on Greender as the residents seem to have already organised themselves in (ethnic) groupings. Accordingly, there are dynamics which can foster the usage of the app as well as be promoted due to *Greender*. The overall ambition is a city full of little neighbourhood hubs with little gardens and sustainable urban farming.

How it works:

First step in Greender is the registration - there exists a visitor mode which will be analysed later on, but the main function of the app is for registered users. Upon registration, personal data of the applicant are requested, and most importantly, valid proof regarding their home address. It is important to verify that the app users have entered their residence correctly so that the networks are created correspond to actual neighbourhoods. Once the residence is verified, the new user is requested to use a map in order to define the area where an intervention could be made. In order to facilitate this procedure, when a neighbourhood is selected, the patios (*akalyptos in greek*), the rooftops and streets are highlighted and the user can define his/her area of influence, so to name the urban space where the user has access to. This is a preliminary potential urban

green mapping whose goal is to trace the potentials of the urban green network. Once registered, even if no activities are proposed, the users are linked with the area they have selected. This data is of crucial importance for the understanding of the potentials of such a network if it reaches full expansion. After registering, users have access to the main branches of the application which will be further analysed: Carpooling, educational mode, Urban Green Network and Visitor‘s mode.

Hour Points (HP)

Hour Points is a currency tool used by the application. The users who offer their time are credited with HP that they can offer in exchange of other people‘s help. Since Greender is focused on equal exchange, HP is a helpful tool that helps keep track of people‘s input in the process and help determine an exchange ratio. Its use is not obligatory, but it is encouraged since it helps promote a cooperative economy that is not based on money but mutual exchange.

Urban Green Network

The focus point of this application is first of all to create urban green spaces, but not separated and unassociated: the goal is to create with cooperative means, a network of green spaces within the city that are mostly produced by cooperative initiatives of people within a neighbourhood. After registering, the users have areas of influence (e. g. their akalyptos) in which they can start proposing projects. These projects mainly focus on green movements, but once created could be expanded in further networking. When proposing a project, the user selects the area where he wants to make an intervention, the name of the project, how many HP he offers and a brief description of the project. For example, a user posts project ‚Akalyptos 3.0‘ which offers 3HP and consists of planting vegetables in the patio where he has access to. When the project is posted, the users within a determined ratio are notified that a new project is posted and declare their interest. Once committed to the project, the participating users can submit proposals and discuss anything related to the project. The actual activity could happen in one day or last for longer periods of time e. g. one hour every Monday. When the project is created in a semi-public space a user has access to, the users that have

access to that space are directly notified and invited as well as the users that have access to neighbouring areas. This way the users can add their space in the project and expand it.

Carpooling

This branch of the application focuses on discovering overlapping roots that neighbours follow in their everyday life in order to connect them and promote ride sharing. It works in a way similar to the philosophy of known carpooling apps, in a sense that drivers publish their future ride or their everyday route and passengers claim interest on them. The difference lays on the audience it is addressed to. Only neighbours with similar roots can view each other‘s data and connect privately to arrange their meet up. This branch of the application does not promote one-time ride shares but instead it aims at the creation of groups of people living close to each other that share a ride every day, with all the beneficial effects that this can have in the environment. The need for this service was not realised by the lack of public transport. On the contrary, there are specific routes in the area that are easily accessible by public transport, like the connection of the area in question with the commercial centre of Athens. The difficulty prevails when one tries to reach the suburbs of Athens in working hours, where public transport is significantly inefficient. Concluding, the carpooling branch of *Greender* is a side-branch of the application, substantial enough for the environmental upgrade of the neighbourhood and a crucial factor to the enforcement of social bonds created within the same neighbourhood.

Visitor mode

A registered user who is evidently active within his own neighbourhood, can gain access to the so-called ‘visitor’s mode’. This means that these users, when visiting a different neighbourhood, can shuffle through the active projects of the district, visit them, upvote, and participate in them if accepted by the supervisor of the initiative. In the visitor’s mode, registered users with evident activity can connect with each other and share experiences and intra-neighbourhood ideas for networking.

Educational mode

A complementary educational menu consists of the ‚bible of urban sustainability‘: Be it detailed instructions for creating a rooftop garden, or data on CO2 emissions of cars in cities, the educational mode offers an insight into all the environmental factors that make a network like Greender necessary as well as all the instructions essential for its application. This data could be used for a presentation of the application, or for a simple introduction to the new user.

Every day use

When browsing through *Greender*, the user can view all active projects on a map with a green dot, all past projects and all future projects. He or she can comment, make proposals and upvote a project. However, the user can only participate in active projects within his or her own neighbourhood. Upvotes and comments promote a more active involvement in the whole procedure, since best projects could be featured and published, as well as expanded in different neighbourhoods.

Conclusion and Outlook

Athens is effected heavily by climate and societal hazards, which need to be tackled effectively. The economic and the refugee crisis have strained efforts in reducing climate related issues. Hitherto, public money is too scarce to handle all problem simultaneously and appropriately. Thus, the idea of using the potentials Athens has to offer arose. The Victoria Square neighbourhood is a district characterised by low-income households with various ethnical backgrounds, which seem to be connected among each other. The residents have other problems than to primarily think about how they can actively contribute to a more resilient and sustainable city. Thus, we have come up with creating an urban green network by an App, which takes advantage of these formed groups and addresses these directly. The App will rise attention for a more sustainable lifestyle and should enable the residents to integrate small habits into their daily life, to make their neighbourhood more climate and socially resilient. Tackling climate change solely by social efforts in reducing carbon emission, greening public spaces and rising awareness to the matter, will not be sufficient. It is clear, that transformations in the built environment have to be made as well.

Furthermore, the heat island phenomenon and its problems have to be embedded in administrative and political decision-making in order to achieve more positive effects. Hence, a multi-level approach including civil society, should be initiated in order to tackle heat-related issues simultaneously.

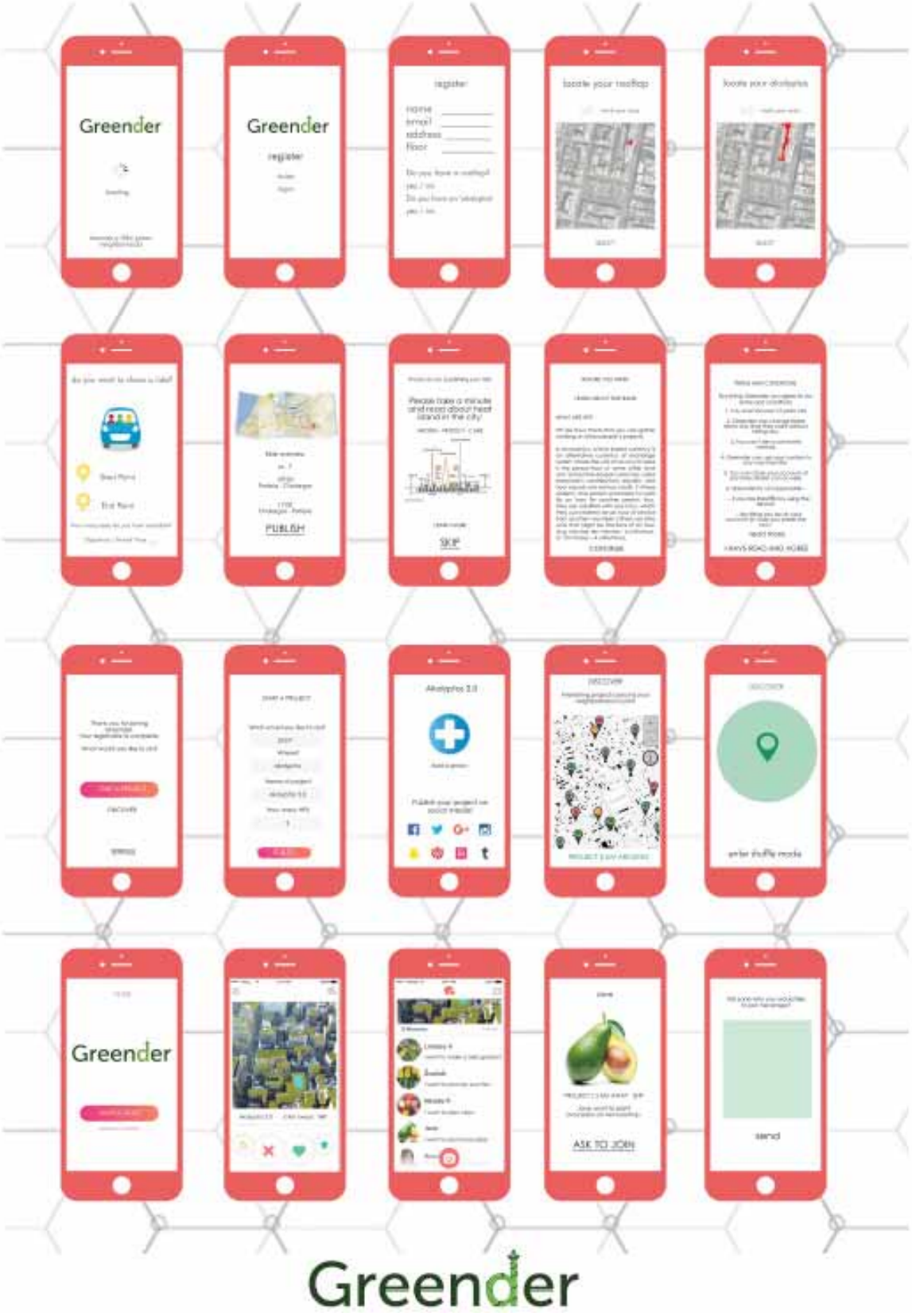

Figure 8: Overview of Greender (Source: Own Depiction)

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Wind of Change

Empowering a community to tackle heat islands collectively

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https://doi.org/10.15488/5570

Introduction

Athens is exposed to high heat stress that has negative effects on its residents. This paper presents an approach to tackle the problem by empowering the community and strengthening local solidarity.

The area examined in this paper has a particular attribute: the park "Pedion Areos". It presents a large potential for residents to escape heat stress. Unlike most areas within an urban structure, the park is mainly unsealed, leaving the surface permeable to water which lowers the urban heat island effect. The park's vegetation cools the area by evaporation and providing shade (Kleere - koper et al. 2012). Due to the limited monetary possibilities regarding the change of grey urban infrastructure, the concept which is presented in this paper focuses on strengthening the opportunities provided by the park and other potential green areas as well as empowering the people to responsibly participate in the district's development in order to create a healthy living environment for its residents.

During the Summer School, on-site inspections of the designated study area were made. By doing that, the area was examined for the subjective feeling of heat, safety and social meetingpoints. Moreover, informal expert knowledge of the area was provided by Greek Architecture students. Detailed analyses of the constructed and social structure were made possible by Greek Census Data and the Athens Office of Resilience and Sustainability.

In order to scientifically justify the aspired strategy, further literature research was done. A big part of this research served the purpose of answering one important key question: What constitutes resilience of a society or neighbourhood? Linked to the crucial role green infrastructure in cities plays in answering this question, the various benefits of urban green were identified. In addition to that, the role of urban planners in the process of making a community more resilient against external threats such as heat islands was debated. Eventually, the key findings presented in this paper were brought together in the depiction of an ideal participatory planning process. The implementation of the presented concept has the potential to improve the current vulnerability of the neighbourhood around the "Pedion Areos" to heat stress and to furthermore generate a greater sense of community and belonging.

Urban green as a means to reduce heat islands

Urban green provides several benefits for societies. The creation and improvement of green spaces contributes to a decrease of temperature (Kleerekoper et al. 2012). The vegetation improves the air quality by filtering emissions and particulate matter, thus also improving the local living quality. Beside these advantages, urban green also benefits the well-being of people in further ways. Humans evolved along with nature, always being closely related to it. That gives natural elements a high importance when it comes to designing spaces for people (Beatley and Newman 2017, 3). Green and natural spaces improve the sense of place as it is received by people. They have biophysical benefits such as stress reduction (ibid., 18). Also the sense of place that is provided by green spaces strengthens the commitment to the neighbourhood (ibid., 14). The quality of the outdoor environment influences its usage, especially when it comes to optional activities when the person could also spend the time elsewhere (Gehl 2014, 147). More social spaces lead to more walking and to more time spent outside (Beatley and Newman 2017, 16).

Being actively engaged with nature can also have additional benefits such as emotional rewards provided by gardening, food production or crafting. People that engage in nature show a higher generosity and helping behaviour (ibid., 18). When it comes to shocks, the residents‘ concern for the well-being of others has a high impact on the neighbourhood‘s resilience. On a personal level, near-natural spaces help to prevent social isolation because they provide the opportunity for informal contact and socialisation (ibid., 20). Also contact on modest levels is important. Even passive contacts, just seeing and hearing people positively influences peoples‘ well-being (Gehl 2014, 148).

Planners are confronted with a highly diverse field of action in urban development processes. Urban communities are by no means homogeneous, but are composed of numerous individual people who represent a broad variety of different values and interests (Healey 2007). Over the past years, the trend in urban planning has developed towards the realisation of projects with the participation of public as well as private actors. Spatial planners find themselves confronted with the difficult task of achieving a consensus between all involved actors and their often conflicting interests in order to find feasible solutions to local problems (ibid.; Hall 2000).

In public participation processes, it is strongly recommended to use mediation methods since they are not only necessary for the resolution of conflicts, but also provide a base for the production of knowledge. Hence, a mediator is needed to liaise between the conflicting parties (Peltonen and Sairinen 2010). Encouraging a dialogue and intense collaboration between all interest parties is crucial for the success of a project, which is why communicative instruments are indispensable in participatory processes (Buchecker et al. 2002). According to Sehested (2009), interdependence, negotiation and trust are the fundamental principles in managing such complex networks. At the same time, a certain amount of "metagovernance" is needed – a means in order to achieve a "regulation of self-regulation" (Jessop 2002).

An urban planner aiming to manage a participatory process has to take over and balance different tasks and responsibilities, including dealing with political and economic matters, structuring the planning processes, and the resolution of conflicts (Klijn and Edelenbos 2007). They need to interact with all parties "as a knowledge mediator, a broker, a counsellor or a critical friend" (Healey 1997, 309). A very important yet difficult task in all this is to create a fair and democratic process in which not only the powerful, but also the weakest parts of the community can express their needs and interests (ibid.). An established strong neighbourhood management, for instance provided by a local planning office, is able to tackle potentially arising tensions and to develop effective responses to raised concerns while taking into account the political, strategic and local context. At the core of the planning process at a local level needs to be a dynamic neighbourhood manager – a dedicated person who is familiar with the neighbourhood and its particular diversity (SQW Ltd. 2007).

Analysis

The examined area lies in the north-eastern part of Athens in the district "Pedion Areos". It lies adjacent to Leof, Alexandras street in the South, 28s Oktovriou in the West, Kefallinias in the North and Andrea Moustoxidi in the East. The neighbourhood is a residential area in which spaces are used for housing and small businesses. Also cultural and social attractions and institutions of services to the public are available within the area, such as schools, a university campus, a sports association,

a hospital and others. Besides the park, the study area contains only a few other green or blue surfaces (see figure 1).

Figure 1: Map of the study area, without scale (Source: Drakontaeidis and Pisimisis 2017)

A high amount of sealing and the lack of open spaces lead to an accumulation of heat in warm periods. The surface temperature measured during a heat wave in June 2016 was relatively low in the study area compared to other districts of Athens. However, the surface temperature measured was higher than 46 °C (Bloomberg Associates and Athens Office of Resilience and Sustainability n. d.). Although the study area was not highly affected by heat in comparison to other districts, heat stress presents a problem that demands action. The situation is intensified by the absence of cooling centers and insulation. More than a half of all buildings in the study area have no insulation (EKKE 2011a, EKKE 2011b) and the next cooling center is further than 0.5 km away from the closest point in the area (Bloomberg Associates and Athens Office of Resilience and Sustainability n. d., data from 2011).

Our study area includes the western part of the eponymous public park “Pedion Areos”. It provides shading and a generally cooler climate (see chapter *Urban green as a means to reduce heat islands*), which presents an opportunity to escape heat stress. The park has been renewed 2008-2010. Still illegal activities within the park such as drug consumption and trade as well as prostitution give it a bad reputation (Drakontaeidis and Pisimisis 2017, verbal message). It is also used by homeless persons for shelter (ibid.).

Vacancies are present throughout the whole district. While empty housing space on upper floors is not much noticeable, empty retail spaces on ground level highly influence how people that are strolling by perceive the neighbourhood. Empty stores make the district appear run down, neglected and inanimate.

Streets in the area that do not serve as a transit area between different parts of the city are mostly narrow. A lot of streets are one-way streets with one lane reserved for parking. Pedestrian walks that are usually located on both sides of the streets are mostly slim and roughly passable. Their curbs are high and seldom flattened. These circumstances make it hard for people with strollers, in wheelchairs, with walkers or children with bikes to pass.

The social environment in the area is diverse. The composition of residents has not significantly changed within the last decade. There was neither an influx nor an outflow of a majority of a social group (Drakontaeidis and Pisimisis 2017, verbal message). Today both the number of seniors and children are relatively low compared to the surrounding districts (Bloomberg Associates and Athens Office of Resilience and Sustainability a, n. d.; Bloomberg Associates and Athens Office of Resilience and Sustainability b, n. d.). The number of low-income households is high. 27,5-30 % of the households in the area have an annual income that is lower than 8.804 € (2008) (Bloomberg Associates and Athens Office of Resilience and Sustainability a, n. d.). Also the share of highly qualified workers within the area ranges between 0 and 35 % of the population which is below-average (Maloutas and Spyrellis 2015, www). There is also a high presence of citizens from other countries than Greece (ibid.). This analysis is based on data from 2011. The financial crisis Greece struggles with as well as the flow of refugees in the last years may have led to an intensification of the situation.

The culturally and financially heterogeneous and likewise place-bound population presents a challenge for the neighbourhood management. Before a strategy or plan can be developed, it is essential to understand the various meanings a neighbourhood can have for its residents. A key theme that needs to be taken into account is the fact that a high level of attachment to the neighbourhood is a precondition for the development of a sense of belonging as well as a sense of community among the residents (Manzo and Perkins 2006). In the examined neighbourhood, the overall sense of community does not seem to be very strong, which may be caused by the lack of spaces for interaction. Further, since the neighbourhood is likely to have been their home for a long time frame, residents may be biased when exposed to change. The first important step for the neighbourhood management is to understand the people‘s emotional connection to a place, to be insightful and accompany them on the way. It is the planner‘s task to convey that the neighbourhood is the residents‘ living environment and that they have the opportunity to actively shape it.

Introducing the concept

Based on the analysis, our aspired goals for the concept presented here are to increase social equity, to lower the impact of heat waves and to reduce emissions and their impacts on the living environment through the creation of green, safe, and social places. Through the creation of such places residents shall receive the opportunity to spend time in cooler spaces with other members of the community.

Our concept to improve local grievances in the study area is based on the following working hypothesis: The more autonomous and self-sufficient a quarter or community is, the less dependent it is on external help in crisis situations (Schneider 2015, 123). Applied to the issue of heat stress or other extreme weather events, this approach suggests that local neighbourhoods can increase their level of resilience against these external threats by becoming more self-sufficient.

As explained in the first chapter (*Urban green as a means to reduce heat islands*), the quality and quantity of urban green areas and how they are used influences the people‘s well-being. Our study area contains roughly 30 ha of “Pedion Areos” park, which is supposed to be-

come a central place for participatory action, but holds a very negative reputation that repels most of the residents.

A feeling of safety is a necessary prerequisite in order for people to use a certain space. Since place attachments influence people‘s motivations as well as their individual and group behaviour in community planning and development processes, the local communities‘ prejudiced opinion on the park needs to be changed in the course of the procedure (Manzo and Perkins 2006). Crime and environmental disasters disrupt place attachments by causing feelings of loss and alienation. Only if they are properly recognised and understood, these feelings can be used to mobilise citizen participation to (re-)build the community (ibid.). Opposed to that, shared interests (e.g. tackling the heat stress, improving the neighbourhood) can foster feelings of belonging to a group. The neighbourhood management has to fathom these feelings and emotions that the residents might be unconscious about.

„Place attachment, place identity, and sense of community can provide a greater understanding how neighbourhood spaces can motivate ordinary residents to act collectively to preserve, protect, or improve their community and participate in local planning processes.“ (ibid.: 347)

Our concept aims at the implementation of green, safe and social places in consideration of the knowledge about existing circumstances as well as the residents‘ needs and wants in a way that will strengthen the resilience of our neighbourhood in the district “Pedion Areos” against heat stress. That shall be done by informing the residents‘ sense of community, justice and sustainability. But more importantly, by empowering the people to take part in their district‘s development, the bond shall be strengthened as well as the identification as a community.

In order to achieve the aspired change, we have developed an – in theory – ideal process of planning and monitoring the desired development in the neighbourhood. Since the process itself is meant to be largely community-led, it is not possible to plan out specific projects or measures; instead, the purpose of this concept is to give advice for planners on how to provide the framework conditions in which the projects and measures chosen by the community in question can be implemented in a

sustainable and just way. Despite the clear focus on a community-led procedure, our concept relies on an adept combination of top-down and bottom-up approaches since both combined can often generate a greater adaptive capacity in the community than either could implemented in isolation (Butler et al. 2015).

Implementing the concept: Procedural steps

The steps presented and explained below are all part of the overall concept and its implementation which aims to achieve a long-term change of the local society's mindset regarding their neighbourhood and their sense of community within its boundaries in order to increase the overall resilience against external threats such as heat stress (see figure 2).

1. Person in charge

The first necessary precondition for the successful and sustainable development and implementation of visions and ideas for the neighbourhood is the designation of a dedicated person who is responsible for the neighbourhood planning process and looks for the specific individual needs of the local residents as well as the concerned public. This person, designated by the city administration, holds the position of a neighbourhood manager who functions as a mediator with the clear aim to balance out the different, often competing needs and interests of different stakeholders and actors. These can also include political, economic and administrative actors on a local as well as regional, national or international level. Ideally, the manager has a history in the field of urban planning and is well-connected with important local service providers. They need to have the influence to actually induce meaningful changes. Furthermore, it is essential that they are present in the neighbourhood and engage in a direct, honest dialogue with the local community to ensure they are trusted and respected by all represented social groups, including marginal groups.

2. Information

The idea of the planning objective – which is to make the neighbourhood more resilient against external threats, especially heat stress – needs to be communicated to all relevant actors and interest groups in order to acquire broad support and acceptance for the purpose. This includes the neighbourhood's

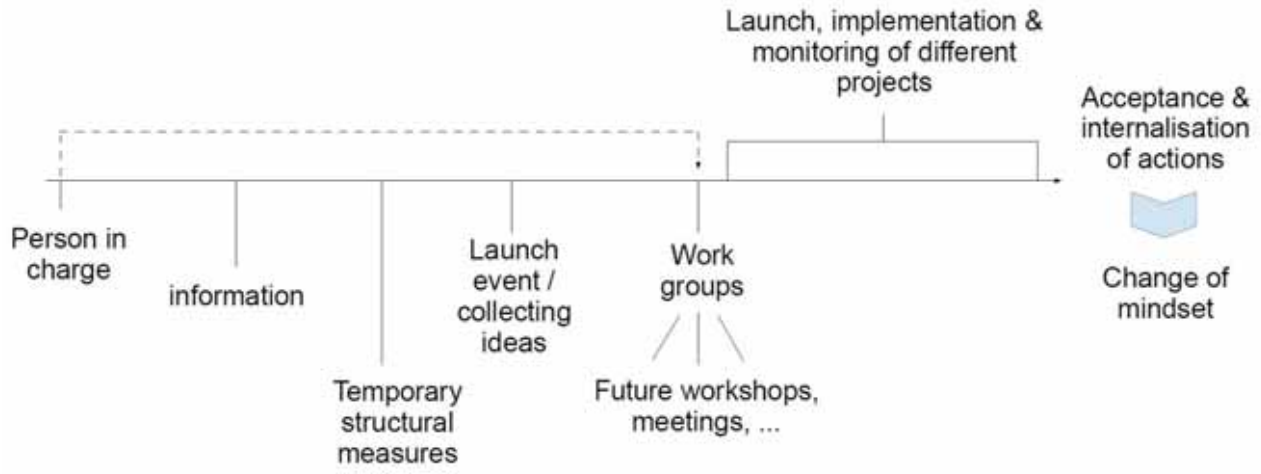

Figure 2: Timeline of the neighbourhood planning concept (Source: Own Depiction)

residents as well as the interested and possibly affected public and potential collaboration partners, such as different organised local groups, e.g. associations, societies, and political parties, and also schools and universities. First of all, all these actors need to be provided with some basic knowledge on the effects climate change has on their neighbourhood (Broto et al. 2015, 9). It is important to only present relevant information which is directly linked to the planning objective, to raise the people's awareness of their neighbourhood's specific vulnerabilities and evoke a desire for engagement and action among them (ibid.). In addition to that, the actors need to be informed about the existence and contact details of the new neighbourhood manager in case of any arising queries and questions, and need to be made aware of the place and date of an imminent launch event during which more details about the planned climate compatible development are going to be announced and discussed. The information can be spread via local media, posters, flyers and the internet. Ideally, the new neighbourhood management has its own website presenting relevant up-to-date news regarding the planning process and progress (Kreiszeitung Verlagsgesellschaft mbH & Co. KG 2010, www). Potential cooperation partners should be contacted directly via email or mail.

3. Temporary structural measures

Case studies have shown that changes made to certain problematic places can have a significantly positive impact on the concerned spaces in very short time and a low budget. An impressive example for this is the "quick action approach" that has been

introduced by the New York City Department of Transportation (NYDOT). More than 50 selected places in New York have been transformed into pedestrian plazas within only a few days – and with the use of temporary materials, such as paint and planters. All plazas were created as temporary pilot projects with an initial testing period of six months. At the end of the trial period, the projects could either be turned into permanent solutions or undone with no remaining effects, depending on the actual success of each transformation. The results were immediate and overwhelmingly positive – with a clear majority of the New Yorkers approving of the changes and the approach having been copied multiple times in other cities (Sadik-Khan 2013, www). As important as communicative instruments and bottom-up approaches are for planning, they also have a big downside to them: It takes a lot of time until the actual implementation of visible measures and noticeable changes take place, which can lead to frustration among the citizens as well as the planners (ibid.). Temporary measures that are implemented by the neighbourhood management in agreement with local authorities, however, are direct and quick. They demonstrate effectively that changes are actually happening, which can evoke trust in the whole purpose and increase the people‘s willingness to participate in the planning process in order to make sure the changes are going to be in their interest and to their individual as well as collective benefit (Tait and Hansen 2013; Birchall and Simmons 2004, 7ff). If the temporary measures turn out to be broadly accepted by the relevant stakeholders and positive changes can be observed, it is always an option to turn the temporary solution into a permanent one. If not, no harm has been done because everything can be redeveloped into the former state (Sadik-Khan 2013, www). This means that people still get a say and power in the final decision-making process, with the temporary measures functioning as an initial spark to get everyone on board.

4. Launch event to collect ideas

The next important step is to prepare and organise the announced launch event which gathers all interested actors in one place. This gathering should serve several purposes. At first, basic information about the reasons for the needed change and the planning objective should be presented to ensure that the attendants have a common basis of knowledge that will ena-

ble them to engage in and follow discussions. Concerned individuals or parties get the chance to voice their doubts, fears and hopes for the area and the community right from the start and, very importantly, within a sheltered framework due to the presence of a mediator (Manzo and Perkins 2006). Another crucial aspect of the event is to obtain valuable information and insight into the local dynamics that only locals can provide and that might reveal hidden potentials or so far unknown (potential) conflicts (SQW Ltd 2007, 9f). As explained previously, it is a crucial task of a neighbourhood planner to understand the people‘s emotional connection to a place and thus their motivations for blocking or rejecting community-based approaches and activities (see first chapter: *Urban green as a means to reduce heat islands*). By the time of the launch event, the neighbourhood manager should have developed and be able to present strategies to tackle the already previously known issues, such as the negative image of the park, and be open and willing to take further concerns raised into account as well. Involving residents in the process of actively developing and shaping their living environment is often very beneficial for the planning process since they contribute to the purpose with their own experience, knowledge and abilities (SQW Ltd. 2007, 9). It is recommended to encourage the present actors to form small groups in which ideas and visions can be exchanged and developed (Manzo and Perkins 2006). It has been proven that direct forms of participation increase the sense of responsibility of all actors, and of the residents in particular since they are going to be affected the most by the change of their living space. Responsible thinking and acting, in turn, is a key factor for the sustainable development of an area (ibid.).

5. Work groups

After the launch event, residents and other actors with similar ideas need to be brought together and encouraged to form working groups in which they can further draw up their ideas and visions for their neighbourhood. Before the groups start their actual work, they receive the opportunity to participate in workshops during which they can gain the basic knowledge and understanding of climate change, its consequences and its impact on cities. That way, it can be ensured that all group members can draw from an equivalent pool of knowledge. It is the

role of the neighbourhood manager to provide assistance and support throughout the work of the groups, create helpful contacts with external partners and also encourage an exchange between different working groups in an attempt to keep the planning processes transparent and open to input from actors who are not an integral part of a group. Throughout the planning and working procedure of the groups, conflict resolution and consensus building must remain one of the main goals of the manager. It can only be achieved by long-term face-to-face discussions in order to get to an agreement on projects, strategies, plans, policies, and actions (Manzo and Perkins 2006). A collaboration on eye-level requires the production of shared values in a joint learning process (ibid.). Processes such as social learning, a fair exchange of knowledge, and the empowerment of the local people are an elementary aspect to developing an adaptive capacity – the ability of a system or community to adapt to changes of the environment (Butler et al. 2015). Moreover, a constant and intense collaboration with the aid of a neutral mediator is the only way of warranting the generation of a high knowledge diversity, an inclusive and just governance, as well as collective action and decision-making (ibid.).

As stated earlier, the process of developing visions and ideas is open and lies to a high degree in the hands of the working groups (see third chapter: *Introducing the concept*), hence no specific projects can be presented at this point. Since the main aim of all work groups and initiatives that may form will be to reduce the heat island effect and the resulting heat stress within the borders of the study area, it is very likely that some of the projects may focus on the enhancement of the amount of green infrastructure in order to provide shade and pointedly cool down different vulnerable places. Possible projects could include the creation of potentially publicly accessible pocket parks in the centre of residential blocks in cooperation with the owners of the buildings and their residents, thus punctually generating shade while allowing for a refreshing flow of air at the same time as a countermeasure against the radiation of heat off of the building facades (see figures 3 & 4). The problem of heat radiation could also be tackled by greening some of the facades (see figure 3), while the park would be ideal for joint activities such as

community gardening or the organisation of public events, maybe in cooperation with the university or local schools. Further temporary measures can be developed and implemented as well in collaboration with local authorities.

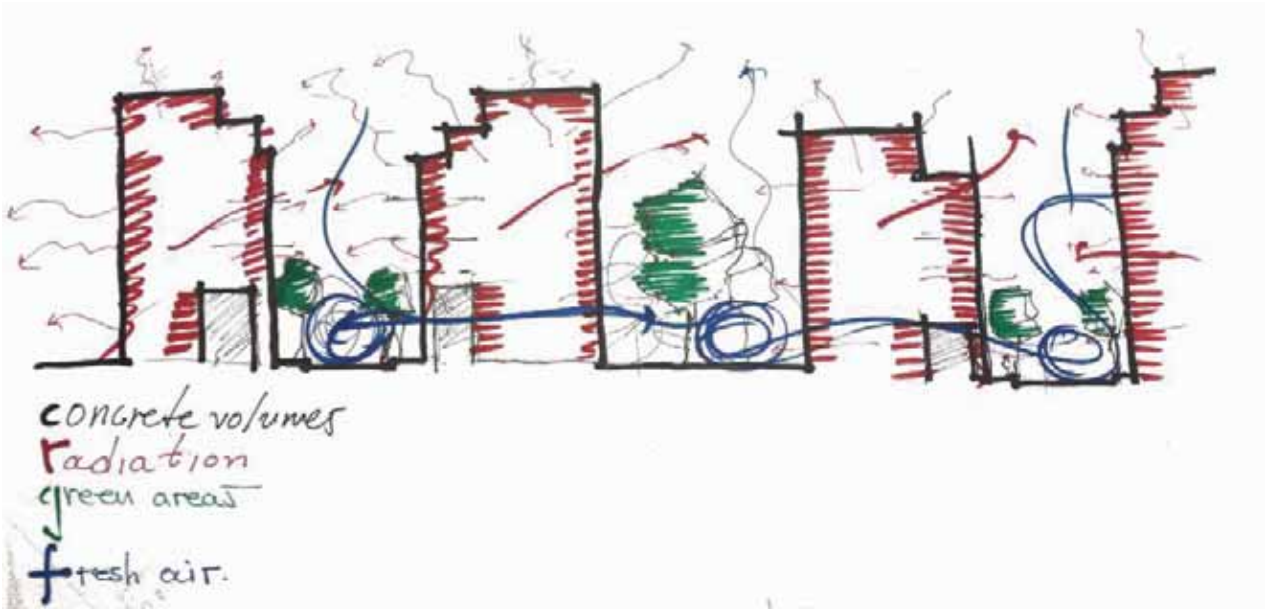

Figure 3: Potential flow of fresh air through the pocket parks (Source: Drakontaeidis and Pisimisis, 2017)

Figure 4: Building with an open space in its centre and passages for air circulation (Source: Drakontaeidis and Pisimisis, 2017)

6. Launch, implementation and monitoring of the different projects

As soon as the individual work groups and initiatives have worked out their concrete visions, concepts, strategies and actions, and have established a good collaboration with important supporting cooperation partners on different levels, the projects can be implemented in the neighbourhood. Again, working out the details should be mainly left to the community in form of the work groups as a means to empower them to actively shape their own living surroundings. However, purposely chosen top-down impulses can be helpful for launching a project, e.g. by providing designated areas of the park for gardening projects (Hoelzel 2015, www). Especially the park should be treated and zoned with care, since the presence of homeless people, prostitutes and criminals during the night time is a real issue that needs to be taken into account and to be dealt with. Having said this, it needs to be pointed out that

solving difficult social problems of this kind is not the task of the neighbourhood manager. It lies within the manager's responsibility, however, to acknowledge the problem, take it seriously and get in contact with professionals who are more suitable and better equipped to tackle this problem in consultation with all relevant stakeholders (SQW Ltd. 2007, 13; 16). Another relevant issue the manager needs to take care of is the allocation of financial and other resources in order to enable the actual implementation of projects. Possible options may be the use of funds or partnerships (Sehested 2009; SQW Ltd. 2007, 12f).

After the successful launch of the different projects and initiatives, it furthermore remains the manager's task to monitor and support the further development of the projects.

7. Acceptance and internalisation of actions & change of mindset

The residents of our study area in Athens have lived in a similar composition of people with different cultural backgrounds and a high discrepancy regarding the income of the different social classes for a significant amount of time now (see second chapter: *Analysis of the area*; Drakontaeidis and Pisimisis 2017, verbal message). They have grown accustomed to the social roles and identities they have inhibited throughout this time. It takes time for these structures to slowly be changed, with this process requiring a long learning-process (Manzo and Perkins 2006). It is worthwhile to encourage such a shift within the community since its result may be a general change of the residents' underlying mindset – away from othering and a general feeling of alienation towards a more active participatory behaviour in the community (ibid.). Taking a part in shaping the local environment can help to generate a closer emotional connection and identification with a place – which would be a desirable effect in the case of the locals' very negative opinion of the "Pedion Areos" park (ibid.). At the same time, building and fostering new networks helps to increase the feeling of integration. Both – the feeling of identification and integration – count to the fundamental human needs. That, in combination with an improved physical living environment, enhances the ability of the neighbourhood to satisfy the needs of the residents and thus prevent them from spending their leisure time away from it (ibid.).

Conclusion

Our study area shows deficits regarding its adaptive capacity towards heat stress. In addition to that, the highly diverse local population lacks a common sense of togetherness and solidarity. In order to provide possibilities to escape the heat and also to strengthen the community, our concept strives to empower the residents to get involved in their neighbourhood's development.

Making use of communicative instruments in participatory planning processes is an effective way of motivating people and to actively engage them in shaping and improving their neighbourhood. Direct participation strengthens the sense of belonging on a physical as well as social level. The different steps, proposed by the concept, follow a clear line by steadily increasing the residents' involvement in the projects and generally within their neighbourhood. Projects and initiatives shall be designed with the aim of lowering the temperature and reducing emissions, and therefore will also contribute to tackling the negative effects of climate change. Moreover, the creation of cooler and bustling spaces may lead to closer connections between the residents, strengthening the local identity. Within the process it is the neighbourhood manager's role to cautiously mediate between the involved actors in order to enable an open and transparent progress, in which everyone feels respected and heard. Although the concept is partly based on short-term actions such as temporary measures and a launch event, it must be kept in mind that a majority of the residents already live in the neighbourhood for a reasonable duration, which makes it hard for them to quickly adapt to change. A process like the one presented here strives for a long-term change of mindsets, which is likely to be a tenacious procedure.

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Challenges of resilience in European cities

The development of resilient cities is the key factor for sustainable development. In the events of crises or hazards (natural hazards such as floods or climate change as well as societal extreme events as the financial crises), cities should be able to fulfil their societal and economic duties in the long term. In many cities the question arises how and with which measures resilience can be increased and how strategies for successful sustainable urban development can be implemented.

The publication summarizes the contributions of the Summer School 2017 in Athens that focused on the development and discussion of approaches and strategies coping with heat islands in the dense urban area of Athens, Greece. The Summer School is a central cornerstone of the university partnership for joint educational and research activities of the Leibniz Universität Hannover (Faculty of Architecture and Landscape) and the National Technical University Athens (School of Architecture), which is funded by the German Academic Exchange Service (DAAD) as part of the project „Resilience as Challenge for European Cities (HeKris): Developing urban planning strategies and concrete projects“.

https://doi.org/10.15488/5555