THE CONTRIBUTION OF SUSTAINABLE ARCHITECTURE TO SOCIAL RESILIENCE ACHIEVEMENT

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Abstract
The leading global challenge is achieving the UN Sustainable Development Goals (SDGs) for a more sustainable and inclusive world by 2030. Architecture may sufficiently contribute to this. In particular, buildings and open spaces that respond to citizens' evolving needs, even in extreme conditions,lead to higher social resilience. Therefore, the efficient management of these issues enforcessustainable growth for the benefit of all stakeholders and should be a target.

Based on experts' perspectives in Greece, the present study examines the impact of buildings and open spaces on social resilience.

A hybrid focus group discussion was conducted, with half of the participants meeting in a classroom and the other half joining via Zoom. Ten (10) experts from diverse and relevant to the examined issue fields, each with extensive experience, engaged in in-depth discussion.

The study's main findings highlighted the importance of architecture and its contribution to sustainable development. Well-designed buildings and open spaces that effectively meet citizens' needs in regular and challenging conditions are essential for enhancing well-being, fostering social interaction, and building resilience. Renewing old buildings and industrial areas may offer valuable services to local communities. A more holistic and proactive approach with the participation and collaboration of all stakeholders should be applied to manage crises better. It is essential to consider the needs of minorities in the design and use of infrastructure.The study is limited as it focuses solely on Greek participants, which introduces bias in their perceptions and may not represent a broader perspective.

Keywords: *Sustainable Development Goals, social resilience, sustainable architecture, sustainable buildings, open spaces, extreme events, sustainability in Greece.*

Introduction

Addressing current global challenges necessitates contributions from individuals, communities, and governments alike.‘The 2030 Agenda for Sustainable Development’ outlines 17 Sustainable Development Goals (SDGs) that form a crucial global framework.

Developed and developing countries must unite in a strong partnership to implement strategies that enhance health and education, eradicate inequality, drive economic growth, protect the environment, and ensure the successful attainment of these targets (UN, nd). The social targets play a crucial role in fostering progress and positive change. Social resilience achievement, including the community's capacity to sufficiently respond to various challenges,is vital. According to Adger (2000), social resilience is defined as "*the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change*" (p. 347). Thus, the social, political, environmental, andeconomic aspects are related, and their efficient management leads to social resilience. Keck and Sakdapolrak (2013) pointed out the following three essential parts to achieve social resilience: a) coping capacities of social actors to cope with and solve all kinds of problems; b) adaptive capacities, using their ability from their experience and adjust their actions to handle future challenges in their daily lives successfully; and c) transformative capacitiesto equip institutions with the required resources to improve 'individual welfare' and achieve sustainable societal robustness to manage future crises successfully. Therefore, achieving social resilience benefits all stakeholders, and the appropriate tools are critical. Architecture plays a key role in designing cities, including buildings and open spaces that are friendly to citizens, considering possible adverse events and uncertainty from climate change. Adaptive reuse architecture (or building reuse) renovates old buildings into new use, mainly from real estate businesses that have the financial resources and expertise is essential (Master Class, 2021). Among the stakeholders in this effort, the role of individual citizens and personal and societal growth are crucial to achieving SDG progress. Inner development is critical to social resilience; it concerns personal development in a 'sustainable future' and requires a holistic transformation (Meridian University, 2024). Adopting a more holistic and proactive approach with the involvement of all stakeholders to improve daily life and successfully respond to uncertainty is imperative. Also, digital technologies provide early warning information, optimise resource distribution, and facilitate remote collaboration, all of which are important to mitigate inequalities and successfully handle extreme events (Vincent & Cull, 2014).

This paper explores how architecture contributes to building sustainable social resilience. It highlights the necessity of integrating social, economic, environmental, and institutional elements to promote adaptive architecture. To effectively promote sustainability and address extreme physical events with significant social, economic, and ecological impacts, buildings and open spaces must be designed and utilised with maximum efficiency.

The current study followed a hybrid focus group where half of the respondents met in a classroom, and the rest participated through Zoom services. Ten (10) experts, mainly from the social and architectural fields, discussed the above issues and generated beneficial outcomes.

The study's main findings proved the importance of architecture and, in particular, the design and use of buildings and open spaces in achieving social resilience, which leads to progress in achieving SDGs. Towards this, the active involvement of all stakeholders, particularly individual citizens, through profound awareness and personal growth is recommended. In addition, a more holistic and proactive approach is required to manage crises better. There should be greater emphasis on regenerating old buildings and repurposing unused industrial areas. Although the study participants had extensive knowledge of the subject, their concerns were primarily local, as they were based in Greece and requested to focus mainly on locally relevant issues.

Literature review

This section of the paper briefly outlines the fundamental issues surrounding the study of social resilience and architecture.

Social resilience

Social resilienceassists people in sufficiently responding to external shocks, stress, and stressors(Kwok et al., 2016; resiliencelinks, nd). It contributes to the phases before, during, and after the disaster through preparedness, response, and recovery, and its main attributes are the community gathering place, social support, risk awareness and impact, collective efficacy, and a strong community sense (Kwok et al., 2016). In addition, human capital (skills and knowledge), social capital, psychosocial dynamics (self-efficacy, aspiration, and confidence), and social protection are important elements of social resilience (resiliencelinks, nd). The involvement of several organisations at global, national, and local levels is required to address community vulnerabilities, enforce social networks, and build capacity to handle economic, social, and environmental challenges efficiently. At the top level, the 'Sendai Framework for Disaster Risk Reduction 2015-2030' supported by the United Nations Office for Disaster Risk Reduction (UNDRR) set ambitious goals to minimise disaster risk globally by providing the required support to countries (UNDRR, nd). Next, governments play a key role in promoting resilience by applying the proper policies, efficiently allocating available resources, and supporting systems that assist communities to withstand and handle emerging challenges. The government increasingly operates as an enabler in cases of emergency, mainly coordinating other actors and less directly intervening to control the situation. At the same time, many responsibilities are increasingly moved to local communities and individuals (O'Grady & Shaw, 2023). Local communities are fundamental in minimising vulnerability and achieving community resilience as the first response line. Their active involvement, local knowledge, and social networks are vital for building adaptive capacity and enforcing sustainable development (UNDDR, nd). Finally, individuals acting independently can be prepared to efficiently manage extreme situations like educating their children or keeping the roads safe. Individual resilience is closely associated with the community's ability to prepare, adapt, and respond to extreme events (Norris et al., 2011). The coordination of these three levels and the clear responsibilities to successfully manage external extreme events are critical. The term 'responsibilisation' as a process that facilitates the responsibilities' shift from state to individuals and communities is widely used (van Bommel &Höffken, 2021). The willingness and capabilities of the local actors to manage and support 'certain responsibilities' and whether these are the appropriate ones are critical (Mustalahti et al., 2020).

The social dimension of resilience and emphasis on social factors for recovery is essential. Thus, social networks, social groups, and their relationships play a key role in how communities "*plan for, adapt, and recover from crisis or climate disaster*" (resiliencelinks, nd). The elements that support social resilience at individual and group levels are the following: information and advice, resources, management capacity, personal and community support, and higher involvement. In the broader context of community support, this can be provided by the following: high knowledge of hazards, shared community values, establishing functional social infrastructure, positive social and economic trends, good partnerships, sufficient resources, and competent skills (Buckle, 2006).

Therefore, individuals' and local communities' role in successfully handling extreme events and contributing to social resilience is vital.

The continuous assessment of the community's resilience to find weak points, improve them, and analyse various relevant factors that show how individuals, groups, and systems

respond to extreme events are highly required. It is recommended to use indicators that encompass physical (such as buildings and infrastructure), social, and economic systems (such as the natural environment), as proposed by the assessment methodology (NIST, n.d.). Below are the most important indicators presented.

Social Vulnerability Index (SVI) is a web-based mapping tool that measures social vulnerabilities and assists communities in managing these (Bureau of Transportation Statistics, nd).

The **Resilience Analysis and Planning Tool (RAPT) is a GIS-based mapping mechanism that uses over 100 preloaded layers and was developed by** the Federal Emergency Management Agency (FEMA). RAPT aims to assist everyone in understanding its communities, providing information on population demographics, community infrastructure, hazards, and other related issues (FEMA, nd).

The PEOPLES is a multi-dimensional, holistic framework for defining, assisting, and enhancing communities' disaster resilience. It focuses on the following seven dimensions of resilience represented by the acronym PEOPLES: Population and Demographics, Environmental/Ecosystem, Organized Governmental Services, Physical Infrastructure, Lifestyle and Community Competence, Economic Development, and Social-Cultural Capital. Combining the above-mentioned dimensions, this framework can be the basis for developing quantitative and qualitative models that may continuously measure the communities' resilience (Renschler et al., 2010).

The **Baseline Resilience Indicators for Communities (BRIC)** framework was developed by the University of South Carolina's Hazards & Vulnerability Research Institute and aims "*to assess attributes of resilience to natural hazards*" at the country level and applied initially in the USA and then to other countries. The BRIC uses 49 variables grouped in the following six dimensions: **human well-being/cultural/social, economic/financial, infrastructure/built environment/housing, institutional/governance, community/capacity, and environmental/natural (University of South Carolina, College of Arts and Science, nd).**

In addition, the relevant literature proposed more resilience assessment tools such as the Community Resilience Measurement Tool (CRMT), the Community Resilience Index (CRI), the Climate Disaster Resilience Index (CDRI), the Disaster Resilience of Place (DROP), etc.

Identifying disaster phases and applying specific actions to improve the situation is essential. In particular, in the phases of reduction, trying to minimise risk and disaster consequences, readiness developing operational capacity, and preparing to handle unusual conditions, response emphasising the protection of lives and infrastructure, and recovery coordinating efforts on a holistic regeneration and improvement of a community (National Emergency Management Agency, 2020).

The governance of social resilience is a fundamental issue, 'complex and often multidirectional', and as governance 'super factors' are mentioned, the "*control of corruption, societal trust, and high-quality political leadership*" (Brown, 2022). The governance of disaster management, particularly the coordination, arrangements, and processes concerning all the involved actors and the proper decision-making, are critical (Tierney, 2012). Finally, gender equity, broad inclusion of young people and minorities, appropriate infrastructure such as public spaces and parks serve the recreation and cultural purposes, and community institutions are essential for social cohesion that creates resilience (resiliencelinks, nd).Architecture must be prioritised because it is crucial for creating a sustainable environment.

Architecture and Social Resilience

The role of architecture in creating a sustainable built environment, social cohesion, and resilience is excellent. The recent pandemic showed the importance of the management of buildings due to the time people spend in these and their impact on their health and well-being (Lipinski et al., 2020). "*By designing buildings and public spaces that encourage social interaction, community engagement, and a sense of belonging, architecture can contribute to the well-being of individuals and society as a whole*" (De Burca, 2023). The built environment facilitates people's connection, adaptation, and recovery. Understanding the relationship between buildings, spaces, and people is critical. The first two issues' design and use impact people's interactions, behaviours, and experiences, creating collaboration and mutual support opportunities (Larsen, 2013).In addition, implementing practical, proactive, and tailor-made policies and practices that meet people's needs is essential (Barham, 2017). Importantly, offering buildings and environments that promote people's well-being is vital. Rashidfarokhi and Danivska (2023) highlighted the following factors that facilitate well-being: a) socio/demographics, b) material living conditions (income, wealth, housing, education, access to services, etc.), c) psychological traits, d) physical and mental health, e) meaning of life, f) security, and g) connectedness. These issues should be considered when designers and policymakers construct buildings, neighbourhoods, open spaces, and cities. Architecture and style in buildings and spaces at individual and community levels, neighborhood distinction, street width and layout, green spaces, house distance to street, parking areas, porches, flexible space, and layout are all essential.Apart from well-designed buildings, offering clearly defined gathering places such as schools, squares, local businesses, and other community centres is a critical issue that creates social capital, enhances community connection, supports disaster response and recovery, and actively reinforces the 'social fabric of communities' (Kwok et al., 2016). Those places should be designed considering community needs and aspirations, and the close collaboration and engagement of architects, community members, and other stakeholders is essential (De Burca, 2023).

Sufficient urban spaces such as healthcare services, cultural and religious facilities, recreational and civic centres, improved infrastructure and accessibility (suitable street design, availability of walkable areas, good public transportation, and pedestrian-friendly services), technical infrastructure (availability of the proper technology, access to the valuable services such as water, air quality, wastewater management, solid waste management, view daylight cycles, easy contact with the nature and views of natural scenery), and functionality and aesthetics (ergonomics, used colours, decor, and fabric and materials) are all important (Rashidfarokhi & Danivska, 2023).

Therefore, special emphasis should be placed on the building and open spaces design to serve better people's needs in regular and extreme conditions. Community social resilience is focused on satisfying the needs and aspirations of the community's members "*to create sustainable and resilient architecture*" that contributes to social cohesion. The two concepts can be integrated to provide substantial sustainability benefits to the community. The following strategies facilitate community resilience: a) sustainable design that supports social, economic, and environmental resilience, b) multi-functional spaces that facilitate social cohesion and community engagement, and c) disaster preparedness that creates resilient structuresto natural and human-made extreme events (De Burca, 2023).

The eight fundamentals of 'Resilient and Climate Adaptive Design' to minimise harm and possible property damage and better adapt to evolving conditions must be "*place-based, risk prepared, equitable, precautionary, system-centric, ready, service-life focused, and adaptive*" (AIA, nd).

The specific characteristicsof each area should be considered, as the requirements in cities and rural areas in architecture and social resilience differ. More than half of the

population currently lives in urban areas (4.52 billion is the urban population, and 3.43 is the rural population), which is increasing. Specifically, in high-income countries (Western Europe, America (USA and Canada), Japan, and the Middle East), more than 80% of the population lives in urban areas; in most upper-middle-income countries (Eastern Europe, East Asia, North and Southern Africa and South America) between 50% to 80% of people live in urban areas. In low-income countries, many people live in rural areas (Ritchie et al., 2024). Architectural solutions provided in an urban context require more density, innovation, and efficiency, and those in rural areas are focused on tradition, sustainability, and higher integration with nature. In both areas, buildings and open spaces should be created that enhance people's well-being and resilience and mitigate risk from extreme events.

The emphasis on sustainability in buildings and open spaces designed to endure extreme events is essential for a resilient and responsible future. Sustainable and regenerative designs are two interrelated approaches that promote environmental protection, social growth and well-being. 'Sustainable design' is focused on creating products, buildings, and systems that consider energy efficiency using renewable energy sources, environmentally friendly materials, waste management, and social responsibility, where the following design is adjusted to human needs and facilitates social justice. 'Regenerative design' is looking to regenerate natural and social resources. Its four main elements include the restoration of the ecosystems that promote natural vegetation and biodiversity, autonomy supporting the local economy and minimising dependence on external resources, the circular economy emphasising efficient waste management, and social participation encouraging the involvement of communities in the decision-making and design processes (Hariramet al., 2023).

The active involvement of minorities in the achievement of social resilience is a critical issue. They have specific needs that should be respected in buildings and open spaces design. Disabled people are the largest minority group in the world population, and over 1.3 billion people live with some disability. In addition, over 20% of the population will be over 65 by 2050 (WHO, 2021). These people require adequate support from other stakeholders, mainly governments, and a more holistic approach to achieving higher inclusion and participation (Poli & Malagas, 2024). Also, other minorities, like children, immigrants, tourists, etc, should participate in daily social life. Architecture must prioritise the design of buildings and open spaces that meet all citizens' needs while proactively addressing the challenges posed by extreme events. Effective urban design that emphasises inclusivity, safety, and flexibility may assist communities to thrive against crises and challenges.

Methodology

Qualitative research was applied in the current study, and it is an exploratory approach that examines people's experiences, perceptions, social phenomena, and cultural meanings using non-numerical data (Creswell & Poth, 2018). It introduces the observer to the real world and makes it visible (Denzin & Lincoln, 2018). The main qualitative methods used are interviews, focus groups, textual analysis, and observations to gain in-depth analysis of a specific issue.

In particular, the focus group method was used in the current study. This is a non-standard technique of information gathering based on apparently informal discussion and interaction among a group of people, where the role of a moderator, who is mainly the researcher and leads the discussion, is critical (Acocella, 2012; Morgan, 1997). The hybrid focus group discussion was implemented as half of the participants were in the same room discussing the examined issue, and the other half were discussed through Zoom services. The discussion meeting lasted more than three (3) hours and took place in the Department of Interior Architecture, University of West Attica, in Athens, Greece. The discussion focused

on Greek reality but presented some general related perspectives. Ten (10) experts from various relevant fields discussed the examined issue. The participants' jobs were a Social Science Professor, an Architecture Professor, a Manager from Civil Protection, a Sociology Professor, a Major from a Big City, a high ranked Manager of Attica Prefecture, a Firefighting Commander, a Sociologist, a Manager of Public Health Services, and a disabled people. All the participants had a rich experience in the examined subject. The first author of the study was the discussion moderator. Initially, the moderator presented the examined subject in detail, while ten (10) days before the discussion meeting, all the participants received an email with the study's details and objective.

The Outcomes of the focus group discussion

All the study's participants initially agreed that architecture and built environment significantly contribute to higher social resilience. Buildings and open spaces should consider citizen needs, respect the environment, encourage social interaction, promote well-being, and protect people from extreme events. In Greece, the fundamental issues concerning people are related to climate change, such as water scarcity, floods, and fires, while efficiently handling earthquakes is critical. Improvements in water and waste management are proposed. The use of fire-resistant materials in buildings and open spaces construction in areas near forests is critical. In addition, implementing zoning policies that restrict construction in high-risk areas and promote green buffers can help the creation of safer urban landscapes. They emphasised that more efforts are needed to raise awareness and create additional neighbourhood open spaces.

An efficient and effective governance and proactive action are required to handle the above-mentioned issues. Adopting a more holistic approach with the active participation of all stakeholders, such as government, local communities, research institutions, and individuals, is essential. The high participation of individuals in decision-making and problem-solving processes is imperative. The unambiguous assignment of roles and responsibilities is important, as there are cases in which central government, regional/prefectures, and local municipalities are in conflict to handle specific cases. The continuous training of leaders and citizens is vital. The **timely provision and dissemination of critical information** regarding crisis management, business operations, public health, and governance are essential. Through these, the various stakeholders may make informed decisions, respond quickly, achieve higher involvement, and minimise risks.

A big city's Major mentioned the importance of regenerating old buildings and unused industrial areas to offer valuable services to local communities.

The Social Science Professor pointed out that the greater use of technologies such as Artificial Intelligence (AI) and big data is vital, as these contribute to higher information circulation and prediction of some extreme events.

The Manager of Public Health Services emphasised strengthening healthcare infrastructures and workforce preparedness and more in primary health services. Telehealth services are essential to healthcare delivery, especially after the COVID-19 pandemic, significantly contributing to their adoption. It assists in providing remote patient care, improving patients' convenience, access, and efficiency, and minimises health system strain and cost.

The disabled person pointed out that minorities like the disabled community have specific needs that should be taken into account in **urban planning, architecture, and infrastructure design.** The design of buildings and open spaces must respond to disabled people's requirements. Inclusive design, where buildings and open spaces are fully accessible and functional for everyone, mainly for those with disabilities, is essential.

Discussion and Conclusions

In the last years, economic crises, energy problems, pandemics, wars, earthquakes, and events related to climate change have occurred more often. Architecture and the built environment are related to these extreme events, require proper design innovation, and substantially contribute to the enforcement of social resilience (AIA, 2023). Therefore, particular emphasis should be placed on the design of buildings and open spaces to facilitate social interaction, well-being, and environmental protection, contributing to better handling of crises.

The active involvement of citizens in the built environmentdesign, decision-making, and problem-solving processes facilitates a sense of ownership and empowerment. The regular feedback and assessment of the various infrastructures should be applied. Towards this, workshops, focus groups, and 'design charettes' are essential to achieve feedback and collect and incorporate ideas from residents (De Burca, 2023). The timely circulation of critical information for effective reaction, enhancing collaboration, risk mitigation, and public safety is vital. In this vein, applying digital communication platforms, AI, the Internet of Things (IoT), and robotics significantly improve recovery and disaster preparedness.

Social networks are more significant than formal humanitarian aid (resiliencelinks, nd). Thus, emphasis on the identification and efficient use of informal and formal social networks that facilitate quick reactions in extreme events is essential. In designing buildings, open spaces, and infrastructure to successfully handle crises, adopting a more holistic and proactive approach with the active participation of all stakeholders, such as governments, local communities, universities, and individuals, is recommended. Buildings and open spaces must enforce social interaction and well-being, mitigate risk, and protect all in extreme situations. Renewing old buildings and unused industrial areas to benefit local communities by supporting sustainable development and economic growth and preserving heritage is also critical. These infrastructures' adaptive reuse and restoration to revitalise urban and rural areas and meet the citizens' current and future needs are important. The extensive collaboration of public and private organisations to promote social resilience through sustainable architecture is recommended. Also, effective waste and water management significantly impacts the health of communities. Public buildings may strengthen social resilience by supporting community needs, emergencies, and social interaction. Well-designed and adaptive public spaces may assist communities to **withstand, recover from, and adapt to challenges** such as natural disasters, economic downturns, and social disruptions.The higher involvement of the neighbourhood in daily social life is recommended (Purdue, 2001).

Hospitals and primary health services must be prepared to handle extreme events efficiently, and the recent pandemic provided helpful guidance. Also, buildings and open spaces must sufficiently respond to the specific needs of minorities. Disabled people are the highest minority group and must equally participate in daily social life, and the offered infrastructure may respond to those people's needs. Tourists, immigrants, Romani, and other minorities also having diverse needs must be included in the provided services.

The efficient implementation of architecture in buildings and open spaces is related to higher social responsibility and more or less to the achievement of several United Nations sustainable development goals (SDGs), such as good health and well-being (SDG 3), gender equality (SDG 5), clean water and sanitation (SDG 6), affordable and clean energy (SDG 6), sufficient industry, innovation and infrastructure standards (SDG 9), reduced inequalities (SDG 10), sustainable cities and communities (SDG 11), responsible consumption and production (SDG 12), improved life on land (SDG 15), and partnership for the achievement of these goals (UN, nd).

Conclusively, the active participation of all stakeholders in designing and using buildings and open spaces to accommodate all citizens' needs and respond to extreme events is

imperative. Individuals must be aware of all relevant issues, have enough training, and receive the proper governance to contribute more to social resilience. Unexpected events have distinct characteristics that demand specific actions and policies. All stakeholders must stay well-informed about these issues and take proactive measures. Resilient design in high-risk areas requires specific architectural design and materials that can withstand natural disasters. Therefore, the future of architectural resilience is bright, with more developments in areas such as sustainable materials, innovative technology, viable reconstruction, and adaptive reuse of old buildings. With these advancements, we can create buildings that are not only attractive and functional but also robust and resilient in the face of unexpected challenges.

Limitations of the current study and suggestions for further research

The current study presents significant limitations as all the participants are based in Greece, and their perceptions mainly concern the Country. Thus, the generalizability of the study's outcomes is limited. Also, more in-depth qualitative and quantitative approaches to gain more insights are recommended.

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