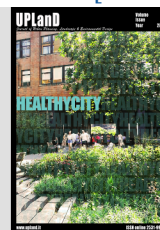


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PLANNING RESILIENT CITIES: THE CASE OF CHANIA

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HIGHLIGHTS

- Building standards for existing buildings in terms of resilience.
 - Coastal erosion areas and zoning standards for sensitive lands.
 - Critical and public facilities policies for hazard areas.
 - Taxation and Information dissemination policies in hazardous areas.
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ABSTRACT

Today's societies face intense problems caused by rapid urbanization and land degradation, globalization and socio-economic poverty, global warming and climate change that affect the world and can be the cause of natural disasters. According to the United Nations "urban risk, city planning and the role of local governments in dealing with risk reduction have been recognized as key factors to build resilient communities and nations" (United Nations, 2010) Physical exposure to disasters can affect not only the informal settlements that carry physical vulnerabilities due to their location or construction practices. In many cases, "formal" urban areas are as well vulnerable due to the absence of adequate building standards and urban planning that would reduce disaster risk by physical exposure.

The current paper will focus on the coastal city of Chania and its vulnerability because of the lack of urban planning. The case study is selected because it concentrates the characteristics of a typical coastal Greek city, which faces rapid demographic growth and unplanned urban and touristic expansion. The examined city has been diachronically influenced by the liberalization of construction regulations, an unqualified private sector emerged, hastily developing housing mostly with government oversight and without building permits.

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1. THE DEFINITION OF URBAN RESILIENCE

As cities are vulnerable to climate change, natural disasters, and economic crisis it is important to develop the tools and procedures which will make them face the problems and ensure the continuity of their development in the future. Resilience has emerged as an attractive perspective with respect to cities, often theorized as highly complex, adaptive systems (Batty, 2008).

In the recent years the term resilience has become popular. In terms of physics, it is used to describe the resistance of a material to an impact and in ecology it is used to describe the capacity of a system to recover and restore its balance and return to its previous state, after being disturbed. In 2009, UNISDR, defined resilience as the ability of a system, community or society exposed to hazards, to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2009). Resilience is also defined as the ability of systems and components to react in such a way to external or internal disturbances that – after a period of recovery – the essential characteristics retained (Knaapen et al., 1999).

In terms of urban planning, resilience has become a new concept with many different definitions. As the urban space is a system of many different elements, urban resilience refers to the ability of the city's social, ecological and technical networks, to maintain and to return to desired functions, to adapt to change and to transform in a way which will secure its adaptive capacity in the future. Cities are systems that are vulnerable to shocks and stresses which can erode their structures and subsequently their resilience. These shocks can be sudden events (flooding, earthquake, fire e.tc.) or continuous processes, as economic crisis, and austerity policies (Martin-Breen & Anderies, 2011). An 'un-resilient city' has limited or restricted capacity to recover, and "has high poverty and crime rates and devastated natural environment, or 'a ghost town'" (Pickett et al., 2013). Research shows that the most vulnerable to climate change and natural hazards are the urban poor, because of their houses locations and the lack of the basic services.

As resilience is the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, and recover from the effects of a hazard promptly and efficiently, it is important for risks

and uncertainties to be managed in a way that is both flexible and robust, using design solutions that build on investments in risk information, strategic communication, cross-sectoral coordination, and a well-planned response and recovery strategy (Jha, Miner & Stanton-Geddes, 2013, p. 9). In this framework it is important to increase preparedness, disaster, response, recovery, and reconstruction, as resilience goes beyond mere mitigation.

As for urban planning, fields as land use planning, urban infrastructures and services are critical not only for emergency response but also for the quick recovery of an urban area. Land use planning and ecosystem management are relatively approaches to managing disaster risks effectively, especially for small and medium-sized urban centers that lack resources and capacity, while urban infrastructure and services need to take into account the possibility of failure through redundant and backup measures so that they can deal with the less possible reverberations to the society. Coastal communities, built infrastructure and established and emerging economic sectors are affected through the disruption of coastal physical processes resulting from climate change and coastal and upstream development. With increased urbanization, rising sea levels and stormier seas, shorelines are increasingly "hardened" with a proliferation of coastal infrastructure and transport infrastructure, industry and commerce and recreational areas (Steven et al., 2020).

The challenges of urban resilience are the accessibility of urban waterfronts, as they constitute important public spaces, the improvement of public areas with limited use, the protection of natural environment and the development of urban activities, the development of sustainable urban mobility and the organization of land uses in an way that will encourage multi-functionality and will settle conflicting land uses. All the above, should be formulated through participatory procedures that will ensure that all parties are represented during the planning process. So, resiliency practices should involve all the parameters that shape and define the urban areas, with respect to its cultural, economic, social, and environmental value.

The main principle of resilience is the development of multifunctional areas in spatial and temporal terms as it secures response diversity to the changes that can be caused, through a multi-level connectivity between the many complicated different urban networks. It is important to propose redundancy networks that can be modularized, and

land uses which make urban areas autonomous and self-organized. In this way urban systems can be transformed in decentralized systems, which can easily adjust to changes. Urban resilience is closely linked to land uses which constitute an important tool for reducing losses in natural disasters. Through the years special emphasis is given in programs as emergency warning evacuation, flood control works and other measures to reduce the danger from the city's exposure in natural disasters. In Greece, as in most of the Mediterranean countries in the long term, the economic crisis has as a result more fragile the economic fundamentals, and due to the imposition of austerity measures, the Greek State have been unable to produce the policies that have been traditionally efficient for the recuperation of pre-existing levels of productivity and well-being (Sgobbo, 2017, p. 335). Under these conditions the current paper will analyze the way the coastal city of Chania has been developed in terms of urban resilience.

The study area of the present research project is the Municipality of Chania-Crete, a characteristic urban

settlement of Southern Greece that occupies an area of 10.862 acres and has a population of 52,000 (Georgi & Dimitriou, 2009). The city is chosen as it presents the typical characteristics of a Greek city. It has a dense coastal historic center, and it is surrounded by new areas constructed in different time periods according to social, economic, and political parameters (Fig. 1). Its limits are constantly expanding in a sprawled way and due to the lack of construction restrictions and controlling mechanisms; it has a lot of arbitrary constructions.

The methodology that will be used is based on the "land use management tools" (Olshansky & Kartez, 1998) which indicate the pillars that must be examined in an urban zone in order to guide development in hazard-prone areas. These pillars include all the physical and anthropogenic parameters that shape resilience as they include facilities and infrastructures, economic parameters and policies for urban resilience.

The paper will investigate the six following pillars:

- building standards and retrofit requirements for existing buildings;



Figure 1: The city of Chania. Source: ©2020 Google

- development regulations including zoning and subdivision ordinances and coastal erosion areas and zoning standards for sensitive lands;
- critical and public facilities policies to move location of public or other important facilities outside of hazard areas;
- land and property acquisition in hazardous areas with public funds;
- taxation and fiscal policies to provide incentives for people who reduce public costs in hazardous areas;
- information dissemination to influence public behavior, provide public information such as posting warning signs in high-hazard areas.

The paper will formulate proposals for the improvement of the city's physical planning, which is an essential element in urban disaster risk management. This will be achieved by a multi-dimensional planning process which can provide the way for reducing disaster risk while producing a sustainable urban development, where "environmental quality, economic growth and social justice coexist" (Beauregard, 2003).

2. BUILDING STANDARDS AND RETROFIT REQUIREMENTS FOR EXISTING BUILDINGS

Before The built environment is the largest industrial sector in Greece from a financial point of view and the major sector in terms of resource flow and an important factor for the achievement of resilience, so the evaluation of existing buildings seismic capacity and retrofitting are important tasks. The building stock in Greece consists primarily of residential buildings and several other tertiary sector buildings. Based on the census of buildings taken in 2011, 4,105,637 buildings exist in Greece. Out of all buildings, 92.0% are single use, and 8.0% are mixed use (Ministry of Environment and Energy, 2018). The Greek construction and urban planning system have defined the rules for constructions according to their safety and their integration to the existing built environment. The analysis of the Greek spatial system regarding building standards is grouped in two different categories.



Figure 2: Buildings of the Venetian period. *Source: author's photo.*

The first group of restrictions is about the sustainable function and safety of constructions. They define detailed standards about the correspondence of buildings in natural disasters, as earthquakes, flood etc. A Presidential Decree of 1979 transposed into Greek legislation the Regulation on the Thermal Insulation of Buildings, which set out the requirements and measures that would ensure proper thermal insulation of inhabited buildings. Directive 2002/91/EC was transposed into Greek legislation with the publication of Law 3661/2008 setting out measures for the reduction of the energy consumption of buildings, while in the same year a Joint Ministerial Decision No14826/2008 setting out energy efficiency improvement and energy savings measures in the public and wider public sector, was published (Ministry of the Environment and Energy, 2017). This Decision is mandatory for all types of buildings and defines construction rules as ventilation requirements, thermal insulation level according to climatic zones to assess the energy classification of buildings.

The second category (Building Regulation (M.D. 3046/304/1989), Generic Building Regulation (Law 4067/4-2012) includes rules and standards for the sustainable form of cities, so it defines the maximum heights, the minimum distances between buildings and other terms of construction. The Greek National legislation outlines roles and responsibilities of subordinate agencies of government and devolves regulatory authority to appropriate levels of government.

Chania city is a typical Greek city with a coast-

al zone, a historic center, arbitrary constructions and sprawled new expansion zones. Its buildings are categorized in three main groups, according to their construction date. The first group are the buildings that were constructed until 1901 (Fig. 2), ottoman, venetian and Greek structures, that are allocated in a wide majority in its historic center, that followed the traditional construction methods of each period. The second group are the buildings that were constructed between 1902 until 1950 (Fig. 3a), which were constructed without thermal and building regulations and finally the third period which contains the "newer" constructions that followed the existing regulations (Fig. 3b). As most buildings in the central compact zone of the city was constructed with no restrictions regarding ventilation requirements, energy consumption and other restrictions and regulations the status of the existing built environment is evaluated as not resilient.

The existing building codes have not succeeded to recognize the incremental process of construction, which is a step by step process that involves funding opportunities, changing construction regulations and available new construction techniques and materials.

In Greece the application of codes is a bureaucratic process that is characterized by many technical concerns. It is based on parameters as health, welfare, and safety of the built environment and it involves legislation governing the certification of building professionals and regulation of the property insurance and mortgage banking industries. One of their characteristics is that they have not



(a)



(b)

Figure 3: a) Construction of the mid-War period. b) Constructions of the 1980's decade. *Source: author's photos.*

considered to define safety measures for the vulnerable arbitrary constructions which are constantly legitimating and simultaneously although strict restrictions for historic constructions exist, the bureaucracy that make the procedures of codes application difficult.

The Greek state has made many efforts towards the direction of constructions resilience but still the fact that most buildings still need a lot of adjustments towards this direction the goal of resilience has not yet been achieved. The recent programs that give the owners by funding the chance to environmentally intergrade their constructions is one important step toward resilience, but still many efforts have to take place in order to ensure the security and the sustainability of the existing constructions.

3. DEVELOPMENT REGULATIONS AND ZONING STANDARDS FOR SENSITIVE LANDS

Greece has an extensive coastline among all Mediterranean countries that measures 13.780 km. 70% of the country's coastline is rocky and the 30% is characterized by sandy beaches and dunes as well as wetlands and lagoons which experience a high rate of erosion. Almost all big urban centers are allocated in the coastal zone as well as 80% of industrial activities and 90% of tourism and recreation. Furthermore 33% of the population lives within a coastal strip of 1-2 km. The population living at maximum 50 km of the seashore is estimated at 85% (Report of Greece on coastal zone management, 2006)

Chania city is a coastal urban area allocated in the coastal zone (Fig. 4), around the hill of Cydonia, the first settlement, which was inhabited around 3.000b.C. Through the centuries the city's expansion was based on its coastal zone which was the pole of the city's development. Today, Venetian fortifications co-exist with modern buildings which have uses as hotels, restaurants, recreation, and other facilities connected with tourism. Recently in the area, phenomena as erosion (Fig. 5a) and landslides (Fig. 5b) are caused due to intense rainfalls.

Research has concluded that in next 30 years (by 2050) the level of the sea may rise up to 1,5 meter according to the scenario of the worst natural disaster, fact that will lead to the coverage of a



Figure 4: The coastal zone of Chania. Source: own elaboration on Map data ©2020 Google

2,83% of the central zone's area (Thomopoulou & Stathakis, 2016). As the historic center of the city has many historic buildings, proposals as their evacuation or demolition is not an option.

As for the actions towards the coastal protection which is evaluated as a vulnerable area, climate change initiatives are limited to mitigation while measures are decided upon in an ad-hoc way by national authorities and implemented by local municipalities. For the phenomenon although many research programs are funded by the European Union, still a detailed plan for the coastal areas protection does not exist as at study level one expresses the need of the most appropriate adaptation measures (more soft measures), whereas in practice only the past and current approach (hard measures) is familiar.

It is interesting though, that focal points have been set up, in different existing laws, regarding the need for compact development, especially in coastal areas, the protection of coastal areas and obtainment of public access, the definition of restricted set-back zones of 50 for tourism infrastructures, in order to avoid the risk of flooding and erosion.

4. CRITICAL AND PUBLIC FACILITIES POLICIES TO MOVE LOCATION OF PUBLIC OR OTHER IMPORTANT FACILITIES OUTSIDE OF HAZARD AREAS

The goal of development programs is the promotion of healthy, safe, and prosperous environments for all citizens. For the achievement of this goal, public and private activities are crucial as in terms of resilience multi-functional and simulta-



(a)



(b)

Figure 5: a) Erosion in Chania's coastal zone. b) Landslides in Chania's coastal zone. Source: author's photos.

neously functionally autonomous areas, must be developed. Towards this direction urban planning is very important for the promotion of urban activities that will be protected from hazardous natural phenomena. Governments are slowly coming to realize that land-use planning is an important tool for reducing losses in natural disasters. The facilities that are needed for the urban tissue's development should be allocated in areas with minimum exposure to hazardous areas climate and at the same time, strategies for existing facilities, should promote their relocation, strengthening, retrofitting, and adding redundancy, revising operations, and adopting emergency preparedness, response, and recovery programs.

Chania city has been developing during the last decades with an urban plan that was legislated in 1988. The aim of this plan was the promotion of recreation and tourism in the city's historic center and its surrounding costal zones and the promo-

tion of residence and other supportive to residence public facilities in the city's 'inner' zones. So, the coastal zone of Chania functions as a magnet that attracts most of its citizens as it is concentrates the city's public life (Fig.6). At the same time open spaces accessible by all citizens for safety in case of an emergency do not exist, due to the compact development of the urban tissue. The moans of the historic center that could function as safety zones, are today functioning as parking areas.

It is crucial for urban planning to engage the exposed to natural hazards zones, and limitations of hazard-prone areas, in a consensus-building process, so that issues regarding public facilities in hazardous areas can be resolved. As the existing Chania's urban plan was legislated almost three decades ago, the need for its reform is very important as issues as climate change and hazard areas are not static and adjustment to new conditions are important.



Figure 6: The coastal zone as a center of night-life. Source: author's photos.

5. LAND AND PROPERTY ACQUISITION IN HAZARDOUS AREAS WITH PUBLIC FUNDS.

Land and property acquisition are an effective way for governments to protect hazardous areas and an important technique to protect against hazards by removing the development potential from vulnerable areas. In Greece, the diverse property development patterns results from the various forms of tenure relations, the supply land assets, the variety of building production modes, the growth of the building sector, and the planning processes have diachronically defined different property development patterns. The historical,

political and economic conditions of the country have led in arbitrary constructions in vulnerable areas, initially for the low income class, in order to cover urgent housing needs, and for high income in the recent decades due to the lack of controlling mechanisms. At the same time, the compact development of central urban areas has as a result the lack of open spaces, which are necessary for resilient planning.

In Chania, many constructions have been developed through the years. Some of them were built under sudden conditions, as the need for refugees housing and post war reconstruction. The emergence of this needs combined with the lack of available land and planning restrictions, led to buildings on streams, moans of the Venetian fortifications and other available, but hazardous areas. In the recent years the fact that the Greek state legitimizes arbitrary constructions, has led to a second wave of buildings that take into advantage the existing legal framework and choose to be allocated in hazardous areas as streams and coastal zones.

The fact that many buildings are constructed that way makes the land and property acquisition or the demolition of these constructions impossible. The recent efforts of the municipal authorities are the creation of open spaces through the demolition of dangerous constructions has not yet been effective as the bureaucratic processes and the lack of funds combined with the lack of political will. So, the land acquisition program to purchase and restore repetitive loss properties to open-space and conservation areas is evaluated as inactive.

6. TAXATION AND FISCAL POLICIES TO PROVIDE INCENTIVES FOR PEOPLE WHO REDUCE PUBLIC COSTS IN HAZARDOUS AREAS

Policymakers have two types of instruments for the reduction of public costs in hazardous areas. The first type is traditional standards across polluters and the second type which is becoming increasingly popular is economic incentive that relies on market forces to correct the use of hazardous areas. Market-based approaches provide continuous inducements, monetary and near-monetary, to encourage polluting entities to reduce releases of harmful pollutants. A criticism of this approach is that firms are only encouraged to reduce to a reg-

ulated level and that policies associated with economic incentives are in most cases inappropriate for dealing with environmental issues that pose equity concerns.

Due to the lack of specific records for Chania city the paper will investigate the national policies regarding taxation and fiscal policies for cost reduction in hazardous areas. In Greece revenue from environment-related taxes is among the highest in the EU. Environmental taxes accounted for 3.97% of GDP in 2017 and energy taxes for 3.18% of GDP (EU average 1.84%). In the same year, environmental tax revenues in Greece were 9.5% of total revenues from taxes and social security contributions (EU average 5.97%). The Operational Program on Competitiveness, Entrepreneurship, and Innovation under the National Strategic Reference Framework (NSRF) 2014-2020 allocates EUR 28.8 million to promoting innovative technologies for environmental protection and resource efficiency in waste management, water management, soil contamination and air pollution (European Commission, 2019).

As for hazardous areas although Greece has adopted Preliminary Flood Risk Assessments and its Flood Hazard and Risk Maps the European Commission has not yet conducted an assessment for these Plans. The characteristic disadvantage of taxation and fiscal policies in Greece is that the implementation of the legislation has been limited in several cases. A positive regulation is that of the available funds of Greece's RDP, 19.20% will be spent on preserving the biodiversity of farmland, 18.72% on improving water management and 25.38% on improving soil management and/or preventing soil erosion is to preserve and improve ecosystems. The direct payment budget for 2015-2020 is EUR 14.9 billion, 30 % of which is being allocated to greening practices that benefit the environment (European Commission, 2019). The disadvantage of the policies is that financial gaps in areas such as nature protection are delaying the correct implementation of EU environmental law and policies.

7. INFORMATION DISSEMINATION TO INFLUENCE PUBLIC BEHAVIOR AND PROVIDE PUBLIC INFORMATION

The tools available for responding to the risks and effects of hazards and disasters are land-use con-



Figure 7: Arbitrary constructions on streams. Source: own elaboration on Map data ©2020 Google.

trols, insurance, engineered protection works and construction standards, disaster response plans, and emergency warning systems. Additionally, warning systems for low-probability events often do not make cost-benefit sense. Warning systems are economically rational only when a risk becomes an actual event and when having inadequate or no warning systems is politically and socially unacceptable.

Civil protection in Greece is organized as a coordinated resource system where national, regional, and local authorities cooperate with local and public institutions and services. The key risks identified in the national risk assessment include forest fires, earthquakes, floods, and industrial accidents. The General Secretary for Civil Protection, the regional authorities and the local government authorities oversee coordinating all operational forces depending on whether the disaster is general, regional, or local and has a cross-sectoral and all-hazards competence, while communication is provided by public authorities in their sphere of competences. Information on all kinds of natural and man-made disasters including guidelines for self-protection is available, in Greek and foreign

languages. Information is disseminated via campaigns, TV and radio spots for specific disasters, publication of leaflets and brochures, electronic material, and school visits (European Civil Protection and Humanitarian operations, 2019).

The recent experience for COVID and other phenomena as fires and floods shows that the dissemination information has managed the prevention of life losses as SMS were sent to the areas that were affected inhabitants, which were warning them to abandon their homes. This has been succeeded with the extensive use of ICT, which are gradually upgrading.

8. DISCUSSION, CONCLUSIONS AND FUTURE PERSPECTIVES

Urban resilience is achieved through a holistic approach of risk within a geographic area, as structural, geological, social, economic political and cultural variables should be taken into account. This approach must assess, in a consistent manner, the non-linear relations of the contextual parameters

and the complexity and dynamics of social systems and improve the effectiveness of management and to identify and prioritize factual and efficient measures for the adequate reduction of risk by authorities and communities, which are the fundamental actors in achieving a preventive attitude. (Cardona, 2003, p. 51). As through the years, the results of climate change are becoming more intense, the development of urban areas should be in accordance with the principles of resilience. Resilience is a goal that should be achieved with procedures that include many different parameters that must be based in the balanced social, economic, and environmental development of the urban tissue.

It is critical for urban planning to adopt protection strategies with restrictions and regulations that designate the allowed or restricted activities with the legislation of conservation plans and mitigation strategies which will minimize the introduction of the over-exploitation of activities that harm coastal urban environments. It is also important to use principles that incorporate natural infrastructure into existing grey infrastructure, relocate at-risk activities and populations away from the coast, and also use incentives to change behaviors and practices and adopt strategies that restore damaged ecosystems (Jha, Miner, & Stanton-Geddes, 2013). The complexity of the built and natural infrastructure, the level of risk, and the analysis of the costs and benefits will determine specific strategies and concrete steps for enhancing urban resilience.

Policies for resilience should contain not only the classical city's planning tools but combine them with participatory processes, taxation motives, funding etc all the factors that shape the urban status. In Greece during the recent years many efforts have been made towards the direction of creating resilient urban areas. This happens in a strong degree because of the need to be in accordance with the EU Directives and of the fact that climate change results affect in a determinant way urban life.

As the parameters that shape resilient are many and complex the research used the investigation of six basic pillars based on the "land use management tools" methodology in order to analyze the factors that shape resilience in a typical Greek city, the coastal city of Chania that concentrates all the Greek urban characteristics: compact and sprawled, historic and modern, which has developed in the recent decades tourism and its sup-

plementary facilities. The use of this methodology revealed that the way the city has been developed until today dictated by the existing planning and funding system is a decisive factor for the area's resilient development.

As for building standards and retrofit requirements for existing buildings, the efforts that are made with the legislation of up-to date restrictions in accordance with the principles of sustainable development is a very important factor. The upgrade of the built environment is essential, and many restrictions and regulations are legislated towards this direction. Additionally it is important to strengthen building codes for new constructions, residential and commercial, which should be built to zero-emissions standards. Building codes should effectively protect against extreme weather, wildfires, and other climate-induced disasters. The main problem is the fact that most of the existing buildings need to be upgraded while the application of the "new" construction rules in new buildings should be controlled. The creation of a database, for every municipality, where all the constructions will be registered and evaluated in terms of resilience can be a tool which will assist the involved stakeholders and authorities to control, prioritize and fund the built environment upgrade, in a fast and organized way according to resilience strategies. This database should also include basic information about procedures, new techniques and materials and funding opportunities. This way, the long-term bureaucratic processes can be facilitated. The difficulty of this proposal is the funding for these buildings construction cost which must be supported by the Greek state. Additionally, in terms of urban planning it is important to promote density, transit access, and mixed uses, which create opportunities for new affordable housing, reduce auto-dependent sprawl, preserve open space, and ensure denser development in areas of lower wildfire and flood risk.

As for the second pillar, the development of regulations and zoning standards for sensitive lands, the main disadvantage of planning is that a detailed strategic plan that will define the actions required towards resiliency, does not exist. The involved authorities have adopted ad-hoc measures mitigation which most of the time is adopted after the occurrence of natural disasters. It is important to recognize and evaluate which areas are vulnerable and define the restrictions needed for its resilience. The main planning principles should minimize disturbance away from sensitive envi-

ronmental and cultural resources and enhance the sensitive lands value with proposals that protect natural habitats and features of environmentally and culturally sensitive lands. They should provide physical and visual connectivity to adjoining and contiguous, existing and proposed development, and community open space and should minimize potential impacts on existing rural lands adjacent to the edge of the urbanizing part of the city (Bronski, et al., 2020). This should be done in a first step national level with respect to each area's characteristics, and in a second step in a municipal level, which will give the authorities the jurisdiction to proceed to more detailed rules regarding the achievement of resilience in sensitive lands.

Urban planning is a decisive factor in the allocation of critical and public facilities in hazard areas. The existing urban planning system is characterized as obsolete, complicated, and bureaucratic while any changes must follow long term procedures to be legislated. The need for urban plans adjustment towards the direction of resilience is imperative, so up to date data and faster processes should be adopted while urban planning principles should formulate proposals based on the limitations of hazard-prone areas, combining environmental, social and economic parameters. It is critical to plan in terms of resilience, with criteria that identify the safest areas for in urban development and infrastructure projects prioritization. The key concerns are the capacity development and resource constraints at subnational levels, the national institutional structures that are not connected to local and community processes and the administrative devolution of risk reduction in some countries that is not backed by financial devolution (Jha, Miner, & Stanton-Geddes, 2013). Towards this direction, many cities have local resilience action plans that emphasize on the reduction of risk through land use planning, but the key point is that they should develop all the amenities that create large additional benefits by reducing risk through land use planning.

Land and property acquisition are necessary in hazardous areas, but they strongly depend on the existing status of each area. In Greece, the social and economic needs combined with the lack of controlling mechanisms have led to the allocation of many structures in land that is not appropriate for construction. It is characteristic that still a database that will concentrate all these constructions does not exist, so there are no precise data that will reveal the intensity of this phenomenon.

Land and property acquisition are not common in the Greek urban reality, due to the lack of funding but mostly due to the lack of political will. It is important the Greek state with transparent procedures to register and prioritize the actions needed, to make funding procedures simple and faster, so that this tool can be effective.

As for the fifth pillar, taxation, and fiscal policies for the reduction of public costs in hazardous areas, the existing gap of the Greek legislation makes the effectiveness of this tool limited. Still, the fact that available funds can promote the soil and water improvement and the development of greening practices, is a positive parameter that should be supplemented by a legal framework which will support the adoption of the existing EU environmental law and policies. It is critical for the achievement of urban resilience you have a financial approach that addresses both short- and long-term financial needs of specific sectors according to each areas special environmental, social cultural and economic characteristics.

Finally, the important pillar of Information dissemination to influence public behavior and provide public information is evaluated in Greece as a successful tool, which can be upgraded with the use of ICT. It is important to develop an integrated warning system which will consist of scientifically designed and located sensors, a facility for analyzing data and making decisions about warnings, the warning message, dissemination capacity and a public educated to understand the message and take appropriate action (Jha, Miner, & Stanton-Geddes, 2013, p. 5). As measures towards resilience should be aligned on stakeholder and community participation, good governance, livelihood improvement, and sustainable development and planning it is important to promote participatory processes with the use of ICT.

The investigation of the factors that shape resilience in the city of Chania shows that there are still more to be done. The role of authorities can be decisive in the formulation of an effective legal framework in fields of planning and funding but also the role of stakeholders is important as they should participate in processes and adopt restrictions and regulation. This way, the reduction of disaster risks will be achieved by the production of a sustainable urban development, which will combine "environmental quality, economic growth and social justice coexist" (Beauregard, 2003).

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