

**Density and sustainability as a new paradigm for urban resilience.  
European programs for territorial adaptation projects**

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**Abstract**

Risk management due to the unstoppable effects of climate change on the territory is an increasingly topical subject in the international scientific debate.

The theme of changing cities involves different disciplinary sectors, so it would not be exhaustive to analyse it from a unilateral point of view.

The contribution proposes a multidisciplinary and multi-scale analysis related to the adaptation measures of urban agglomerations through a socio-economic analysis aimed at achieving a high level of security, efficiency of ecosystems and social inclusion.

Overcoming the sectorial and specialist approach of modernist urbanism is the basis for addressing what appears to be the "challenge" of the new millennium.

It is authors' conviction that the physical transformations of space, in the presence of geomorphological alterations due to climate change, must be based on strategic policies in the medium and long term, shared and articulated at the different levels of government of the territory.

In this frame of reference, the question of density merges with the concept of sustainability, overcoming it, becoming a new paradigm of urban resilience.

**Key words:** *climate change; adaptation strategies; urban design; green economy; risk economy*

**Highlights:** *Risk management; effect of climate change; multidisciplinary and multiscale analysis; long-term strategic policies*

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## **1. Population growth and climate change: a new urban issue**

For at least twenty years there has been a considerable increase in the world population, as evidenced by the *World Population Prospects 2017*, a document updated every two years by the Department of Economic and Social Affairs of the United Nations Secretariat, which shows an increase compared to the estimates foreseen in the previous report of 2015. In fact, the trend goes from 8.5 billion expected for 2030 to 8.6 estimated for the same period of time, the growth trend also for forecasts to 2050 goes from 9.7 to 9.8 billion; however, both the 2015 and 2017 editions agree on the predictions for 2100, according to which the world population will reach 11.2 billion people.

Together with the population growth forecasts, the same institution draws up the *World Urbanization Prospects*, concerning urban and rural populations in all countries of the world. The version of the document, updated to 2018, highlights that more than 50% of the world population currently lives in urban areas, and is predicted a considerable increase by 2050. Furthermore, a further increase in the population is expected by this date, which could add about 2.5 billion people to urban populations. These numbers clearly show how the crisis factor, linked to the demographic growth and population density in urban centres, foreseen for the near future, emerges predominantly, urging public administrations and private operators to give answers about the social economic and environmental repercussions that this phenomenon will lead to long distance.

These forecasts are associated with those relating to the constant and sudden worsening of climatic conditions and the effects on the territory, which place the emphasis on the need to guarantee a safe habitat, taking into account the considerable increase in population density in urban centres.

The fifth IPCC report - Intergovernmental Panel on Climate Change (2013) and subsequent updates, represents the current state of knowledge on climate change and their potential environmental and socio-economic impacts. Man's responsibility for these changes is now undeniable: the constant increase in the concentration of greenhouse gases in the atmosphere is the main cause of global warming of the planet (IPCC, 2013).

For several years, government bodies, research institutes, and scholars have been engaged in the development of strategies aimed at raising awareness among both the population and local administrations on issues relating to Climate Change phenomena, in order to guide a sustainable urban development of the territories, thus as indicated by the European Environment Agency (EEA) in the *Climate change, impacts and vulnerability in Europe 2016* report which shows the need for European countries to define territorial adaptation strategies and plans at the national, regional and local level for the prevention and risk management related to the climate crisis.

In fact, “le aree urbane sono la parte del Pianeta dove si pagheranno i costi sociali maggiori del *global warming* e dunque appare sempre più urgente assumere la questione dell'adattamento ai cambiamenti climatici nella pianificazione territoriale e urbanistica” (Musco & Zanchini, 2014).

It is clear, at this point, how the concept of density represents, from the aforementioned point of view, a very complex issue, at the same time acting as the cause and solution of the problem: the population increases, it moves more and more inside the cities, which consequently see their population density skyrocketing, with consequent increases in CO<sub>2</sub> emissions, and therefore contributing more and more to climate change.

Therefore, it is incontrovertible how the issue of density is closely interconnected with that of sustainability, in environmental and socio-economic terms. To cite the title of the contribution, the two concepts become a new paradigm for urban resilience to the effects of climate change.

High housing density, in contrast to the phenomenon of urban sprawl, associated with sustainable interventions, is the response for achieving this desirable goal.

The contribution aims to demonstrate, through some European programs, how a dense city represents a city in which interventions of territorial adaptation are a good long-term investment.

In this regard, it is necessary to specify, that, in order to face this issue, which poses itself as the main challenge of the 21st century, it is necessary to put in place integrated strategies and political approaches, through innovative urban and territorial planning and through different economic and financial instruments at the micro and macro level.

Therefore, the urban regeneration strategies to be adopted in these contexts must be aimed at mitigating the effects of climate change, in order to restore a renewed perception of safety to the territories affected by these emergency events. It is a question of adopting a methodological approach that is capable of directing urban development towards a "coexistence" with the crisis dimension, questioning the limits of current urban forms, and favouring "un superamento dell'approccio settoriale a favore di un approccio integrato alla complessità urbana" (Macciocco, 2015).

### *1.1 Green economy and risk economy for environmental sustainability*

"L'urbanizzazione è un motore fondamentale per la crescita economica, tuttavia, essa pone anche una serie di sfide quali: l'inclusione, l'ambiente, l'efficienza, la salute e il patrimonio culturale" (Perra & Venturi, 2018).

As mentioned in the previous chapter, the demographic increase and the massive displacement of the population in urban areas could lead to the consumption of "circa 2 milioni di ettari di terra l'anno, di cui circa tre quarti di quella agricola" (Perra & Venturi, 2018).

*The Aalborg Charter* (1994) highlighted how fundamental the role of cities is, in light of the sustainable development of the planet and of the dynamics of transformation, both from the point of view of urban and socio-economic planning. It is evident that a dense urban fabric is the prerogative of a city that tends towards urban resilience to the effects of climate change.

Causone (2019) highlights, in fact, that

Come sottolineato dall'associazione C40, gli effetti economici del cambiamento climatico nelle città possono essere altrettanto devastanti di quelli fisici (...) Le città hanno però degli strumenti per prevenire e contrastare gli effetti del cambiamento climatico. Anzitutto la densità urbana deve essere vista e incentivata come un punto di forza, limitando l'uso di suolo per ulteriori espansioni delle città nel territorio.

Therefore, it appears necessary to set transformative processes in motion in cities affected by calamitous events, which underlie the concept of financial sustainability of public investments. In this regard, it is necessary to encourage greater involvement by private actors and stakeholders in the management and accompaniment processes for initiatives and investments in the matter. The entrepreneurial fabric, in fact, is showing increasing attention to the theme through two interconnected models: the green economy and the risk economy.

In the report of the Working Group of the Italian Observatory on Sustainable Finance, entitled *Il rischio climatico per la finanza in Italia*, while being reiterated that the fragility of the territory, accentuated by the Climate Change, requires correct risk management, it is also highlighted how much this could represent a new business perspective to be implemented. On an international level, "tra le iniziative di mercato si annoverano la Rete di Banche Sostenibili (The Sustainable Banking Network- SBN) promossa per i paesi emergenti dalla *International Finance Corporation* (IFC), l'Inchiesta per la finanza sostenibile (The Inquiry for Sustainable Finance) e l'Iniziativa finanziaria promossa dal Programma ambientale delle Nazioni Unite (The Finance Initiative by the UN Environment Program UNEP). La rete SBN, in particolare, ha istituito il gruppo di lavoro per la misurazione delle finanze sostenibili allo scopo di sviluppare orientamenti tecnici, attraverso l'armonizzazione di indicatori, per valutare l'efficacia delle politiche di finanza verde. Le iniziative UNEP Inquiry del 2017 e la Road Map per un Sistema Finanziario Sostenibile della Banca Mondiale mirano a realizzare un sistema finanziario che tenga anche conto delle esternalità positive e negative con strategie di ri-orientamento del flusso di risorse verso attività più inclusive e sostenibili. Numerose sono state le iniziative istituzionali in fora internazionali. In ambito G20 il Gruppo di studio sulla finanza verde (Green Finance Study Group GFSG) ha sviluppato nel 2017 una serie di raccomandazioni per mobilitare capitali privati verso investimenti verdi e incoraggiare e facilitare la condivisione delle conoscenze sui rischi ambientali e finanziari. Altre importanti iniziative sono state intraprese in sede OCSE (OECD Centre on Green Finance and Investment - CGFI). Il Financial Stability Board, in particolare, ha creato nel 2015 la Task Force on Climate-related Financial Disclosures (TCFD) per studiare i rischi finanziari legati ai cambiamenti climatici, incoraggiare la consapevolezza in merito ai rischi collegati al clima da parte sia delle istituzioni finanziarie che non

finanziarie e favorire la canalizzazione dei flussi finanziari volti a sostenere un'economia a basse emissioni di carbonio (...) In ambito comunitario, come parte integrante della strategia globale dell'UE in materia di finanza sostenibile, la Commissione europea ha lanciato, nel marzo 2018, un Action Plan, teso a delineare una strategia finanziaria sostenibile per l'UE fondata su due imperativi: migliorare il contributo della finanza alla crescita sostenibile e inclusiva finanziando le esigenze a lungo termine della società; consolidare la stabilità finanziaria integrando i fattori ambientali, sociali e di governance (ESG) nel processo decisionale relativo agli investimenti” (Faiella & Malvolti, 2019). Among the new socio-economic paradigms, the so-called impact finance, according to the latest Eurosif report (2017), was the most effective sustainable and responsible investment strategy (SRI) for achieving the objectives for sustainable development, even in cases of territorial adaptation, representing an interesting model to follow. Through this new model, inextricably linked to the third sector, the conditions for a new form of sharing economy can be created in which the company is configured according to new micro and macroeconomic models including that of shared value and Benefits corporations; the citizen directly or indirectly participates in the creation of a circular economy model whose benefits can be used; the public subject, while maintaining its role as a decision-maker, finds interlocutors ready to support, in a participatory way, transformation processes of cities aimed at improving resilience and sustainability. “La finanza di impatto racchiude quegli investimenti che intendono generare impatti sociali e/o ambientali misurabili, oltre al rendimento finanziario. È proprio l'intenzionalità proattiva con cui l'investitore persegue lo scopo sociale, insieme al ritorno economico, che distingue questa nuova generazione di investimenti dall'approccio del Sustainable Responsible Investing (...) nel 2016, 190 delle aziende 500 Fortune hanno riportato un risparmio di 3,7 miliardi di dollari USA attraverso gli sforzi fatti verso le energie rinnovabili e l'efficienza energetica. Coinvolgere il settore privato negli investimenti intelligenti per il clima sarà essenziale per raggiungere gli obiettivi dell'Accordo di Parigi [...] Sebbene gli investimenti globali annuali su progetti legati ai cambiamenti climatici superino 1 bilione di dollari (in fase di accelerazione), l'iniziativa New Climate Economy stima che il mondo debba moltiplicare gli attuali investimenti - a circa 6 bilioni di dollari l'anno - tra oggi e il 2030 solo per soddisfare le esigenze infrastrutturali globali” (Perra & Venturi, 2018).

## **2. Urban density and adaptation to the effects of climate change. New multidisciplinary approaches**

As previously expressed, urban density represents, on the one hand, a new paradigm in the methodological approach between city and multi-fragility of the territory, in order to make the latter resilient to the effects of Climate Change, on the other an element at the basis of new economic models, which see their strength in the public-private partnership. This paradigm presupposes the need, on the part of the political decision-maker and the stakeholders, to define a new city design through different models, planning, and programming approaches in the field of territorial planning and new economic tools to support public adaptation interventions. Before reflecting on the latter two aspects, however, it is useful to provide an overview of the state of the art on the subject in the European and international context.

### *2.1 The strategic dimension of the European and national climate adaptation plans*

Before to go deeper on some European programs, it is necessary to frame the phenomenon from an urban planning point of view to understand what support tools the public administrations have adopted, at European and national level, to face the cities adaptation challenge and whether the existing instruments are compatible with the directives proposed by international strategies. The matters are still treated at a strategic level, which often collides with the little flexibility of urban plans. During the COP21 climate conference in Paris in December 2015, 195 countries adopted the first legally binding and universal global climate agreement (United Nations, 2015) and, in Resolution 2017/2006 (INI, 2017), the authorities, in points 44 and 47, are invited to implement decentralization and better apply the principle of subsidiarity to further strengthen the level of local and regional government in the fight against climate change and urged to carry out pilot projects in the sustainable urban development sector. For greater clarity it is necessary to frame the discussion within the legal-regulatory overview at the European level, to better understand the developments conducted at the

national level. In April 2013, the European Commission published *The EU Strategy on adaptation to climate change* (UE) with the following objectives:

- promote action by the Member States by encouraging them to adopt global adaptation strategies, providing them with funding to develop local adaptation plans;
- stimulate specific climate-proof actions in particularly vulnerable sectors, such as fishing, agriculture, and social cohesion, ensuring that infrastructure enhancement measures are promoted to guarantee greater protection against natural disasters;
- enhance knowledge on the subject through the development of a European platform on adaptation to climate change (Climate-ADAPT), an important information tool on the state of knowledge of the environment by the EEA, the European Environment Agency.

As mentioned in this paragraph, Italy has its own *Strategia Nazionale di Adattamento ai cambiamenti climatici* (SNAC), approved with the executive decree n. 86 of 16 June 2015, which starts from the following documents:

- Technical-scientific report *Stato delle conoscenze scientifiche su impatti, vulnerabilità ed adattamento ai cambiamenti climatici*;
- Technical-legal report *Analisi della normativa per l'adattamento ai cambiamenti climatici: quadro comunitario e quadro nazionale*;
- *Elementi per una Strategia Nazionale di adattamento ai cambiamenti climatici*.

This strategy aims to identify the main impacts of climate change for a number of socio-economic and natural sectors and to offer adaptation actions (MinAmbiente, 2015).

In May 2016, the application of the *Piano Nazionale di Adattamento ai Cambiamenti Climatici* (PNACC) was started to proceed with the implementation of the SNAC requirements with the primary purpose of:

- identify priority adaptation actions for the key areas identified in the SNAC, specifying the timing and those responsible for implementing the actions;
- provide indications to improve the exploitation of any opportunities;
- encourage coordination of actions at different levels.

In July 2017 the first draft of the PNACC was published.

In the light of what has been illustrated, with particular reference to the *EU Strategy on adaptation to climate change*, it is clear that the role of local administrations is considered of significant importance in order to promote local adaptation plans to climate change; this central role is enshrined with the agreement of the issue within the Covenant of Mayors for Climate and European Energy, which brings together thousands of local bodies committed, on a voluntary basis, implementing the community objectives on climate and energy.

Although in the absence of specific policies at the national level, some local administrations are promoting actions aimed at making their territories less vulnerable to climate change through initiatives supported by European funding.

About this resilience of the territories, understood as “[...] the capacity to lead to a continued existence by incorporating change” (Berkes, Colding, Folke, 2004), which have seen the participation of numerous local administrations who, together with public and private subjects, have developed their own strategies for adapting to climate change.

## 2.2 Local adaptation plans in the urban context. The Life Act program

Interesting in this regard is the European project *LIFE ACT - Adapting to Climate change in Time*, funded by the European Commission under the *LIFE Environmental Policy and Governance* program, with the clear objective of proposing replicable guidelines in Mediterranean contexts characterized by the presence of similar environmental stresses, through a structured, integrated, participated and shared methodological process by all the actors involved, in order to build a local adaptation strategy capable of managing the environmental, social and economic impacts triggered by the climate change that it can bring the drafting of specific local adaptation plans for the partner cities of the initiative.

While aware that each territory is characterized by its own peculiarities and identity features, the program has taken into consideration those similar problems that characterize the regions of the Mediterranean basin, with the aim of developing a method that can be repeated in different contexts.

The project saw the collaboration of several actors including *Istituto Superiore per la Protezione e la Ricerca Ambientale* (ISPRA), *Forum delle Città dell'Adriatico e dello Ionio* (FAIC) and the local administrations of the partner cities of the initiative: Municipality of Ancona, Italy; Municipality of Bullas, Spain; Municipality of Patras, Greece (Layman's report, 2013), all densely populated urban contexts, on which, as previously said, a plan for adaptation to climate change, proved to be a good investment over the long term.

The primary goal of the program was to identify the threats from which to protect the territory and then to delimit the areas of greatest vulnerability on which to focus the main actions and adaptation measures.

For the city of Ancona attention has fallen on the prevention of landslide risk following coastal erosion, through monitoring and control actions aimed at protecting the coast of Portonovo.

However, one of the main critical issues for the city of Bullas is represented by the excessive consumption of water for agricultural use, therefore, the adaptation actions focused on the development of new irrigation technologies. As for this city, the program has envisaged the development of a public awareness campaign on the effects of climate change, indicating the measures to be taken in the event of an emergency.

Also for the city of Patras as for that of Ancona, attention has essentially fallen on the phenomenon of coastal erosion to be addressed through the construction of protective walls and breakwaters in order to prevent the loss of sandy material caused by the wave motion, on the protection of forests and biodiversity, thanks to the development of environmental education projects and, finally, also in this case, on the definition of an information campaign to make citizens aware of the need for water-saving, by distributing flow regulators.

### *2.3 Public-private partnership programs for territorial adaptation. Density as a new paradigm for urban resilience*

In this regard, there are also significant private initiatives at the international level, engaged in the development of strategies that aim at sustainable urban development of cities. The *100 Resilient Cities* program, promoted by the Rockefeller Foundation, for example, is founded on the purpose of providing support to the cities participating in the initiative with the aim of promoting the ability to resilience to the physical, social and economic challenges that characterize the contemporary urban dimension.

The program is based on the creation of a network of 100 densely populated cities, each of which presents a series of chronic stresses, problems that progressively weaken the fabric of a city, (unemployment, inefficient public transport, endemic violence, food shortages, and water) and acute shocks, sudden and acute manifestations (earthquakes, floods, epidemics, terrorist attacks), to which the work teams propose to give answers in terms of strategic programming, promoting a comparison between public and private operators (EY / 100RC, 2017).

The Italian cities of Rome and Milan are also part of the program, but one of those where the issue of mitigation of the effects of climate change is most evident is the city of Vejle, in Denmark.

The city is half of its extension at an altitude of two meters above sea level and the other half at a lower level, it is considered one of the areas of Denmark most vulnerable to the risk of flooding caused by floods and rising sea levels. It is estimated that by 2050 the first tangible effects on the urban structure will be registered and that by 2100 half of the city will be completely flooded. One of the most significant socio-economic problems of this phenomenon is a progressive migration of the population, which today is around 54,000 people, and a considerable drop in the sense of belonging. The work team identified by the organization of the 100 Resilient Cities program has developed, together with the Public Administration of the city, a strategic plan entitled *Vejle's Resilient Strategy* which was immediately integrated into the existing urban planning tools.

The vision of the municipal administration, for the future sustainable development of the city, which covers the time span from 2017 to 2029, tests the guidelines identified by the adaptation strategies.

Specifically, there are four points on which the strategy is articulated:

- Co-creating city: a slogan that refers to public-private collaboration put in place in order to direct the urban development of the city;
- Climate-resilient city emphasizes the effects of climate change to the detriment of the city's infrastructure (the port, the coastal area, communication infrastructures, the water, and sewage system)
- Socially resilient city: which aims instead to increase social and economic cohesion thanks to the active involvement of citizens from the decision-making to the implementation phase.
- Smart city: which promotes the introduction of digital technologies for the management of risks related to climate change.

Specifically, the proposals of the strategy for resilient Vejle, signed by the municipal administration and put on the agenda are the creation of the Laboratory for climate change adaptation and flood control, information and experimentation centre with the aim of managing the risk of flooding the fjord, exploring integrated and innovative solutions for the adaptation of coastal public spaces, in order to encourage economic growth and absorb changes due to water intrusion; the installation of permeable flooring capable of implementing the management capacity during extreme rains, a solution expressly to the advantage of the existing sewage system which, in this way should not cope with an excessive load; the dissemination of the proposed strategies through the drafting of updated catalogs in order to promote Vejle as a pilot city, an international model of urban resilience (Vejle's Resilient Strategy, 2013).

### **3. Conclusions**

The rapid growth processes of the cities that led to the birth of the Megacities have led to the strengthening of those critical factors that have not been taken into consideration for too long. The fragility of the territory, both from a geomorphological, social, cultural and economic point of view, need concrete solutions capable of redesigning the city in all its facets, in order to make it resilient and to promote sustainable development. It is clear how this challenge must be faced with an interdisciplinary perspective because the integration between different sectors allows to find long-term answers. The issue of urban density, for example, can be addressed simultaneously from the economic-financial and territorial urbanistic point of view, here understood as adjectives of the noun “planning”.

“Il tema della sostenibilità ambientale dei processi di trasformazione urbana ha modificato in modo sostanziale la tradizionale visione della città. C'è bisogno dunque di un aggiornamento culturale complessivo che preveda da una parte che non venga perduto un patrimonio prezioso di contributi specifici che hanno definito nel passato i caratteri qualitativi delle città (forma, funzione, ecc.), dall'altra che la disciplina dell'architettura modifichi e aggiorni le proprie metodologie di indagine rivedendo e reinterpretando i termini e i parametri che hanno costituito per molti anni un sicuro appoggio disciplinare, appannaggio esclusivo delle discipline urbanistiche” (Ottone, Cocci Grifoni, Marchesani & Riera, 2019).

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