Enhancing cities' resilience in the face of multiple challenges: on-going experiences in Italian and Greek cities

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Abstract: Nowadays cities are widely considered as main actors in the challenge against climate change, since they act both as generators of climate-related hazards and as vulnerable targets to their impacts. Although the issue of climate change has been for long addressed on a global scale, the key-role of cities, required to translate global objectives and strategies into tailored to the site actions, is nowadays widely acknowledged. However, climate urban strategies are often largely pushed by international initiatives. This contribution focuses in particular on the 100 Resilient Cities Initiative, launched by the Rockefeller Foundation and addressed to financially support cities all over the world in developing and implementing strategies capable to increase urban resilience in order to better cope with multiple shocks and stress factors, including climate change. In detail, the contribution provides a comparative analysis of 2 selected case studies, Rome and Athens, focusing on their resilience profile, their goals and objectives, the governance of the resilience building processes (actors involved, engagement of local communities, etc.), the set of the proposed actions, highlighting strengths and weaknesses of the whole process as well as the relevance assigned to climate issues and the potential impacts of climate-related actions on cities' resilience.

Keywords: urban resilience; climate change; 100 Resilient Cities; Rome and Athens

1. Enhancing Cities' Resilience: why and how

Cities are nowadays at the core of the international planning debate, due both to their rapid growth that will further increase in the next decades, and to the multiple and heterogeneous challenges, mostly social and environmental, that require urgent attention since they are seriously threatening their current livability as well as their future development. As pointed out some years ago by the Italian planner Bernardo Secchi (2013), social inequalities, which are more and more exacerbated by migration flows, and the impacts of climate change are probably the most important aspects of a "new urban question" that demands new approaches and tools.

The Agenda 2030 provides large emphasis on the need for renewing and planning our cities in order to reduce their impacts on environmental resources and on the global climate systems. In particular, The Agenda 2030 for Sustainable Development includes a specific goal, the 11*th*, that aims to "make cities inclusive, safe, resilient and sustainable", stressing on the need for "adopting and implementing integrated policies and plans towards

inclusion, resource efficiency, mitigation and adaptation to climate change", enhancing their resilience to disasters, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.

Thus, how do we cope with the multiple and heterogeneous challenges threatening cities? How to outline new directions for a responsible urban development, capable to achieve the goals established by the Agenda 2030? What are the new approaches and tools capable to guide cities towards future and largely uncertain development scenarios?

According to numerous scholars, the polysemic concept of resilience, enriched over time by multiple meanings and interpretations thanks to its migrations across different disciplinary fields (Galderisi, 2018), can be nowadays considered as a key principle to "frame scientific and political discourses on cities" (Sharifi, Yamagata, 2018), paving the way to new urban development strategies capable to overcome sectoriality and specialisms (Gabellini, 2018). In the last decades the resilience concept has gained more and more prominence, also thanks to numerous international initiatives aimed to translate this concept into practice, by providing both a theoretical frame and operational tools capable to support the resilience building at city scale, in order to enhance their capacity to deal with current and emerging environmental, social and economic challenges.

The numerous on-going initiatives largely differ from each other, as they are promoted by different organizations, pursuing different aims. The most relevant ones, in terms of number of involved cities, are the 'Making Cities Resilient' Campaign, launched in 2010 by the United Nations International Strategy for Disaster Reduction (UNISDR) and the 100 Resilient Cities Initiative (100RC), promoted in 2013 by the Rockefeller Foundation.

Figure 1: The City Resilience Framework. Source: (The Rockefeller Foundation/ARUP 2016)

We will focus here on the 100RC Initiative, which aims at supporting cities, both in economic and organizational terms, in developing and implementing strategies capable to increase urban resilience in the face of a wide range of stresses and shocks, ranging from migrations to water shortage, from earthquakes to climate change (The Rockefeller Foundation/ARUP, 2016). This Initiative provides an interpretation of resilience as "the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience"[1].

[1] http://www.100resilientcities.org/resources/

Thus, it seems to combine an "adaptive" perspective, aimed to continuously adapt cities to a constantly changing context, with a "transformative" one, which implies actions aimed to change and innovate the existing state of urban systems, providing new answers to new contexts. Moreover, in order to support the selected cities in the building up of a Resilience Strategy, a set of tools are provided. The 'City Resilience Framework' (CRF), set up by the Rockefeller Foundation in cooperation with the global design firm Arup, represents the main reference to measure and assess cities' resilience (Figure 1).

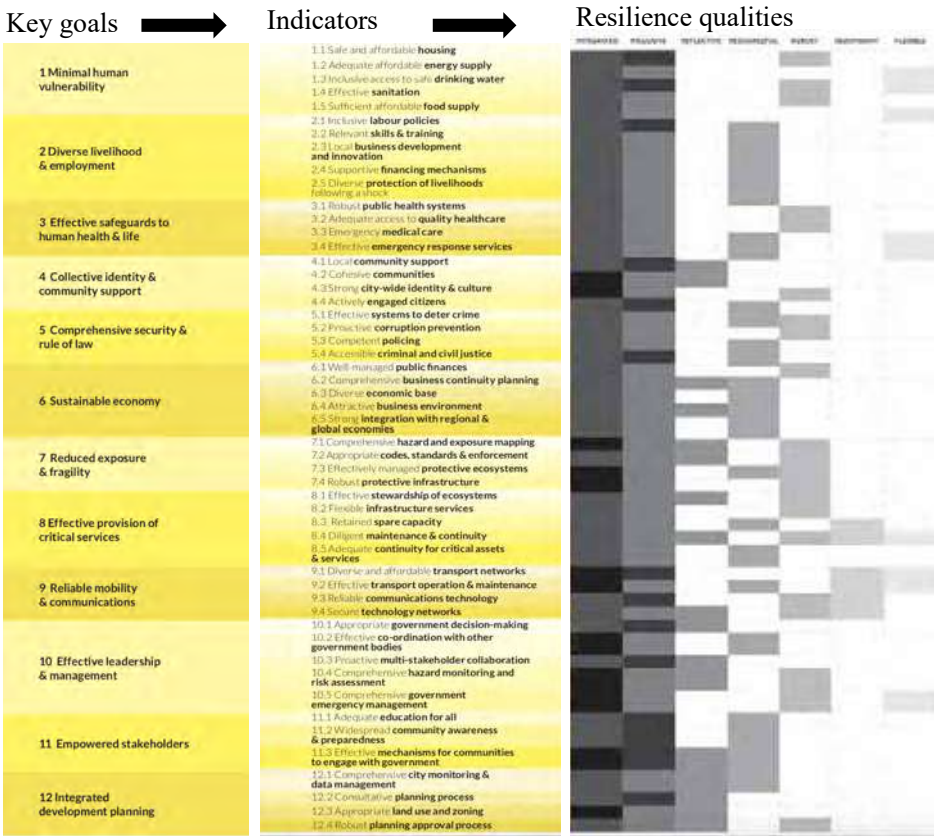

Figure 2: The City Resilience Framework: key goals, indicators, resilience qualities. Source: (The Rockefeller Foundation/ARUP 2016)

The CRF is structured as a circular model composed by different rings and sectors: it identifies four dimensions (Health & Wellbeing; Economy & Society; Infrastructure & Environment; and Leadership & Strategy) and 12 key goals (3 for each dimension) that cities should achieve for improving their resilience. Then, in respect to the 12 key goals, a set of 52 indicators, and the most adequate qualitative or quantitative metrics for their measurement and assessment, are provided. Finally, each indicator is related to the seven qualities that a resilient system should strengthen to effectively withstand, respond and adapt to shocks and stresses, and namely: inclusiveness, integration, reflectiveness, resourcefulness, robustness, redundancy, and flexibility (Figure 2).

This paper, based on an in-depth analysis of two selected case studies, Rome and Athens, provides a brief overview of their resilience profiles as well as of their goals and objectives; then, a methodological path for analyzing and comparing the resilience strategies carried out for the two cities, with a specific focus on the climate mitigation and adaptation measures, will be outlined. The main aim of this contribution is to critically analyze which is the relevance assigned in the two case studies to climate issues, which type of actions have been outlined in respect to each context, how these actions contribute to achieve both the key goals and the seven resilience qualities identified by the CRI.

2. Cities' profiles

As mentioned above, the scope of the 100RC Initiative is to support cities all over the world in enhancing their resilience features in order to better cope with environmental, climatic, social and economic challenges. In the following section, the profiles of the two selected cities, Rome and Athens, will be briefly outlined in order to show the main criticalities as well as opportunities that characterize the two contexts.

2.1. Rome: the city profile

Rome, the Italian capital, with its about 2.900.000 inhabitants and a territorial extension of more than 1.280 square kilometers, is the fourth largest city by population and one of the widest in Europe. From an administrative point of view, the city is composed of 15 Municipalities with managerial and financial autonomy, which refer to the Mayor and the Capitoline Assembly. The Municipalities are articulated in 155 urban zones for land management. The development of the city has been largely shaped by the presence of the Tiber river: since the ancient times, the Tiber represented an attraction as well as a constraint, and often a threat, for the city, as largely documented by Tacitus, who devoted large room in the Annales to the frequent floods affecting the city as well as to the numerous efforts, never succeeded, to reduce flood risk. Thus, over time Rome has constantly tried to achieve a balance between limits and constraints set by the natural environment and urbanization dynamics. In the last century, the population growth and the societal development let arise new demands, contributing to further exacerbate the fragile balance between the city and its natural environment (Resilient Rome, 2018).

Current urban structure reflects the demographic growth of the city over the years: the dense city center, where about 500.000 inhabitants currently live, with high levels of population density, the post-war belt, which hosts about 1.600.000 inhabitants and the peripheral low-density areas, with about 750.000 inhabitants.

The index of social disease highlights the significant difference, in socio-economic terms, between the central districts and the suburbs, characterized by a severe social marginalization. In addition, the old age index and the increasing migration flows require more adequate services, capable to better respond to the needs of the most disadvantaged categories (elderly, immigrants, low income population), by increasing their opportunities to access public facilities, promoting social inclusion and ensuring higher safety levels.

The historical, cultural and natural heritage, which represents one of the main strengths of Rome, suffers from the lack of effective maintenance policies as well as of an integrated governance of the urban system; moreover, although green areas cover more than the 60% of the municipal area, public green areas represent only the 5%. Even the infrastructural networks suffer the effects of the economic crisis: the aging and scarcely maintained transport, water supply, waste disposal networks struggle to satisfy the population needs. Moreover, the low efficiency of public transport contributes to the continuous growth of the car-based mobility and, consequently, to the increase of GHG emissions and air pollution.

Finally, it has to be underlined that land take and soil sealing in flood prone areas have significantly exacerbated flood risk in the municipal area: almost the 82% of the total land take in the Municipality occurred in flood prone areas, while soil sealing seriously increases surface runoff and, consequently, the damage due to extreme rainfalls (Munafò and Polverini 2018)

2.2. Athens: the city profile

The City of Athens, characterized by an important and intricate historic and cultural heritage, has a population of 664.046 inhabitants (2011 Census), covers the central area of the Attica Region and is one of the most densely built and populated municipalities in Greece. The Region of Attica presents a complex and interesting

morphological landscape, with the city of Athens located in the immediate vicinity to mountains, protected areas (Natura 2000 network, National Park), forests and coastal areas and to the Port of Piraeus, which is the largest in Greece and one of the biggest in the Mediterranean area and Europe.

According to the Resilience Strategy, urban environment is characterized by high population density, insufficient planning as well as by a low quality and aging built urban fabric, narrow streets and lack of green (public) open spaces. Uncontrolled land take and soil sealing (more that 80% of the Municipality surface is waterproof), coupled with the depletion of peri-urban green areas and the covering of the majority of the natural water network of the Attica plain, intensify phenomena such as Urban Heat Island (UHI), flash-floods and low levels of air quality. Moreover, since Athens is highly exposed to earthquakes, the dense and aging built environment largely contributes to increase the potential damage levels. Furthermore, the major flash-floods and forest fires occurred in the last years in the Attica Region clearly demonstrate how unprepared the city is to cope with these kinds of events.

For several years the city has been facing a serious socio-economic crisis (an aftermath of the global financial crisis of 2007-2008), resulting in severe austerity policies and measures. Among the main consequences of the resulting recession were declining incomes, growing personal debt, high real estate taxes as well as increasing levels of unemployment, poverty and homelessness, leading to violence and civil unrest. Moreover, austerity led to significant cuts in local government's budget and thus in public works and social services, which deeply affect the most vulnerable population.

At the same time, the large flows of refugees and immigrants in the city, intensified the social pressures and the feeling of mistrust between citizens and local Authorities. Currently, about 20.000 migrants and refugees are living within the municipality of Athens, with an increase of about 5% of urban population. This shock, however, has provoked a wave of citizens' mobilization and solidarity networks, and the growth of civil society responses, including non-profit organizations and informal groups. Gradually, it became clear that refugees may represent an opportunity for the city's crucial problem of sharply declining and aging population. This changing in demographic features affects city's cultural mix and identity. It is worth noting that the City of Athens, in contrast with the other municipalities of the Region, is a socially mixed area, characterized by the existence of vertical social differentiation[2] (Maloutas & Karadimitriou, 2001, Maloutas, 2004, Maloutas & Spirellis 2015). City's urban structure with multi-story residential building and mixed uses has enabled, to some extent, this vertical differentiation among social classes and ethnic identities, thus avoiding the creation of urban "ghettos" (Resilient Athens, 2017).

2.3. Rome and Athens: common challenges

Both Rome and Athens have experienced several changes and transformations throughout their history, and they stand now at the crossroads of challenges, many of which common to other cities in Europe and beyond, but also of opportunities for triggering more responsible urban development processes.

Climate-related impacts, such as flash floods, heat waves, forests fires, represent a major challenge in both cities, also due to a highly vulnerable built environment: high population density, inadequate infrastructures, lack of public green areas as well as of effective maintenance policies result into a limited capacity of both cities to cope with more and more frequent climate-related hazards. Moreover, in the last decade economic crisis and migration flows significantly affected both cities, increasing poverty and social inequalities, in particular in

[2] There is however a northwest part of the municipality mainly occupied by lower-middle class.

Athens, where large-scale flows of refugees, combined to the severe consequences in terms of loss of jobs, reduction of incomes and increase of taxes, led to acute social conflicts.

Thus, Rome and Athens are here assumed as representative of two main aspects of the "new urban question" (Secchi, 2013): the impacts of climate change and the growing social inequalities. The two selected cases study could provide useful insights on the effectiveness of a resilience-based approach in tackling the different challenges threatening urban future development and, in particular, climate change.

3. The resilience building process

In December 2013, Rome was selected as one of the first 32 cities to be included in the 100 Resilient Cities network. After the start of the activities in June 2014, with the Agenda Setting Workshop in Rome, the selected working team started the first phase of the resilience building process, aimed to outline the reference scenario for the resilience strategy (Figure 3). Athens was selected in 2014, in the second round, to join the Initiative and in the spring of 2015, through the Agenda Setting Workshop, it presented the framework and the methods of the 100 Resilient Cities program (Figure 4).

The Agenda Setting Workshop represented for both Rome and Athens an opportunity to trigger a participatory, interdisciplinary and innovative decision-making process, by engaging a number of stakeholders from public and private sectors, Councilors and Directors of the different Departments of Municipality, local and regional administrations, NGOs or local organizations. In particular, the participation of Rome in the 100 RC network was part of a wider action promoted by the Urban Transformation and Environment Department and aimed at launching urban innovation pathways in a context characterized by a significant lack of internal resources (Coppola, 2016). When the city joined the 100RC initiative, local administration was characterized by a culture strongly rooted in traditional procedures and tools and scarcely innovation-oriented (Tocci, 2015). In Athens, the Office of Resilience and Sustainability (ORS), established in February 2016, laid the foundations for drafting and implementing the resilience strategy with the participation of 130 individuals from the municipality, the public, private, non-profit and academic sector as well as the civil society. The ORS gained official status as part of the Mayor's Office in December 2016 (Government Gazette No 3812/B'/28-11-2016). In both cases, the first phase of the resilience building process was carried out through open seminars and focus groups and addressed to outline: current socio-economic context and governance, strengths and weaknesses of each city, as well as shocks and stresses affecting them, existing plans, programs and related actions.

Based on these activities, the working group of Rome's Strategy drafted 4 intermediate reports in September 2015 and, finally, published the Preliminary Resilience Assessment (PRA) in January 2016. The Preliminary Resilience Assessment highlights strengths and weaknesses of the city and identifies 5 main vulnerable assets: economic recession and vulnerability of the population, integrated governance, quality of life, land safety and climate change, maintenance of the city's heritage. The vision for a resilient Rome, arising from the preliminary activities, outlines an inclusive and supportive city with an exceptional natural, historical and cultural heritage, capable to safeguard its past and to develop it by promoting environmental sustainability, economic development and public well-being (Resilient Rome, 2018).

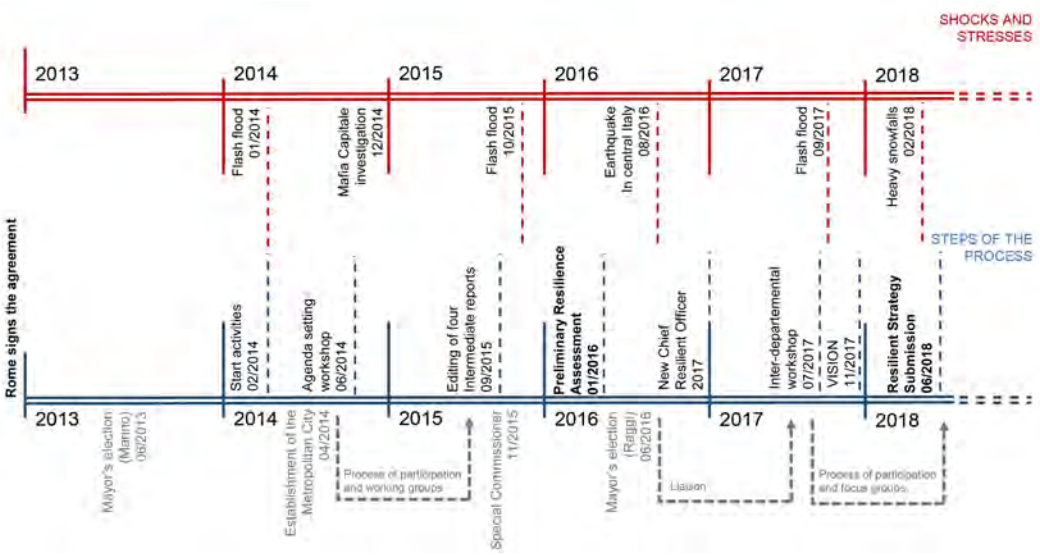

Figure 3: Occurred shock and stress events (red) and steps of the process aimed to outline the Resilience Strategy in Rome (blue).
Source: Resilient Rome (2017)

Citizens' engagement was one of the most important goals of the Athens' Strategy too, thus stakeholders mapping and the development of an integrated Stakeholder Engagement & Communication Plan were the first steps of the process (Resilient Athens & ADDMA S.A., 2016). During the first phase of the drawing up of Athens' Strategy (February - June 2016), 11 focus groups[3] were created. The participants were interviewed about city's critical assets, shocks, stresses and vulnerabilities and their personal view about what makes Athens resilient. Based on the above diagnostic activities, in July 2016, the PRA was released: it presented 5 discovery areas that Athens had to explore in detail in the second phase, in order to discover opportunities that would contribute to resilience building. Moreover, the vision for a resilient Athens was shaped, namely a city that is open, green, proactive and vibrant (Resilient Athens, 2017).

It is worth noting that during the process aimed at building up the Resilient Strategy, Rome suffered numerous climate-related events (Figure 3) that have probably contributed to increase citizens' and decision-makers' awareness on climate issues. In the case of Athens, the major events that affected the whole Attica Region in the time span of reference are reported (Figure 4). It is worth mentioning that every year this Region is affected by numerous flash floods (the several less intense events occurred are not mentioned in Figure 4). Moreover, in 2018 severe wildfires, which exacerbate climate change impacts, hit the Attica Region: however, they are not reported, since the city of Athens was not directly hit by the event.

Following the release of the PRA, Rome has gone through a phase of strong political instability leading to a slowdown of the activities. After the establishment of the new City Government, in September 2017, a new Chief Resilience Officer (CRO) was appointed. This transition led to a review of the identified challenges, according to the political agenda of the new Mayor, and significantly affected both the timing of the process and the involved actors. Hence, after the selection of the new CRO in September 2017, the working group outlined the final Resilience Strategy that was officially launched in June 2018.

[3] City districts' council members, advisors to the Mayor, architects, start-uppers, tour guides, young entrepreneurs, CSOs, NGOs, migrant women, homeless street paper vendors and elders.

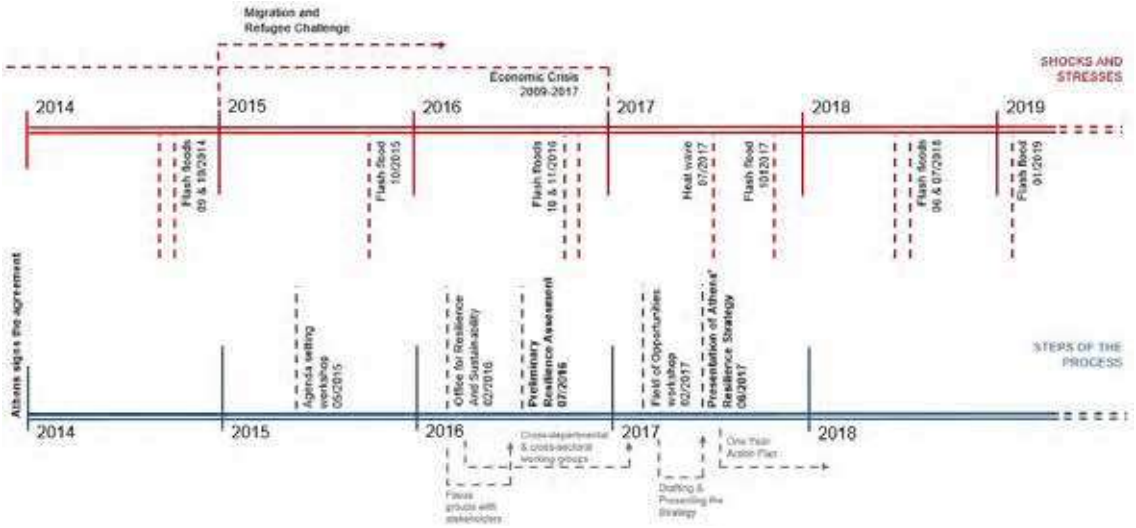

Figure 4: Occurred shock and stress events (red) and basic steps of the process aimed to outline the Resilience Strategy in Athens (blue).
Source: Resilient Athens. (2017) meteo.gr, www.hnms.gr/emy/

From March to June 2017, the Athens Resilience Strategy was drafted and presented to the Mayor of Athens, the city Council, the municipal Executive Committee, the Resilience Steering Committee (RSC) and the municipal political parties. Its official public launch was held in June 13, 2017. Finally, Phase III (from July 2017) has included the launch of the One Year Action Plan and the start of the Strategy's implementation.

Hence, by comparing the timelines, it is evident that, despite being chosen in the second round (one year later), Athens filled the temporal gap, by surpassing Rome in terms of speed of the Strategy building process. Moreover, while the process in Athens was linear, in Rome it was considerably affected by the political instability of the city.

In both cases, stakeholders' engagement was very relevant through all the different steps of the process and allowed the working groups to:

- ground on heterogeneous perspectives and approaches in defining critical issues and visions for the cities' future development;
- increase the stakeholders' awareness about challenges and opportunities of the contexts at stake;
- ensure an active stakeholders' engagement in the implementation of the Strategies.

4. Rome and Athens Resilience Strategies: the relevance of climate related actions and their role in enhancing cities' resilience

4.1. A methodological path for analyzing the Resilience Strategies

The analysis of the Resilience Strategies carried out in Rome and Athens has been addressed to understand, firstly, the relevance assigned in both strategies to climate issues; then, the potential impacts of climate-related actions on the resilience qualities identified by the CRI. To pursue these aims, a common methodological path has been outlined. The latter has been structured according to the following steps:

- the identification of the most relevant shocks and stresses as perceived by the stakeholders, with a focus on the relevance assigned to climate issues, and of the key challenges that, according to the stakeholders' opinions, each city has to face;
- the identification of the key goals that the two cities should improve, according to the stakeholders' opinions;
- the singling out of the actions directly or indirectly addressed to counterbalance climate change, in respect to the whole set of actions outlined by the two strategies, by distinguishing mitigation actions, adaptation actions or actions that could address both;
- the qualitative analysis of the potential impacts of the actions directly aimed to counterbalance climate change on the set of 52 indicators identified, in respect to each dimension and related goals, by the CRI;
- the qualitative analysis of the potential impacts of the actions directly addressed to counterbalance climate change on the resilience qualities that, according to the CRI, depends on the relationships between the indicators (to which each action is positively or negatively related) and the resilience qualities;
- the relationships among the Resilience Strategies and other existing plans/programs/initiatives specifically addressed to counterbalance climate change.

The different steps have been developed through an in-depth analysis of both the Preliminary Resilience Assessment and the Resilience Strategy carried out by each city.

It is worth underlining that the potential impacts of the actions directly addressed to counterbalance climate change on the set of indicators provided by the CRI have been evaluated according to a qualitative judgment structured as follows: positive, indifferent/no, and negative. The provided qualitative judgments are based on the description of the actions provided by each Resilience Strategy and refer to potential impacts, since only few actions are currently in progress, while most of them have to be still implemented; thus, their actual impact is not evaluable at this stage.

Moreover, the potential impact of the identified climate-related actions on the resilience features, expressed according to a binary qualitative judgment (increase/decrease), has been singled out according to the relationships between the indicators to which each action is positively or negatively related and the seven resilience qualities identified by the CRI (Figure 2).

4.2. The baseline assessment

In the case of Rome, the PRA, released in January 2016, described the current situation of the city, by providing qualitative and quantitative data on population, economy, services and infrastructure and governance. During this phase, stakeholders' engagement was addressed to define both the most relevant shocks and stresses and the main challenges that cities had to face. According to the stakeholders' opinions, natural hazards (earthquakes) and climate-related events (pluvial and river floods, landslides, sinkholes, heat wave) represent the most relevant shocks, while the numerous identified chronic stresses refer to the lack of integrated planning, to the soil, water and air pollution, to the loss of ecosystem services, to the poor maintenance of public areas, infrastructures and building, to the inadequacy of public transport and the lack of citizenship (Figure 5).

Moreover, they identified five main challenges that Rome has to cope with, referable to the economic recession and the increasing vulnerability of population, the need for a more effective and integrated governance, the urban safety, in respect to both geological and climate-related hazards.

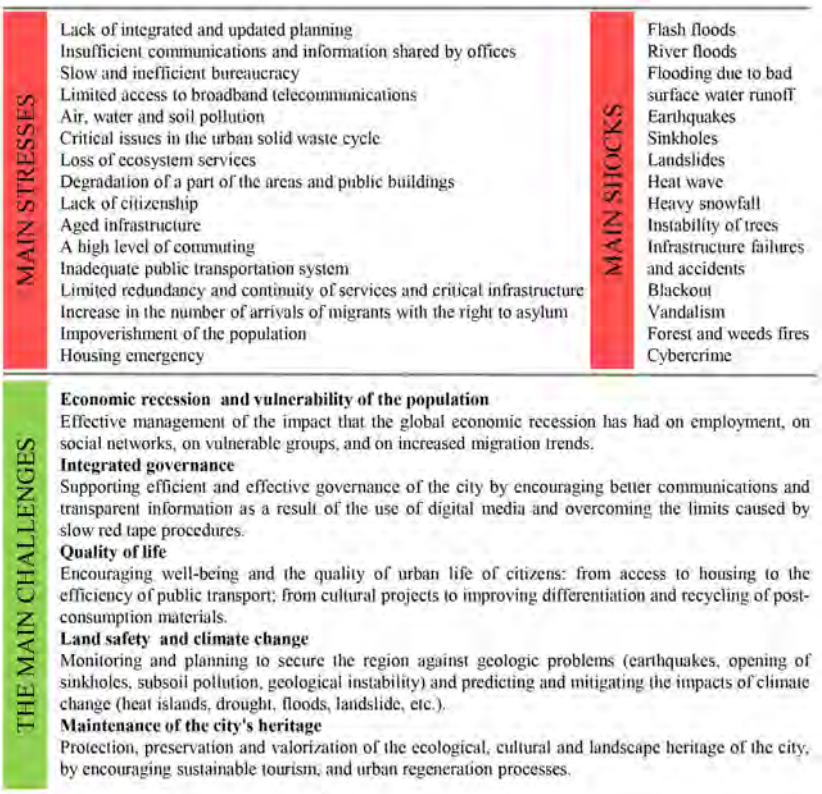

Figure 5: Rome: shocks, stresses and challenges perceived by the engaged stakeholders.

In respect to the key goals identified by the CRI, the engaged stakeholders recognize the need to improve all the key-goals related to the *leadership and strategy* dimension, and namely to an integrated development planning, considered as a precondition for achieving the key goals related to the *health and well-being, economy and society, infrastructure and ecosystems*. As a matter of fact, an integrated development planning would also contribute to enhance city's resilience and, namely, city's *robustness*, transformability and adaptability to hazardous events, especially those related to climate change.

Athens' PRA, released in July 2016, describes Athens' current status at that time, regarding the demographic and social analysis of the urban area, the economy, the physical and man-made infrastructures, the cultural resources, the development strategy, the funding tools as well as the administrative structure. Three basic tools were used for a diagnosis of Urban Resilience: a perception tool based on the stakeholders' opinions, an action tool and an asset and risk tool. The perception tool was addressed to collect the perceptions about city resilience from a wide range of stakeholders. Based on their answers, shocks and stresses as well as the main challenges that the city have to cope with were identified: also in the case of Athens, natural hazards (earthquakes) and climate-related events (heat waves and flash floods) are perceived as important shocks to be faced, combined with civil unrest (largely due also to the pressure of the economic crisis) and cybercrime. Regarding chronic stresses, less numerous than in Rome, the most relevant ones refer to the impacts of economic crisis, to the aging infrastructures and to the increasing migration flows. The identified main challenges, also in this case five areas, range from the urban decay to climate impacts (Figure 6).

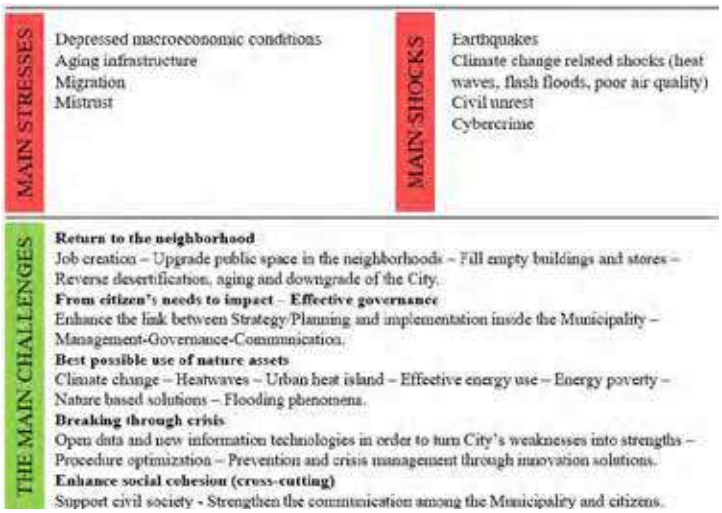

Figure 6: Athens: shocks, stresses and challenges perceived by the engaged stakeholders.

In respect to the key goals identified by the CRI, the engaged stakeholders ranked citizens' participation and the cohesion of the communities as an area of strength for city's resilience (*Goal 4: Collective identity and community support*): this positive rating depends on the widespread idea that, despite the weakness of the local authorities that generally fail in communicating with citizens, in providing access to information and education, and in taking into account citizens' needs, citizens are active and mutually supportive. On the opposite, they provide a negative evaluation of the Goal 8 (*Effective provision of critical services*), 12 (*Integrated development planning*) and 10 (*Effective leadership and management*). The criticisms revolve around the issues of the emptying out of the city, the aging infrastructure, the abandoned buildings, the lack of public services as well as of open and green spaces, the traffic congestion. They also complain the lack of long-term planning and of an effective coordination among different plans and actions.

4.3. Resilience strategies: relevance and impacts of climate related actions

The Resilience Strategy carried out for Rome is based on four pillars, mirroring the strategic vision outlined for the city. In respect to each pillar, some priority actions, directly linked to the pillars, the key goals and the actions that will allow the city to achieve these goals have been identified (Figure 7).

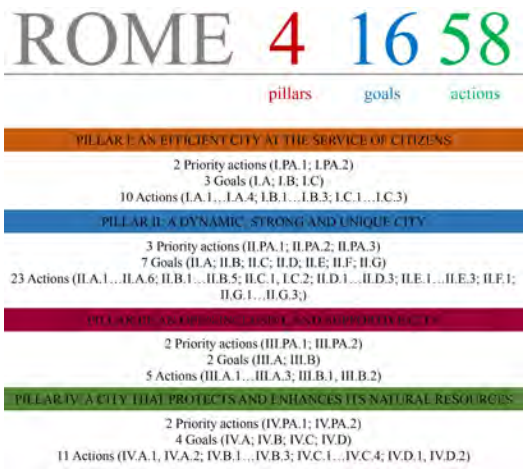

Figure 7: The structure of the Rome Resilience Strategy.

It is worth noting that in respect to the whole set of priority actions and actions outlined by the Strategy (58), more than half are related to climate issues (Table 1). All the climate-related actions have been classified according to their role in counterbalancing climate change, by distinguishing mitigation actions, adaptation actions and actions that could address both; moreover, these actions have been distinguished according to their direct or indirect impact on climate change.

	CC RESPONSE	IMPACT
PILLAR I: AN EFFICIENT CITY AT THE SERVICE OF CITIZENS		
PRIORITY ACTION 1: Create an operation and management center	Mitigation & Adaptation	Indirect
PRIORITY ACTION 2: Establish a Resilience Office	Mitigation & Adaptation	Indirect
GOAL A: Make the city's administration more efficient, transparent and participatory; ensure the monitoring of procedures		
I.A.1. Link the budget commitments to the three-year annual program of the Departments' activities	-	-
I.A.2. Reorganize the running of Departments and encourage synergies with other institutions	-	-
I.A.3. Create a unique communications interface between private citizens and Public Administration with the help of new technologies	-	-
I.A.4. Establish guidelines to optimize the planning, construction and management of projects	-	-
GOAL B: Incentivize centralized governance actions		
I.B.1. Complete the implementation of the 'Rome' laws required to ensure greater governance autonomy of the region (e.g. archaeological parks, rivers, etc.)	-	-
I.B.2. Create a unique geographical database that may be updated and shared	Mitigation & Adaptation	Indirect
I.B.3. Establish a Geological Survey of Rome to unite the governance of the urban subsoil	Adaptation	Indirect
GOAL C: Implement the Smart City plans		
I.C.1. Introduce guidelines for updating the Open Data platform	Mitigation & Adaptation	Indirect
I.C.2. Upgrading the public Wi-Fi network and coverage	-	-
I.C.3. Construct a Smart Grid	Mitigation	Indirect
PILLAR II: A DYNAMIC, STRONG AND UNIQUE CITY		
PRIORITY ACTION 1: Govern the relaunch of the River Tiber by implementing projects coordinated by the Special Office for the Tiber	Adaptation	Direct
PRIORITY ACTION 2: Evaluation of the resilience potential of the regeneration of Ostiense Marconi district	Mitigation & Adaptation	Direct
PRIORITY ACTION 3: Change the perception, use and promotion of the archaeological and cultural heritage sites in Rome for citizens' everyday life	-	-
GOAL A: Promote the cultural life of the city		
II.A.1. Reorganize the management of the cultural sector	-	-
II.A.2. Support stakeholders in the contemporary cultural sector in the dissemination of the cultural offer	-	-
II.A.3. Organize seasonal programs of cultural events throughout the city	-	-
II.A.4. Assign a new role to public libraries by organizing innovative socio-cultural programs for the local communities	-	-
II.A.5. Start the application to list Ostia Antica as a UNESCO World Heritage Site	-	-
II.A.6. Fashion Relaunch Plan of Rome	-	-
GOAL B: Promote urban regeneration		

II.B.1. Activate Fabbrica Roma (Rome Factory), a regeneration plan for abandoned public buildings	Mitigation & Adaptation	Indirect
II.B.2. Upgrade the Building Regulations according to new housing and working needs	Mitigation	Indirect
II.B.3. Regenerate the Tiburtina Stations and Pietralata areas	Mitigation	Indirect
II.B.4. Reorganize the network of public and private transportation to streamline the mobility system (tram lines, bus lanes, cable cars, etc.)	Mitigation	Direct
II.B.5. Establish incentives to facilitate the transfer of know-how between small-medium businesses, start-ups, institutions and research centers	-	-
GOAL C: Promote the landscape and natural heritage in the urban environment		
II.C.1. Restore and/or reorganize the use of and access to the Roman coast by implementing the Utilization Plan for Rome's Coastline	Adaptation	Indirect
II.C.2. Implement the management reorganization of parks and historic villas by establishing a Curator who would also be responsible for planning the fundraising processes	-	-
GOAL D: Encourage the farming tradition of the city		
II.D.1. Relaunch farming companies managed by the Municipality	Mitigation	Indirect
II.D.2. Develop new markets for farmers to support the direct sale of produce and products to consumers	Mitigation	Indirect
II.D.3. Increase food forests and urban vegetable gardens	Adaptation	Direct
GOAL E: Improve the attractiveness and the safety of Rome		
II.E.1. Create tourist facilities to promote youth and student tourism	-	-
II.E.2. Plan activities to promote the attraction of urban areas by increasing the number of cycling tracks, environmental islands and use of the public transport system	Mitigation	Direct
II.E.3. Regulate businesses in the historic center in order to protect the quality of products and craftsmanship so as to preserve the identity of the historic center	-	-
GOAL F: Ensure the safety of the public and private heritage in the city		
II.F.1. Protect infrastructure, public buildings, and schools	Mitigation & Adaptation	Direct
GOAL G: Prepare city's adaptation to climate change		
II.G.1. Create green and blue infrastructure to reduce urban heat islands	Adaptation	Direct
II.G.2. Assess the impacts of climate change and raise awareness among citizens	Adaptation	Indirect
II.G.3. Create infrastructure and pilot projects to reduce the risk of flooding	Adaptation	Direct
PILLAR III: AN OPEN INCLUSIVE AND SUPPORTIVE CITY		
PRIORITY ACTION 1: Implement a program to encourage everyone into sports to enable social integration of diverse communities	-	-
PRIORITY ACTION 2: Implement the new social integration program for asylum seekers and other people covered by international protection	-	-
GOAL A: Promote a hospitable city that respects diversity		

III.A.1. Implement a program to strengthen and extend the support network for vulnerable communities	Adaptation	Indirect
III.A.2. Establish assessment criteria to assign public spaces under concession to NGOs, associations and organizations that promote social inclusion, education and sustainability	-	-
III.A.3. Finalize Public Housing Development Programs and develop new energy-efficient social housing	Mitigation	Direct
GOAL B: Promote the cultural growth of the vulnerable population		
III.B.1. Introduce projects for the inclusion of children in the cultural life of the city in collaboration with other institutions	-	-
III.B.2. Implement the new intervention policies for unaccompanied foreign minors to facilitate opportunities of growth and integration	-	-
PILLAR IV: A CITY THAT PROTECTS AND ENHANCES ITS NATURAL RESOURCES		
PRIORITY ACTION 1: Renew the public vehicle fleet and introduce eco-sustainable buses	Mitigation	Direct
PRIORITY ACTION 2: Optimize separate waste collection of post-consumer materials	Mitigation	Indirect
GOAL A: Protect the ecological system and restore the value of the water resources		
IV.A.1. Implement sustainable urban forestry principles to protect biodiversity, enhance and protect parks and nature reserves	Adaptation	Direct
IV.A.2. Protect and enhance local water resources	Adaptation	Direct
GOAL B: Promote the use of renewable energy sources		
IV.B.1. Incentivize the use of renewable resources	Mitigation	Direct
IV.B.2. Introduce incentives to secure the safety and energy efficiency of private real estate property	Mitigation	Direct
IV.B.3. Review the green credential and safety of the public structures	Mitigation	Direct
GOAL C: Create sustainable mobility and introduce solutions to reduce pollution and GHG emissions		
IV.C.1. Develop an efficient and economic transport model for people and goods	Mitigation	Indirect
IV.C.2. Develop sustainable electric mobility plan	Mitigation	Direct
IV.C.3. Test new technologies for decreasing emissions into the atmosphere	Mitigation	Direct
IV.C.4. Develop the pedestrian and cycle network and sharing transport schemes	Mitigation	Direct
GOAL D: Promote a zero-waste circular economy		
IV.D.1. Open centers for the direct processing and reuse of post-consumer materials	Mitigation	Direct
IV.D.2. Develop sustainable waste plants	Mitigation	Direct

Table 1: The whole set of priority actions and actions outlined by the Rome Resilience Strategy and the actions addressed to counterbalance climate change.

Once the actions aimed to counterbalance climate change have been identified, the potential impact of each action, limited to those directly related to climate change, on the set of 52 indicators provided by the CRI, has been evaluated. Then, based on the outcomes of the qualitative assessment and according to the relationships between indicators and key goals identified by the CRI (Figure 2), the examined actions are expected to have a positive impact on the key goals 8, 10, 11, 4 and, consequently, on the related dimensions *Infrastructure and Ecosystems* and *Leadership and Strategy* (Figure 8).

Figure 8: The potential impacts of directly climate actions on CRI's key goals.

The potential impacts of the actions have been largely regarded as positive or neutral and only in few cases as negative, even though some of them could induce, once implemented, some negative externalities related, for example, to an increase in soil consumption or to the occurring of gentrification phenomena. However, it is difficult to assess such externalities, only based on the general description of each action provided by the Resilience Strategy.

Finally, the potential impacts of the selected actions on the resilience qualities that, according to the CRI, depends on the relationships between the indicators (to which each action is positively or negatively related) and the resilience qualities, have been assessed. Based on this, it is possible to highlight that the selected actions could contribute to significantly enhance at least three out seven resilience qualities, making Rome a more integrated, inclusive and robust city, and contributing to a lesser extent to enhance the other resilience qualities (Figure 9).

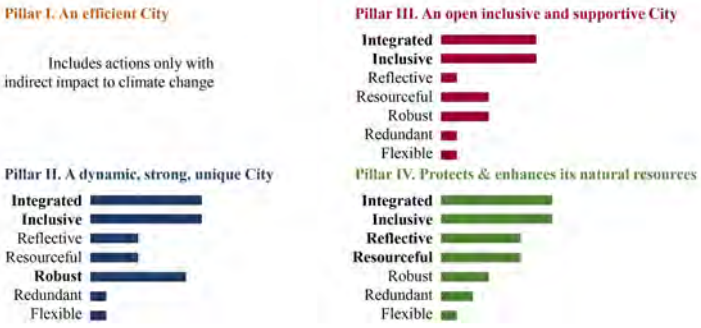

Figure 9: The potential impacts of the climate actions on the resilience qualities.

Athens' Resilience Strategy has been structured into 4 pillars, 13 goals, 44 actions and 55 supporting actions. Each goal of the Strategy is related with the goals of the CRI (Figure 10).

Figure 10: The structure of the Athens Resilience Strategy.

Among the 44 actions included in the Strategy, the ones addressed to counterbalance climate change have been identified, by identifying those contributing, directly or indirectly, to the reduction of GHG emissions as mitigation actions, those related to the adjustment and regulation of urban system as well as to changes in behavior in order to better cope with the more and more frequent climate impacts, as adaptation actions. There are, of course, actions that address both mitigation and adaptation (Table 2). This analysis indicates that more than the half of the actions concerns climate-related issues (28 out of 44 actions), half of which are directly related (15 out of 28).

	CC RESPONSE	IMPACT
I. An Open City		
GOAL A. Become more transparent and accountable		
A.1 Open data	Mitigation & Adaptation	Indirect
A.2 Communication campaigns	Mitigation & Adaptation	Indirect
A.3 Major public events impact assessment	-	-
GOAL B. Enhance and streamline the city's processes		
B.1 Digital agenda	Adaptation	Indirect
B.2. Smart operational center	Adaptation	Indirect
B.3 Health & social service centers	-	-
B.4 Map of the public realm	Mitigation & Adaptation	Indirect
GOAL C. Foster collaboration and engagement		
C.1 Thematic stakeholder platforms	Adaptation	Indirect
C.2 synAthina platform	Adaptation	Indirect
C.3 University and City Synergies	Adaptation	Indirect
C.4 Athens Partnership Fund	-	-
C.5 Athens Culture Net	-	-
II. A Green City		
GOAL A. Integrate natural systems into the urban fabric		
A.1 Climate Change adaptation action plan	Mitigation & Adaptation	Direct
A.3 Triple green development project (Mega Resilience Project)	Mitigation & Adaptation	Direct
A.4 Elaionas: a resilient district (Mega Resilience Project)	Mitigation & Adaptation	Direct
GOAL B. Make our city cleaner		

B.1 Waste management action plan	Mitigation & Adaptation	Direct
GOAL C. Promote sustainable mobility and co-create public spaces		
C.1 Sustainable mobility roadmap	Mitigation & Adaptation	Direct
C.2 Public space rejuvenation initiative	-	-
C.3 Public space co-development framework	Mitigation & Adaptation	Indirect
GOAL D. Foster sustainable food systems		
D.1 Sustainable food policy plan	Adaptation	Direct
GOAL E. Establish sustainable and equitable energy system		
E.1 Climate Change mitigation action plan	Mitigation & Adaptation	Direct
E.2 Energy poverty mitigation roadmap	Mitigation & Adaptation	Direct
E.3 Renewable energy cooperatives	Mitigation	Direct
III. A proactive city		
GOAL A. Enhance planning in the face of serious challenges		
A.1 Crisis preparedness and management plans	Adaptation	Direct
A.3 Metropolitan Authority and other legislative and policy making reforms	-	-
A.4 Detailed resilience studies	Mitigation & Adaptation	Direct
A.5 Old building retirement	Mitigation & Adaptation	Direct
GOAL B. Empower the municipal workforce and elected officials as well as the voice of the local community		
B.1 Municipal neighborhood network	-	-
B.2 Municipal capacitiy building	-	-
GOAL C. Engage with our neighborhoods		
C.1 Schools open to the neighborhood	-	-
C.2 Migration integration action plan	-	-
IV. A vibrant city		
GOAL A. Enhance the City's identity and promote new types of belonging		
A.1 Athens ID	-	-
A.2 Creative economy strategic plan	-	-
A.3 Holistic city brand	-	-
A.4 Green and cultural urban corridors	Mitigation & Adaptation	Direct
A.5 Sustainable municipal Real-estate management	Mitigation	Indirect
A.6 City center development project	Mitigation & Adaptation	Direct
GOAL B. Maximize existing City assets and support employment		
B.1 Vacant buildings: crucial urban resource	Mitigation	Indirect
B.2 Employment action framework	-	-
B.3 Social housing program	-	-
B.4 Old train stations refurbishment	-	-
B.5 Expropriation and greening of abandoned lots in Athens	Mitigation & Adaptation	Direct

Table 2: The whole set of actions outlined by the Athens Resilience Strategy and the actions addressed to counterbalance climate change.

Following the methodological path previously outlined (see paragraph 4.1) and based on the potential impact of the actions that directly address climate issues on the 52 indicators provided by the CRI, it is possible to state that the selected actions have a positive impacts on the Goals 4, 8, 10, 12, whereas the least positive impact is on the Goal 5 (*Comprehensive security and rule of law*) (Figure 11). Comparing these results with the stakeholders' opinions previously mentioned, we can argue that these opinions have been largely taken into consideration in

the drawing up of the Strategy. However, a potential negative impact, in social terms, of the numerous regeneration projects included in the Strategy, should be highlighted. The potential gentrification effects of these projects may significantly affect Goal 1. Thus, in the implementation of the foreseen actions the potentially negative social impacts should be carefully analyzed and compensated through appropriate measures.

Figure 11: The potential impacts of directly climate actions on CRI's key goals.

Finally, based on the correlation between the indicators and the resilience qualities provided by The Rockefeller Foundation & Arup (2016), the potential impacts of the selected actions on the resilience qualities have been assessed. According to the outcomes of the evaluation, the selected actions might help the city to become more integrated, inclusive, reflective and resourceful while also increasing, to some extent, its robustness. However, redundancy and flexibility should become more prominent (Figure 12).

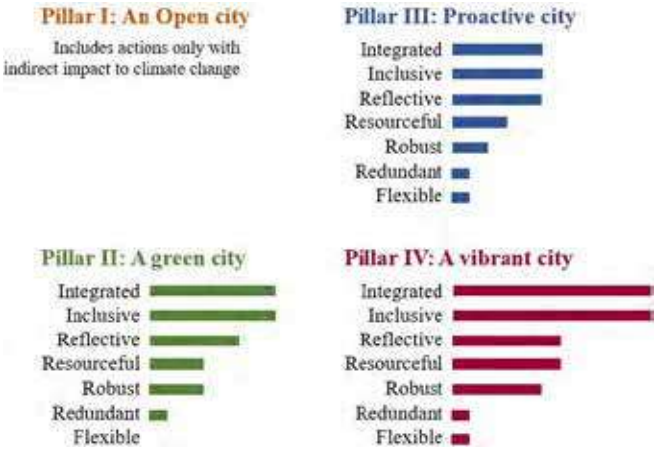

Figure 12: The potential impacts of the climate actions on the resilience qualities.

4.4. The relationships with other urban strategies, plans and policies

One of the main opportunities for cities that decide to adopt a resilience strategy is to systematize and link all the heterogeneous actions planned by different actors and included in different planning tools, framing them into a common and shared vision for future development.

The attention devoted to create links among actions already included in other plans and programs, approved or with a still pending approval, is surely a strength of the Rome Resilience Strategy. The number of actions already in progress at the time of the adoption of the Strategy and framed into the strategy is double in respect to

the new actions. As clearly stated in the Strategy, this may contribute to guarantee both their implementation and a higher continuity in the city's development policies. Hence, the Rome Resilience Strategy is closely linked to numerous existing plans and projects (plans for urban regeneration, plans for sustainable mobility, urban greening, etc.). All actions aimed at building platforms for the dissemination of knowledge, involving citizens, creating a unique interface between public and private actors, stakeholders and decision makers, updating and integrating data and information from different specific sectors, can be traced back to the Digital Agenda of Rome (2016) , addressing the digital transformation of the public administration. Moreover, as regards the relationships among the Rome Resilience Strategies and other existing plans/programs/initiatives specifically addressed to counterbalance climate change, it is worth noting that most of the actions classified as mitigation actions are already in progress, being already included into previously approved plans, although not fully implemented (e.g. the SEAP submitted in 2013). On the opposite, adaptation actions are generally new, due to the lack of a previous adaptation plan: the Municipal Council, that took office in 2016, joined the New Covenant of Mayors for Climate and Energy in 2017, with the commitment to submit the SECAP by November 2019. The objectives set up for the SECAP are fully in line with the actions aimed to counterbalance climate change included in the Resilience Strategy, namely in the second and fourth pillars, mostly addressed to promote urban regeneration, to ensure a sustainable development in mobility, to improve public green areas. Despite the numerous links among plans carried out by the different sectors of the Municipality, it has to be underlined the persisting lack of coordination among different Public Bodies. In particular, the actions related to the goal "Prepare city's adaptation to climate change" could have benefited from a closest relationship between the Strategy and the 10-year program of actions designed by the River Basin Authority to guarantee the safety of Rome from floods, landslides and sinkholes (River Basin District Authority 2018), which is not even mentioned in the Strategy, probably due to its recent adoption.

Athens' Resilience Strategy also draws upon other local, regional, national and international strategic documents and it seems to be aware of the lack of communication among the different municipal departments and public bodies and, consequently, of the lack of coherence among policies and plans. Moreover, it clearly acknowledges the citizens' need of more information and mechanisms allowing them to better engage with decision-making processes. Hence, the Strategy supports and creates information platforms, for municipal departments, stakeholders and communities, promotes partnerships with national and international networks and favors linkages with other plans, programs and initiatives (throughout its four pillars). These endeavors make data and services available to everyone, ensure the comprehensive dissemination of relevant information and raise the awareness about resilience issues. As regards the relationships among the Athens Resilience Strategy and other existing plans/programs/initiatives specifically addressed to counterbalance climate change, it is worth noting that the Athens Climate Change Adaptation and Mitigation Plan represents a fundamental part of the Resilience Strategy. This plan, which includes 2 parts, respectively focused on mitigation and adaptation, outlines specific actions aimed at improving quality of life, mostly in respect to increasing temperatures, flash floods and poor air quality. Many of the Adaptation and Mitigation Plan's actions are incorporated in the Strategy as new actions (apart from the supporting action "Enhance Green infrastructure in city", which is already on-going). Other actions are linked with urban, regional and national plan and programs for sustainable mobility, waste management, energy saving, as well as with the economy strategic plan, the migrant integration action plan, the public space co-development framework, the crisis preparedness and management plans and the sustainable food policy plan.

Finally, it is worth reminding that in November 2017 Athens entered the Smart Mature Resilience (SMR) project, which responds to the need for enhancing resilience in European cities. Athens is one of the Tier 3 cities (as well as Thessaloniki): thus, it is one of the 'engaged' cities that receives training in the use of finalized tools (which are piloted in a group of three core cities/Tier 1) (Grimes, 2018). The engagement of the city into this project could represent a further opportunity to strength awareness, capabilities and skills within the different sectors of the public administration and to empower, in so doing, local institution, making the latter more autonomous in respect to the leading role hitherto assumed by the Rockefeller Foundation.

5. Concluding Remarks

The two selected cities, Rome and Athens, show numerous similarities both in terms of shocks and stresses that the two cities have to cope with, and in terms of strengths and opportunities. Climate-related impacts are recognized as a major challenge exacerbated, in both cities, by a vulnerable built environment: high population density, inadequate infrastructures, lack of public green areas as well as of effective maintenance policies. Although economic crisis, migrants and refugees are mentioned as chronic stresses in both cities, their relevance in Athens is significantly higher, while the lack of integrated and participatory governance represents a very sensitive issue in both cases.

Due to the relevance assigned to climate issues by the stakeholders engaged in the resilience building process activated in the last years in the two selected cities, the examined Strategies include a significant number of climate-related actions that represent, in both cases, more than half of the total. However, while in the case of Rome these actions are mostly addressed to mitigation issues, being adaptation a new challenge for the city, in the case of Athens, most of the foreseen actions contribute to address both mitigation and adaptation issues.

By joining the 100 RC Initiative, Rome and Athens brought resilience into the urban political agenda, relying on a set of tools for understanding, assessing, and improving their capacity to cope with different stresses and shocks and raising meanwhile community and decision makers' awareness on resilience issues. The engagement of multiple stakeholders and the collaboration among different sectors of local governments can be interpreted as an opportunity for both cities to overcome the still prevailing "silo" approach to urban policies (Proust *et al*., 2012) and to promote more participatory decision-making processes. However, the case study examples, and mainly the case of Rome, clearly show how sensitive is the resilience building process to the political leadership: the weakness or the frequent change of the latter could significantly affect the resilience building process that, to be effective, requires continuity on a long-term perspective.

For both cities, the Resilience Strategy represents an opportunity to address some critical issues related to different urban dimensions (society, economy, environment and governance), grounding on a shared vision for future development, capable to systematize into a common frame new measures and on-going actions already included in different tools (e.g. climate plans, urban regeneration projects, etc.).

However, being the resilience building process only at a first stage or, better, at a "planned stage", it is quite difficult to assess its effectiveness in the long term. Numerous actions could induce negative impacts if not adequately designed and implemented, as in the case of neighborhoods' redevelopment projects that could increase social inequality while improving environmental quality.

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