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Urban resilience: a methodological approach

Resiliência urbana: uma abordagem metodológica

Resiliencia urbana: un enfoque metodológico

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Palavras-chave:
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Abstract
This article discusses a methodological proposal for the elaboration of urban resilience plans, which is one of the most important issues involving cities nowadays. The etymological concept of “resilience” needs to be rescued because Urban Resilience is the exact application of the original concept applied to cities, regardless of their scale. Bausista-Puig (2022, p.1) had examined 1014 publications during the period 1998–2020 and concluded that urban resilience literature has grown since 2009 until today and this reveals the great international interest in this topic during the last decade.Cities, due to their complexity and locus of living for a large part of the global population and with a rising tendency, need to guarantee their conditions of habitability. Considering the improvement of extreme weather events and the consequences for cities, resilience plans have become urgent and fundamental elements in this whole process. As demonstrated in this article, it is not only climate change that impacts urban life, but there are other elements such as infrastructure failures, strikes by essential professional services and the issue of refugees, which can also destabilize the urban balance. On the other hand, resilience plans that aim to return cities to their initial operational conditions need to contain all the elements that guarantee their execution. Plans with only diagnoses and actions of what should be done, will not guarantee their execution. Another important issue discussed in this article is the structuring axes which means, what are the priority areas and the themes that should be present in an urban resilience plan. Are they just those related to climate change or are there others with a high potential to destabilize our cities around the globe?

Resumo
Este artigo discute uma proposta metodológica para a elaboração de planos de resiliência urbana, que é um dos temas mais importantes que envolvem as cidades na atualidade. O conceito etimológico de “resiliência” precisa ser resgatado porque a Resiliência Urbana é a aplicação exata do conceito original aplicado às cidades, independentemente de sua escala. Bausista-Puig (2022, p.1) examinou 1.014 publicações durante o período 1998-2020 e concluiu que a literatura sobre resiliência urbana cresceu desde 2009 até hoje, e isso revela o grande interesse internacional neste tema durante a última década. As cidades, pela sua complexidade e lócus de moradia de grande parte da população mundial e com tendência crescente, precisam garantir suas condições de habitabilidade. Considerando a melhoria dos eventos climáticos extremos e as consequências para as cidades, os planos de resiliência tornaram-se elementos urgentes e fundamentais em todo processo. Como demonstrado neste artigo, não são apenas as mudanças climáticas que impactam a vida urbana, mas existem outros elementos como falhas de infraestrutura, greves de serviços profissionais essenciais e a questão dos refugiados, que também podem desestabilizar o equilíbrio urbano. Por outro lado, os planos de resiliência, que visam devolver as cidades às suas condições operacionais iniciais, precisam conter todos os elementos que garantam sua execução. Planos apenas com diagnósticos e ações do que deve ser feito, não garantirão sua execução. Outra questão importante discutida neste artigo são os eixos estruturantes, ou seja, quais são as áreas prioritárias e os temas que devem estar presentes em um plano de resiliência urbana. São apenas aqueles relacionados às mudanças climáticas ou existem outros com alto potencial para desestabilizar nossas cidades ao redor do globo?

Palabras clave:
Ciudades,
Riesgos,
Metodología.

Resumen
Este artículo aborda una propuesta metodológica para la elaboración de planes de resiliencia urbana, que es uno de los temas más importantes que involucran a las ciudades en la actualidad. Es necesario rescatar el concepto etimológico de “resiliencia” porque Urban Resilience es la aplicación exacta del concepto original aplicado a las ciudades, independientemente de su escala. Bausista-Puig (2022, p.1) examinó 1.014 publicaciones durante el período 1998-2020 y concluyó que la literatura sobre resiliencia urbana ha crecido desde 2009 hasta la actualidad, y esto revela el gran interés internacional por este tema durante la última década. Las ciudades, por su complejidad y locus de vivienda de gran parte de la población mundial y con una tendencia creciente, necesitan garantizar sus condiciones de habitabilidad. Teniendo en cuenta la mejora de los fenómenos meteorológicos extremos y las consecuencias para las ciudades, los planes de resiliencia se han convertido en elementos urgentes y fundamentales en todo el proceso. Como se demuestra en este artículo, no es solo el cambio climático el que impacta la vida urbana, sino que existen otros elementos como las fallas de infraestructura, las huelgas en los servicios profesionales esenciales y el problema de los refugiados, que también pueden desestabilizar el equilibrio urbano. Por otro lado, los planes de resiliencia, que tienen como objetivo devolver a las ciudades a sus condiciones iniciales de operación, deben contener todos los elementos que garanticen su ejecución. Planes solo con diagnósticos y acciones de lo que se debe hacer no garantizarán su ejecución. Otro tema importante que se trata en este artículo son los ejes estructurantes, es decir, cuáles son las áreas y temas prioritarios que deben estar presentes en un plan de resiliencia urbana. ¿Son solo los relacionados con el cambio climático o hay otros con un alto potencial para desestabilizar nuestras ciudades alrededor del mundo?

Introduction

Sanderson, Solecki, Waldman and Parris pointed that "resilience theory concepts have emerged independently from a variety of disciplines, including psychology, engineering and ecology" (2016, p.26) as well as cities. Meerow, Newell and Stults (2016, p. 38), demonstrated that the popularity of urban "resilience has exploded in both academic and policy discourse, with numerous explanations for this dramatic rise". Current metrics for international urbanization rates underscore the unlikely possibility of a reversal of the current growth trend. There is no way to avoid situations of urban stress in the world's large cities and climate change, among others, are agents of this process. Intense rains, flooding, lack of rain, prolonged droughts, lack of electricity, collapse of viaducts, windstorms, hurricanes, fuel strikes, interruption in supply, are some of the situations that plague urban regions of the world. In this context, studies, plans and urban resilience actions are presented as alternatives and strategies to mitigate future impacts and need to be increasingly carefully studied.

These issues are not resolved only with Urban Sustainability Plans or Risk Management Plans, but with plans dedicated to preparing cities for impacts, of all sizes and from different origins. It is worth mentioning that the major urban themes such as water, energy, climate, flooding, among others, are related, and an eventual impact on one of these themes will undoubtedly affect other themes.

In the urban context, in one way or another, the themes are always related. An example of this was the truck drivers' strike that hit the supply of fuel in Brazil in 2018 and affected not only urban mobility but also the supply of consumer goods in cities all over the country1.

The scale factor assumes great importance in this process, for example small cities are more likely to manage the consequences of a crisis than large cities. Issues such as food supply and mobility are generally easier to manage in small towns. The point is that megacities are growing and their number in the world is also increasing.

In the 1950s we had only two megacities (urban areas of at least 10 million population), NYC/Newark (USA) with 12.4 million and Tokyo (Japan) with 11.3 million. In 2022 that number grew to 44 cities. Forecasts predict a scenario of around 50 megacities by the year 2040. Today there are a total of 97 urban areas with at least 5,000,000 residents, up from 90 last year (DEMOGRAPHIA, 2021, p2).

Cities: Organized and fragile plots

If we carefully analyze the functioning and operation of our cities, we will notice that, after all, cities are highly organized, and this organization is proportional to the size of the cities. This fact is quite clear in simple examples such as an inhabitant of the city that goes to the bakery for his breakfast every day. Over there he will find fresh bread, freshly brewed coffee, butter, and different kinds of cheese. Most of these items were not manufactured in the bakery but were transported through a highly organized and controlled logistics network, every day, rainy or sunny.

Similar situations occur when we go to fill up our cars at gas stations, or when we turn on taps in our homes and find drinking water, or when we turn on the lights in our workplaces. For each of these operations to occur, hundreds of coordinated operations are necessary, involving hundreds or thousands of people, each one of them with a specific function, strictly following pre-established deadlines. Of course, sometimes this balance is broken more drastically, being felt in part of urban life, but the city management process quickly acts to return to normality.

As a counterpoint, just as they are highly organized, cities are highly fragile environments, and this fragility is also proportional to its population. Cities are not prepared to withstand two weeks without the collection of solid urban waste; cities are not prepared for a week without the supply of fuel for the car fleet and urban public transport; cities are not prepared to withstand two days without the supply of drinking water; cities are not prepared to endure just one day without the supply of electricity; cities are not prepared to endure just one hour without the operation of the World Wide Web.

[1] The truck drivers' strike, in May 2018, lasted 10 days and caused an abrupt interruption in the supply of goods and basic inputs to the economy. For a few days, cities emptied, for lack of fuel at gas stations. The impact on the economy was immediate, both in terms of inflation and GDP. The quick resolution of the problem meant that part of the impact of inflation was temporary: the strong rise in June was offset by some deflation in August. The impact of activity, particularly in the manufacturing industry, was more permanent: the median of GDP growth projections before April 2018 was 2.8%. GDP ended up growing by just 1.2%. Available in: https://conteudos.xpi.com.br/economia/tbt-como-a-greve-dos-caminhoneiros-de-2018-afetou-a-economia/ (access in 22th October, 2022).

In the environmental area, in any city, even the most prepared, stronger, and more intense rains will cause flooding and damage; winds above normal speeds will knock down trees and cause significant impacts on urban infrastructure; prolonged droughts will dry up reservoirs and leave cities on the brink of collapse2.

Why resilience?

For a series of socio-economic reasons, the world population living in urbanized areas follows a constant and sharp growth curve since the 50's of the 20th Century when the percentage was around 30%, reaching 55% in 2020 with forecast to reach to 68% by 2040. Based on the same growth rate, about 7 billion people will live in cities by 2050, i.e., an additional 2.2 billion people (U.N. News, 2022).

This reality only tends to worsen the fragile conditions of our cities. (Figure 1). An additional 2.2 billion people demanding food, water, energy, perishables, durable goods, and mobility, among others, only tends to worsen the tenuous balance between organization and fragility.

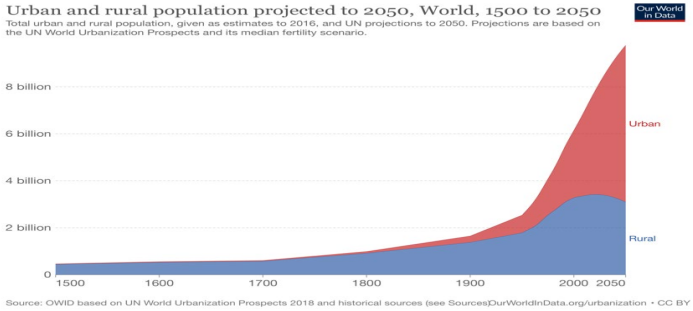

Figure 1. Urban e rural population projection

Available in: https://ourworldindata.org/grapher/urban-and-rural-population-2050 (access 13-10-2022)

Moreover, the climate change effect can become a dangerous element against stability between the organization and the fragility. Climate change is a reality, and it is difficult to dispute the relationship between the increase in GHG emissions and the rise of the temperature across the planet. Empirical measurements indicate that there is a parallelism between the two actions. The answer to facing this issue lies in the emergency actions of urban resilience that go beyond a risk management plan.

What "structuring axes" should be considered in an urban resilience plan?

This question seems to be simple to answer, but it is not. If we consider that cities are fragile and vulnerable, the first structuring axes to be addressed are those that can cause significant damage to urban stability such as: Coastal Erosion, Drought, Flooding, Winter Storms, Coastal Storms, Earthquakes, Severe Weather, Chemical Risks, Biological Risks, Radiological Risks, Nuclear Risks, Diseases Outbackers, Extreme Temperatures, Wildfire and Cyber Threats. These issues are present in the risk management plans of large global cities such as New York, for example.

On the other hand, the scope of urban resilience goes beyond risk management and other issues must be considered as structuring axes. One way to start this discussion is to analyze the structuring axes considered in the urban resilience plans of 453 cities around the world and coordinated by 100 Resilient Cities (ROMERO, 2018, p.6).

Figure 2 below illustrates these structuring axes and the number of total occurrences, as well as occurrences covered in cities located in developed and developing

[2] The population of the city of São Paulo faced between 2013 and 2014 a water crisis never experienced by its population. Despite all the efforts of the population as the change in consumption patterns, their habits the eight systems that supply the city collapsed throughout 2014. In January 2014, the largest water supply system in the city had only almost of 27% of its total capacity. In May, the capacity reached zero and an operation began to capture water from the “dead volume” of the dam, that is, below the normal withdrawal quotas. For this, additional pipes were installed to the bottom of the dam to supply the population. A series of actions such as water rationing, the collection of rainwater by the citizens and the use of reused water ensured a minimum operating condition for the city of São Paulo. With the worsening of global and national weather conditions, what happened in 2014 could happen again. Available in: https://agenciabrasil.ebc.com.br/geral/noticia/2014-12/sao-paulo-sofreu-pior-crise-de-agua-da-sua-historia-em-2014 (10-13-2022).

[3] The 45 cities are: Amman-Jordan; Athens-Greece; Atlanta-; Bankok-Thailand; Berkeley-USA; Boston-USA; Bouder-USA; Bristol-UK; Byblos-Lebanon; Cali-Colombia;Da Nang-Vietnan; Dakar-Senegal; Dallas-USA; El Passo-USA; Glassgow-UK; Los Angeles-USA; Medelin-Colômbia; Melbourne-Asutralia; Mexico City-Mexico; Montreal-Canada; New Orleans-USA; New York-USA; Norfolk-USA; Oakland-USA; Panama City-Panama; Paris-France; Pittsburg-USA; Porto Alegre-Brazil; Quito-Equador; Rio de Janeiro-Brazil; Rome-Italy; Rotterdan-The Netherlands; San Francisco-USA; Santa Fe-Argentina; Santiago do Chile-Chile; Santiago de los Cabelleros_Rep. Dominicana; Semarang-Indonesia; Surat-India; Sydney-Australia; Thessaloniki-Greece; Toyama_Japan; Tulsa-USA;Vejle-Denmark; Wellington_New Zeland; Greater Christchurch-NZ.

countries.

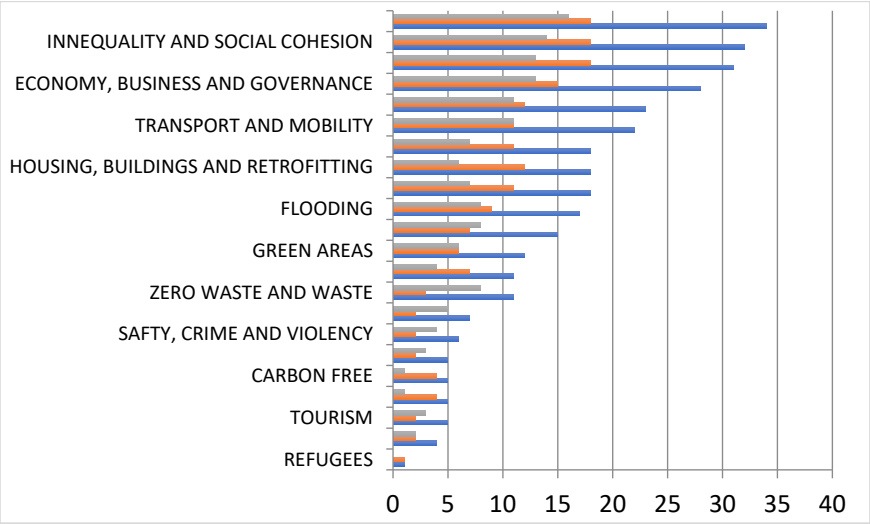

Figure 2. Occurrences of structuring axes in 45 resiliency plans worldwide

Source: Romero, Marcelo de A. 2018, p. 6.

The analysis of the graph points to 22 structuring axes considered in the resilience plans of these 45 cities. The most recurrent axes, present in about 35 cities (78%) was “prepare the population” and “education of the population” to face situations of urban shock and stress.

A detailed analysis of this issue demonstrates a relevant concern that does not address the risk itself, but how the management of this risk will be conducted by the population. It is necessary to have a prior preparation and organization to have no surprises.

The second most present axis, “social cohesion”, which is closely related to the first, demonstrates a concern of cities to understand social cohesion as an important element for the preparation and the organization of the population.

Figure 2 shows that developed countries recognize more the importance of these actions when compared to developing countries. It is important to point out that in the list of structuring axes, there are aspects that are not present in risk management plans in many cities around the globe, but they are relevant for urban resilience plans, such as economy, business, and governance; environmental design; housing and emergency housing; employment and jobs, safety, crime and violence and tourism and refugees. It is noted that many of these issues are of social and economic aspects, and they can drastically impact our cities4.

Based on research carried out in 45 city plans and based on other situations of stress and shocks that can occur in cities, we are proposing a list of structuring axes that generally address the greatest weaknesses to which cities are subject. Of course, due to some characteristics of certain cities, this list can be extended or reduced.

1. Connectivity and Communication,
2. Data Security,
3. Design and urban plannig,
4. Drought,
5. Energy Supply,
6. Floods,
7. Food Supply,
8. Health,
9. Housing,
10. Infrastructure failures,

[4] “With the worsening of the economic and social crisis in Venezuela, the flow of Venezuelan citizens to Brazil has grown massively in recent years. Between 2015 and May 2019, Brazil registered more than 178,000 requests for asylum and temporary residence. Most migrants enter the country through the northern border of Brazil, in the state of Roraima, and are concentrated in the municipalities of Pacaraima and Boa Vista, capital of the state. To accommodate part of this population, 11 official shelters were created in Boa Vista and two in Pacaraima. They are administered by the Armed Forces and the UN Refugee Agency (UNHCR). More than 6,300 people, of which 2,500 are children and adolescents, live in the areas. It is estimated that almost 32,000 Venezuelans live in Boa Vista. Projections by local authorities and humanitarian agencies indicate that 1,500 Venezuelans are homeless in the capital, among them almost 500 are under 18 years of age.” Available in: https://www.unicef.org/brazil/crise-migratoria-venezuelana-no-brasil (access em 18-10-2022).

11. Management and governance,
12. Mobility,
13. Natural Disasters,
14. Prepare de population,
15. Refugees,
16. Social Cohesion,
17. Unnatural Disasters (Caused),
18. Urban Solid Waste.

Sustainability, Resilience and Climate Change

One aspect to be highlighted is the relationship between sustainability, climate change and resilience. Both are entirely related but they have different essence and different goals. Most of the resilience plans that exist in important cities around the world mix these concepts and put sustainability actions into the resilience scopes that are not related to any resilient action. There can be no confusion between these concepts although they are related. See the following figure 3:

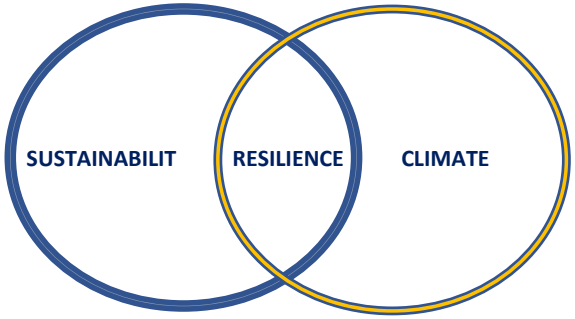

Figure 3 - The relationship among sustainability, climate change and resilience

Source: The author

In the classic concept of resilience, cities after suffering impact must be prepared to return to their original position, in a circular and continuous process of shocks and recovery. On the other hand, this is not the best option, and this isn't happening. After a shock or stressful situation and its recovery, cities tend to strengthen themselves to be more prepared for another similar situation, again and again. So, the process is not circular (C), but it has a spiral (S) shape, generating constant transformations in cities (Figure 4).

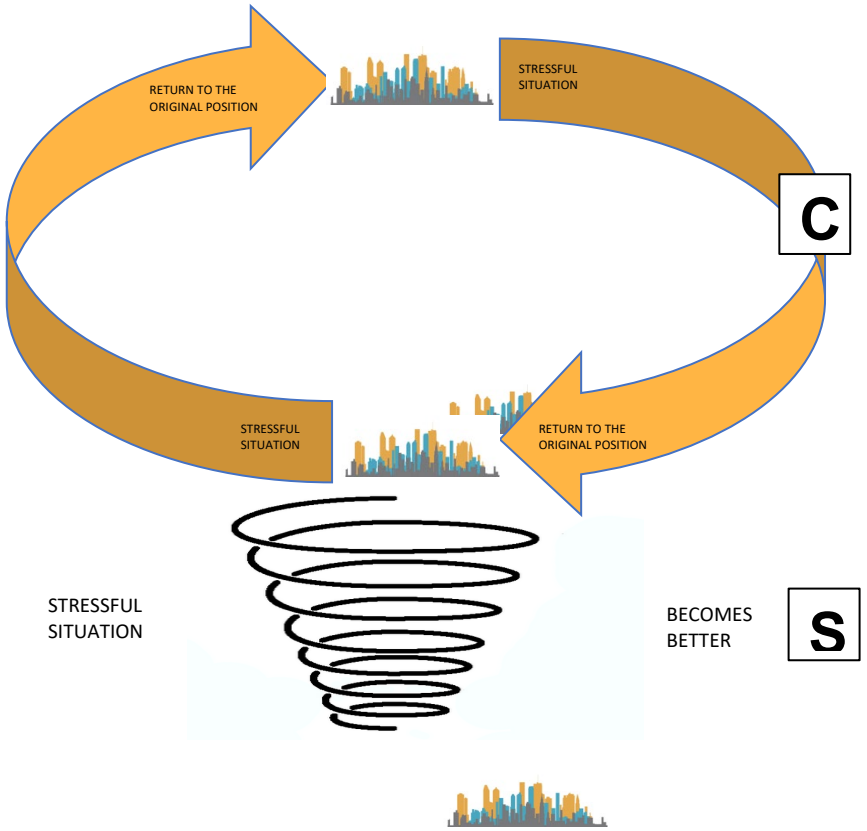

Figure 4. The circular and spiral process of resilient actions.
Source: The author

The first actions to be developed in a resilience plan are emergency actions to be applied as soon as a stress or shock condition occurs in any of the structuring axes. For example, what measures should be taken if a strike in municipal solid waste collection exceeds a period of more than some days and weeks. Even if the inhabitants separate their solid household waste, the failure in the urban public collect system will generate a crisis.

Certainly, these emergency measures depend on the level of organization already implemented in the city, even so, most of the cities are not prepared to deliver their waste to the municipality for a period larger than 15 days. Cities need an emergency system, or "Plan B" ready to go into operation. A second type of emergency alternative system is "redundant systems" which are another type of solution, with the same proposal and reach the same goal. A very common example of redundant systems is the existing electricity generators in residential, commercial, and service condominiums around the world, or an alternative urban mobility system ready to operate as soon as the shock in the traditional system (Figure 5).

In some cases, an emergency system (Plan B or Redundant) can become permanent if it proves to be a highly sustainable alternative. On the other hand, not all "Plan B" or redundant emergency systems can become permanent actions because the characteristics of each of them are different. If this is true and it is, the municipality must implement emergency and permanent actions already studied and ready to be activated in an acute shocks or chronic stresses conditions[5].

Regarding the lack of rain causing extensive periods of water reduction, and therefore, the interruption of water supply, rainwater collection measures as a policy for the building sector is an example of an emergency system that could be a permanent system. This measure happened in Sao Paulo, Brazil, after the water supply crisis in 2014 - 2015.

Thousands of houses kept their rainwater collect system even after the crisis. Ribeiro and Gonçalves (2019, p.1) recognize the importance of the "redundancy" aspect in resilient systems as one of their five main characteristics. There are other examples of green rainwater management around the world such as: rain barrels in Vancouver - Canada; rain gardens and cisterns in Seattle - USA; extensive green roof added to a residential condominium building in Toronto - Canada; Rain Garden in Corinth – Greece (BUT et alli, 2016, p.15).

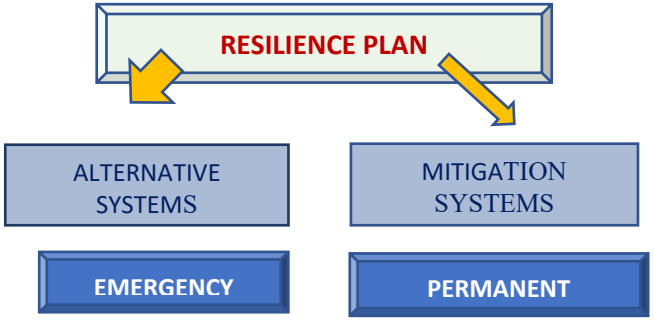

Figure 5. Alternative and Mitigation Systems
Source: The author.

It is important to consider the 2030 Agenda for Sustainable Development adopted at the United Nations Sustainable Development Summit, on September 25th, 2015. This agenda contains the 17 Sustainable Development Goals and 169 targets which demonstrate the scale and ambition of this new universal Agenda (U.N., 2022).

Two of these goals are related to resilient cities: goal 9, build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation and goal

[5] Examples of chronic stresses include high unemployment; an overtaxed or inefficient public transportation system; endemic violence; and chronic food and water shortages. Examples of acute shocks are the sudden, sharp events that threaten a city, including earthquakes, floods or disease outbreaks. Source: Frente Nacional dos Prefeitos & 100 Resilient Cities, 2018, p.4

11, make cities and human settlements inclusive, safe, resilient, and sustainable. It is worth mentioning that objective 9 differentiates between resilient cities and sustainable cities and this differentiation is correct because resilient and emergency actions are not always sustainable, but all sustainable actions make cities more resilient.

As an example, the case of a disruption in the supply of electricity to a city, or part of a city, or just to a building, such as a hospital. The most immediate solution to keep the hospital running without interrupting its main equipment is turning on electric generators powered by diesel oil, or some non-renewable energy source. It is an emergency action of resilience but not sustainable.

The methodological process

The methodological process is the key for a resilience plan to succeed or not. A plan that can't contain only generic goals, like dozens of resilience plans for cities and megacities around the world that contain diagnosis and goals but don't contain other important aspects such as: department in charge; leader, budget, source of resources, schedule of implementation and monitoring progress. Without this ordering, the chances of a succeeding plan will be minimal (Figure 6)

Figure 6. Phases of the methodological process

Source: Adapted of NYC HMP, 2014,

One question that arises when implementing the plan is who will be the organization that will lead and coordinate the entire process. It is also necessary to have a single leadership, i.e., a person in charge of leading all players. There seems to be no doubt that this leader should answer to the mayor of the city and in this aspect the methodology of 100 Resilient Cities seems to us to be quite important and necessary.

Resilient plans are multidisciplinary works and involve all the city management bodies as well as other players from the private sector, NGOs, universities and organized civil society. As shown in Figure 5, the resilience plan has 6 phases that are detailed below.

Phase 1: Obtaining and organizing data

Commitment of the Mayor and the involved municipal departments;

Training of the technical leadership team - Core Leaders;

Definition of structuring axes of actions; Working groups creation for each structuring axis (sectors/secretariats/agencies);

Collection of secondary data;

Strategies and actions adopted by other international, national, and local capitals analysis;

Vision Definition.

In phase 1, the commitment of the mayor and all public administration departments is necessary for a very simple reason: no city starts a resilience plan from scratch. Certainly, in many cities around the world, many reports, plans and actions have already been built in various sectors of the city or public companies that provide services to cities, but they are not organized in the format of a resilience plan with emergency actions, medium and long-term actions and implementation and monitoring process.

For this reason, if there is no commitment from these sectors, the information contained in these reports and plans will never be made available to the sector in charge of carrying out the resilience plan.

Phase 2: Estimated Risks

Identification of risks by structuring axis;
How the city is prepared to face the risk;
How to reduce risks;
Estimate of losses for each risk.

Risks are situations of stress and shocks to which cities are subjected. For each structuring axis there are some risks that can occur, and at this stage, it is necessary to simulate limit situations, not based on what has already happened in the past, but going further, based on what has not yet happened, but based on what might happen.

Phase 3: Risk Mitigation Actions

Emergency actions - short term (Plan B or Redundant System);
Permanent actions – long term (Mitigation System);
Planning and implementation;
Strategy application assessment;
Application assessment on urban area;
Strategy technical assessment;
Strategy economic assessment;
Details of actions;
Tools for Training the population.

Risk mitigation actions should, whenever it's possible, be built considering emergency measures and measures that can become permanent, in the medium and long term. In certain situations, an action built to be an emergency can become permanent, but this is not always the case. Some actions will always be an emergency even if they may occur more than once in a situation of urban stress.

The issue of involving the population through local leaders by neighborhoods or regions of the city is crucial for the success of actions, especially emergency actions. When an event occurs, a prepared population will act more objectively and quickly. The population's education and awareness actions can be carried out in different ways and digital tools are great allies in this process. Snep, Voeten, Mol and Van Hattum (2020, p.2) demonstrated the effectiveness of nature-based solutions for resilient actions in different conditions with an emphasis on water management.

Phase 4: Plan Development - Leadership

- Responsibilities;
- Leadership.

Phases 5 and 6: Implementation and Monitoring Progress

Definition of deadlines and resources sources;
Draft Plan;
Plan implementation and start;
Monitoring Strategies.

A resilience plan needs several levels of leadership proportional to the depth of each structuring axis, and the leader above all the others, should monitor the entire process and make the connection between the various sectors of the City Hall and external players, such as, neighborhood associations, universities and the third sector. There are many tasks that will be under the leader's responsibility as well as the management of the entire process, from phase 1 to phase 6.

Phases 4, 5 and 6 are the ones in which the plans will be put into practice, and this is what is lacking in the resilience plans that are only on paper and have not been executed or were very little executed.

A plan with few actions but detailed and containing all six phases is preferable than comprehensive and extensive plans, without detail, without budget, without source of funds and without a leadership in the implementation monitoring process. The construction of a follow-up worksheet with

responsibilities, leadership, budget, and status of progress of actions is the best beacon to know if the plan will be carried out or not.

Conclusions

Despite some architects and urban designers saying that cities are chaotic environments, they are not. Cities are like living organisms, highly organized and highly fragile. This balance between organization and fragility can be broken with situations of chronic stresses and acute shocks to which cities are subject.

Global warming and the consequences generated with it have further worsened this balance. Global warming is not the only factor responsible for chronic stresses and acute shocks in cities. There are other causes of social and economic origin that can significantly impact the balance and life in cities. In this scenario, cities need to be prepared to face a series of climatic and non-climatic events.

Risk management plans are not enough to generate resilient cities. To really make cities resilient, plans need to address climate, social and economic issues. In addition, plans require very clear and detailed steps with committed budgets and monitoring of tasks already carried out, and tasks to be carried out. The commitment of the mayor and all municipal staff in this process is important and necessary.

Considering that the planet's population is increasingly urbanized, urban resilience plans are increasingly necessary. It is important to note that urban resilience plans do not eliminate sustainability plans or climate mitigation plans. Each of them has different essences and goals.

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