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CLIMATE ACTION AND INFRASTRUCTURE FOR DEVELOPMENT

Enhancing climate resilience through urban infrastructure and metropolitan governance

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Abstract

The policy brief (PB) proposes the need for development of new approaches to adapt to climate change that highlight the importance of involving multilevel governance. The largest amount of greenhouse gas (GHG) emissions are produced in cities. Yet they are also at risk of facing the financial and human consequences of climate change, both in terms of lives lost and in material damages. However, national policies have great difficulty coordinating their efforts with subnational governments in a systematic manner. Three types of innovative approaches to be considered, adopted and promoted by national governments and implemented locally are proposed in the PB: the use of urban metabolism as a conceptual framework, the development of metropolitan governance bodies capable of carrying out plans for adapting to climate change, and new, long-term investment mechanisms in low carbon infrastructure.

Challenge

Today, cities are becoming increasingly key actors in addressing climate change. This is a global phenomenon, but it is at the local level, where people, governments, and economic actors jointly release GHGs, where common global approaches, by national governments, and by sub-national and non-federal actors are required. Cities have a socially and economically transformative role that convert them into sustainable development drivers (Dick, 2016).

Linking urban planning to climate change response is fundamental given that the urban population will continue to grow. So far, the world urban population has grown rapidly since 1950, from 746 million to 3.9 billion in 2014 and it is expected to increase to 6.3 billion by 2050, representing about 70% of the world population (United Nations, 2014). In particular, megacities and metropolitan regions continue to expand: the United Nations estimates that by 2030, there will be 41 megacities home to at least 10 million residents each, mainly situated in the global south (Mayr, et al., 2017).

Whilst urbanization levels have increased, so too have global carbon emissions from fossil-fuel burning, having risen during 1950-2005 by almost 500 percent (Mayr, et al., 2017). Cities are responsible for between 60% and 80% of energy consumption, generating as much as 70% of the human-induced GHG emissions (UN-Habitat, 2016).

The current wave of urbanization is an opportunity to foster climate- and sustainable-focused variables in urban planning. GHG emissions are strongly linked to materials, energy use in a city, and the waste that it generates (Seto, et al., 2014). Bearing in mind that over the next 15 years we will build as much urbanized areas as has been built in the entire history of humanity (Lanfranchi & Contin, 2017), it becomes clear that there is an urgent need to build climate

resilience in order to face the negative impacts that climate change poses to cities.

According to the IPCC, urban agglomerations on nearly all continents will be exposed to a temperature rise greater than 1.5°C over pre-industrial levels by mid-century[1] (Revi, et al., 2014). The frequency of weather extreme events will also increase and it will raise the level of risk of morbidity and mortality (Rosenzweig & S, 2015). Eighty-two percent per cent of cities are located in areas that face high risk of mortality associated with natural disasters. Furthermore, 89% of cities are located in areas highly vulnerable to economic losses associated with at least one of the six types of natural disasters (UN-Habitat, 2016).

The most significant weather-related health hazards in urban areas are storms, floods, heat extremes, and landslides (Revi, et al., 2014). It has been observed that globally, the number of natural disasters is increasing in both frequency and intensity: 4,000 between 2003 and 2012, compared with 82 in 1901-1910 (UN-Habitat, 2016). These kinds of events limit the functionality and overall resilience of a city, affecting its ability to recover (Mayr, et al., 2017). Furthermore, estimates show for example that the global material cost of disasters for the period 1996- 2005 amounted to US$667 billion (UN-Habitat, 2016).

Generally, a top-down approach has been implemented to tackle climate change, since national governments design the climate-related strategies, including regulations, incentives, and also commitments in the international arena. Despite their organization in a number of regional and global advocacy networks, cities and metropolitan areas have lacked the leverage to shape or influence national climate governance frameworks. Even though, an increase interdependency between the different tiers of government has been witnessed in the past few years (Dawson, et al., 2014). It has become clear that urban planning plays a key role in the global response to climate change. Building resilience to climate risks is paramount in the context of rapid urbanization, in which climate resilience expands beyond both sectoral divisions and jurisdictional boundaries. Thus, it is necessary to revise governmental schemes and to foster an integral institutional approach that can address the metropolis transversally, rather than by territorial zones or thematic sectors (Gómez Álvarez & Lanfranchi, 2017); a framework that provides further guidance for what climate resilience means in practice and points to how it can be strengthened and explored by city-level planners (Tyler & Moench, 2012).

Proposal

1. Integrate the concept of urban metabolism into adaptation strategies

Urban Metabolism

Cities' adaptation to climate change must articulate viable pathways for transitioning urban economies from a dependence on nonrenewable materials and energy to more resource efficient and sustainable flows.

The concept of urban metabolism represents the study of material and energy flows serving the city (Fernández, 2014). It is also defined as "the sum total of the technical and socio-economic processes that occur in cities, resulting in growth, production of energy, and elimination of waste" (Kennedy, Pincetl, & Bunje, 2010). In this sense, urban metabolism is utilized as a comprehensive understanding of natural resources, construction and industrial materials production, consumption and lifecycle combined with biomass, electricity, CO2 production at a territorial level. This new understanding of urban metabolism allows for a rethinking of place making through flows of resources in and out. By applying this concept, key strategies for green and resilient cities could be designed by decision-makers in an integrated way. In an urban context, resilience and sustainability is well within reach of municipal and regional authorities through careful consideration of the resource flows serving cities (Ferrão & Fernández, 2013).

Generation and interrelationships of information

In utilizing the concept of urban metabolism for resilience assessment, it is necessary to examine the complex, dynamic interrelationships that are present in physical and social processes and also their implications for urban planning and territorial interventions (Musango, Currie, & Robinson, 2017).

For achieving climate-related objectives, cities need to promote and share a science-informed and evidence-based policy-making process. A network of city-science panel partnerships should be created that shares city-relevant information. The integration of social, ecological, and technological systems in cities is crucial, because they provide transformative avenues leading to urban climate adaptation and mitigation, highlighting also the level of interdependent pathways that connects them (with the opportunities and risks this brings). With this in mind, an integrated approach for development and resource management has to be implemented, both across sectors and across scales in order to optimize synergies between sectors and manage trade-offs through innovative, integrated and cost-effective planning, as well as collaborative decision-making and implementation (GIZ & ICLEI, 2014).

The supra-municipal territorial management is the cornerstone of urban metabolism and adaptation to climate change

Cities should consider the availability of their own resources, including those that are outside their boundaries. This may also require coordination with public and private institutions across jurisdictions and multiple levels of government (Revi, et al., 2014). It is crucial to understand the existing complexity related to the need for scale integration, the management of many variables and/or actors, as well as the integration of sectors (Lanfranchi & Contin, 2017).

2. Develop metropolitan governance mechanisms to manage resilience

National Governments (especially in developing countries) too often lack the ability to implement efficient policies that address localized issues. They lack the proper tools or strong relationship with territories required to respond to global challenges, mainly because too often local authorities lack the technical or financial skills and capacity to take the right course of action. Metropolitan coordination is key to overcome fragmented governance. It should therefore be promoted as a priority by national and local levels of government altogether.

Metropolitan approaches are unusual even though 85% of urban agglomerations above 100.000 inhabitants are already metropolitan (UN-Habitat 2016). A new framework needs to be developed in order to understand the metro gaps (Lanfranchi 2015). Some national constitutions do not consider metropolitan governments as they tend to organize governance schemes in local, regional (provinces, states, or departments), and national levels. In order to be responsive to global threats such as climate change it requires changing the rules of the game by rethinking the institutional arrangements (Gómez Álvarez & Lanfranchi, 2017). In this sense, vulnerability to climate change can vary immensely within metropolitan regions, a phenomenon not often captured in adaptation or resilience planning (Dinshaw, Giroux Lane, & Elias-Trostmann, 2017). Having a better sense of how ready they are to contend with the effects of climate change will enable metropolitan regions to effectively build on their strengths and address their weaknesses when planning for climate resilience (Dinshaw, Giroux Lane, & Elias-Trostmann, 2017). Metropolitan resilience planning should identify and engage stakeholders closely and continuously in all stages of resilience planning: assessing climate change risks, identifying and prioritizing options, developing information databases, and implementing resilience measures. Associations of smaller municipalities outside the strict metropolitan area could help balancing cities' centripetal force in terms of resource allocation, and investments.

Furthermore, climate governance consists not only of decisions made by government actors, but also by the private sector, non-governmental and civil society actors in the city (Gómez Álvarez & Lanfranchi, 2017). Citizen participation needs to be reinvented within metropolitan governance schemes as does the relationship between local governments and entrepreneurs and the business community at large (Buchoud, 2017). Increasing social participation and collecting feedback from residents and community members leverages local knowledge useful for resilience planning. This can also help to ensure that climate resilience measures address local needs and residents' concerns. At the same time, it has a great potential to create legitimate, effective response strategies. Also, new information and communication technologies present an opportunity to improve citizen engagement and participation in the intermediate governance instances that are emerging between local and regional authorities (Gómez Álvarez & Lanfranchi, 2017).

Moreover, many cities are beginning to develop metropolitan governance bodies by applying integral development approaches (Lanfranchi & Contin, 2017), which work mainly on regional development, transport and spatial planning. In this context, countries should consider how much policy coordination can the metropolitan governance body achieve; what budget and staff does the metropolitan governance body have; and to what extent do citizens understand the metropolitan governance body.

Nevertheless, the creation of new metropolitan entities does not mean to take away functions from the municipalities or the national government, but to complement them: improving efficiency and equity in the performance of metropolitan resilience projects (Lanfranchi & Bidart, 2016).

In addition to that, governance bodies have to take into account the interdependence of modern urban infrastructure systems, such as energy, transport, telecommunications water, etc. The cascading impacts of climate change on interconnected infrastructure systems at the urban scale is projected to cause adverse effects on them due to an increase in the magnitude and frequency of extreme weather events. Therefore, the identification of infrastructure interdependencies and climate impacts can serve as a first step in reducing risks to systems (C40 & AECOM, 2017).

SDGS and Paris Agreement

Climate change represents a serious threat to achieve Sustainable Development Goals (SDGs). At the same time, the SDGs provide an opportunity to foster climate-related actions in order to achieve their sustainability targets. Cities play a key role in achieving sustainable development worldwide, being the arena, where the Paris Agreement and the 2030 Agenda converge. Both Agendas need to be implemented in an integrated manner (Brandi, 2018). It is clear that the achievement of one Agenda depends on the success of implementing the other one, as

demonstrated by SDG 11: "Make cities and human settlements inclusive, safe, resilient and sustainable" (UN, 2015).

Local authorities are key actors in enforcing policies that consider the SDGs targets and Nationally Determined Contributions (NDCs): Around 65% of the SDG targets can only be achieved if they are implemented in cooperation with local actors. Similarly, 110 NDCs mention urban areas as the implementing territory for their GHG reduction efforts (Brandi, 2018).

Urbanization has to be a key issue in international cooperation since investments in urban infrastructure made today will have positive or negative implications for achieving global challenges addressed by the Global Agenda. Also, urban capacity to shape effective policies through collaborative governance needs to be bolstered (Brandi, 2018). The G20 should encourage cities to make a comprehensive analysis of how climate actions in their territory could contribute to the achievement of SDGs (Dzebo, et al., 2017).

The pathway initiated to achieve the objectives of the SDGs and the Paris Agreement offers cities a unique opportunity make real changes by implementing actions towards more sustainable societies in terms of the different dimensions of sustainability (Brandi, 2018).

3. Incorporate low-carbon development strategies in infrastructure investments

To mitigate climate change and to adapt to its risks, planned investment must be steered towards lower-carbon, climate-resilient options. Emissions related to infrastructure growth are tied to investment decisions, existing urban energy systems, and regulatory policies that shape the process of urban growth (Seto, et al., 2014). A transition to low-carbon, climate-resilient cities requires more urban infrastructure investment and a shift in the way those existing financing streams are allocated. Further, a key aspect is that cities link their land use planning decisions to their climate action (Colenbrander et al., 2018). By promoting urban development that is compact, connected and coordinated, cities can reduce global infrastructure requirements by more than US$3 trillion over the next 15 years, delivering an annual abatement of 0.3GtCO2e by 2030 and 0.5GtCO2e by 2050 (Colenbrander et al., 2018).

To achieve the Paris Agreement objectives, cities need to refurbish existing systems and infrastructures while fast-growing cities need to shift towards lower-carbon development pathways (Revi, et al., 2014). Innovation, learning and scaling of financing instruments, financial architecture and governance structures is urgently needed, particularly in four interconnected sectors that represent the greatest abatement potential: electricity grid decarbonization, greater energy efficiency in buildings, more efficiency in transport systems, and waste management process improvement (Colenbrander et al., 2018). In

particular, the transport sector creates significant challenges, due to their exposure to fluctuations in climate-related variables, such as precipitation,

temperature, winds, visibility, and for coastal cities, rising sea levels with the associated risks of flooding and damages (Revi, et al., 2014).

Infrastructure investments are partial and fragmented in most cities across low- and middle-income nations, and most of the time informal settlements are ignored. It is significant given that in 2014 approximately 45% of the urban population in developing countries lived in informal settlements in inadequate housing conditions (UN Habitat, 2015). Deficits in infrastructure and service provision increase the differentials in exposure to most climate change impacts between income groups. So, sometimes, rather than reducing risks, unequal investment strategies can increase, shift or concentrate risks (Revi, et al., 2014).

The New Climate Economy estimates that low-carbon urban actions present a global economic opportunity of US$17 trillion by 2050 (Godfrey & Zhao, 2016). Seventy per cent of the projected investment needs for sustainable infrastructure will be required in emerging and developing countries, particularly in Africa where urban population growth rates are highest (Bhattacharya, et al., 2016)[2] (Watts, et al., 2017). A recent report by the Paulson Institute and Energy Foundation estimates that China alone will require approximately US$1 trillion over the next five years for low carbon buildings, sustainable transport, and clean energy in urban areas (Godfrey & Zhao, 2016).

It is also important to recognize that many of the estimates do not take into account the additional investment required to adapt existent urban infrastructure to present and future climate risks. According to the World Bank, the capital costs required for urban infrastructure adaptation is estimated in US$11-20 billion per year for 2010-2050. Compared with estimates by the United Nations Environment Programme (UNEP), that is a conservative estimate, which suggest that the costs of urban adaptation could be up to US$120 billion per year by 2025 to 2030 (Godfrey & Zhao, 2016).

In addition, it will be necessary to consider investments in 'soft infrastructure', which include capacity building, the provision of healthcare, designing and establishing participatory decision-making processes, among others. This kind of investments can also enhance the effectiveness of other types of adaptation investment (Colenbrander et al., 2018).

The creation of new jobs will be a part of this opportunity. In some cases, these positions will be new jobs, whereas in others they may represent a shifting of jobs from one sector to another (Watts, et al., 2017). The large-scale deployment of climate solutions has the potential to boost labor demand from both manufacturers and installers. In general, the greater the

proportion of investment that goes to installation, the larger the number of local jobs supported.

4. G20 proposals

We propose three approaches to advance urban resilience to climate change:

- Integrate the concept of urban metabolism into adaptation strategies: We propose the promotion of a new technical-methodological approach across a given territory that accounts for the relationship between resource and energy flows and greenhouse gas (GHG) emissions;

- Develop metropolitan governance mechanisms to promote and manage resilience more effectively: an integral way of organizing the governance of the planning and intervention processes in a given territory beyond its jurisdictional limits, to include multi-sector and multi-stakeholder coordination to overcome the administrative gridlock.

- Incorporate low-carbon development strategies by rethinking infrastructure investments: a framework to finance infrastructure in order to achieve low carbon development pathways and climate resilient cities. This also means supporting the rapid development of green finance to support such investments.

Finally, the G20 can support these recommendations by organizing its working groups by comprehensive themes and not by sectors. This is the only way that solutions to key problems can be dealt with in a coordinated and consensus-making way.

References

[1] Using the RCP2.6 scenario: The Representative Concentration Pathways (RCPs) are used for making projections based factors such as population size, economic activity, lifestyle, energy use, land use patterns, etc., which at the same time condition GHG emissions. The RCPs include a stringent mitigation scenario (RCP2.6), two intermediate scenarios (RCP4.5 and RCP6.0) and one scenario with very high GHG emissions (RCP8.5) (IPCC,2014).

[2] The New Climate Economy estimates that low-carbon urban actions present a global economic opportunity of US$17 trillion by 2050 (Godfrey & Zhao, 2016). Seventy per cent of the projected investment needs for sustainable infrastructure will be required in emerging and developing countries, particularly in Africa where urban population growth rates are highest (Bhattacharya, et al., 2016) (Watts, et al., 2017). A recent report by the Paulson Institute and Energy Foundation estimates that China alone will require approximately US$1 trillion over the next five years for low carbon buildings, sustainable transport, and clean energy in urban areas (Godfrey & Zhao, 2016).

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