



Integrating resilience with urban sustainability in neglected neighborhoods: Challenges and opportunities of transitioning to decentralized water management in Mexico City



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ARTICLE INFO

Article history:

Received 25 August 2014

Received in revised form

9 March 2015

Accepted 27 March 2015

Available online 7 April 2015

Keywords:

Urban resilience

Urban sustainability

Climate change adaptation

Neglected neighborhoods

Decentralized water management

Mexico City Green Plan

ABSTRACT

The impacts of climate change and decreasing local resources are increasingly threatening the resilience and sustainable management of urban areas and infrastructures worldwide. To cope with such threats and vulnerabilities, urban sustainability and resilience oriented plans have been developed. Accordingly, policy makers need to learn how to properly integrate urban sustainability with urban resilience principles and practices in the re-shaping of urban agendas. In order to highlight the future potential of integrating transformative resilience principles into the general sustainability approach, this paper provides a critical review of a recent and successful urban regeneration and development plan, the “Mexico City Green Plan”. This paper also discusses a feasibility study for urban redevelopment and transition towards resilience in Mexico City, in order to illustrate the necessity and potential of urban resilience for the improvement of the life prospects of disadvantaged inhabitant groups. The Valle del Chalco neighborhood in Mexico City is presented as an example, whereby resilient and sustainable urban transformation was achieved through an integrated and sustainable decentralized water management and infrastructure plan. In practice, the terms ‘Sustainability’ and ‘Resilience’ can be exploited to justify conventional, non-sustainable urban development practices. The results discussed in this paper demonstrate the necessity of the integration of transformative resilience principles within sustainable urban redevelopment and regeneration. The main findings are i) Policy makers underestimate the potential of urban resilience in shaping more sustainable urban futures, since they only understand resilience as the flipside of specific vulnerabilities, ii) The building of urban resilience within sustainable urban transitions and redevelopment can effectively foster people empowerment, particularly in combination with the decentralization of resources management systems, and iii) The main challenge for the implementation and execution of transitions processes towards urban resilience and sustainability is the elimination of political barriers.

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1. Introduction

One of the most relevant factors in global dynamics, influencing both environmental and climate change (hereafter CC), is the dramatic shift in urban living (Grimm et al., 2008). While in 1900 urban dwellers comprised only 10% of the global population, they currently exceed 50% of the global population (United Nations, 2012). Developing countries are experiencing the most rapid

land-use changes, where recently expanded urban areas sometimes host almost 80% of the county's total population. Consequently, addressing emerging and increasing urban vulnerabilities is a key for the sustainability and resilience of the planet's urban habitat. This paper provides useful insights into the scientific discussion on policies that foster the adaptation and transformation capacities of urban environments (Romero Lankao & Qin, 2011), exploring the nexus between urban sustainability and resilience in overcoming emerging vulnerabilities. At the beginning of this century, urban sustainability was mainly related to greening and pollution reduction practices, and reduction strategies involving resilience to risks. Recently, however, the emergence of urban

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resilience thinking (Elmqvist, 2014) and the launch of the Rockefeller City Resilience Framework have broadened the structure for urban resilience. A new multidisciplinary and integrated understanding of urban resilience (Chelleri & Olazabal, 2012; Collier et al., 2013; Elmqvist, 2014) has been highlighted as follows. i) Resilience in this context does not imply the normatively positive nature of 'resilience' (Pizzo, 2015; Vale, 2013), because it can include a set of capacities that could increase the wellbeing of someone at the expense of someone else, implying trade-offs (Chelleri, Waters, Olazabal, & Minucci, 2015). ii) There is a need to combine resilience within sustainability objectives (Redman, 2014). This paper stresses that today's practitioners and policy makers that need to deal with increasing urban problems need to properly understand how to apply the integration of urban resilience and sustainability (Pearson, Newton, & Roberts, 2014). This paper focuses on two main points, which need to be addressed in order to integrate resilience and sustainability as follows. i) Resilience needs to be understood not merely as the flipside of vulnerability, but as a set of principles that should be used for the reframing and transition of an existing system. ii) The definition of urban sustainability is an integrated part of urban resilience and resilience oriented actions need to be framed within sustainable development.

Regarding the first point, different authors have recently explored the differences between vulnerability and resilience (Gallopín, 2006; Miller et al., 2010; Turner, 2010). These concepts derive from different traditions in both methodology and application. While the vulnerability approach (Adger, 2006) refers to the system's exposure to perturbations (so depending on time – place variables) and its sensitivity and capacity to adapt perturbations, resilience by contrast reflects the system's ability to absorb disturbances, to reorganize and transform itself, learning from the experiences (Folke et al., 2010). Because the resilience approach focuses on system properties and capacities toward evolutionary potential, notwithstanding the exposure to risks factors, resilience cannot be considered as merely the flipside of vulnerability (Gallopín, 2006). In this way, the key message of this first point is illustrated through the case study discussed in this paper: if planning and policy makers wish to build resilient cities by fixing specific vulnerabilities, they underestimate the potential of the resilience approach. Regarding the second point, we build our notion of urban sustainability on "a form of development that fosters adaptive and transformative capabilities, and creates opportunities to maintain equitable, long-term prosperity and well-being in complex and interlinked social, economic, and ecological systems" (Schewenius, McPhearson, & Elmqvist, 2014: 441). Both sustainability and resilience approaches can be over-simplified and prone to being 'instrumentalized' by policy makers into a set of normative core principles by mainstreaming 'business as usual' practices (Lizarralde, Chmutina, Boshier, & Dainty, 2015; Pizzo, 2015). This paper therefore proposes transformative, long-term prosperity and wellbeing centered perspectives of sustainability and resilience. There are already case studies in which people-centered approaches can boost sustainability while improving social learning (Cerón-Palma et al., 2013) and thus improving resilience. However, it has been pointed out, that poorer people usually lack adaptive and transformative capacities (Romero-Lankao et al., 2014). We thus contribute to such debate by demonstrating the technical feasibility of building urban resilience in a neglected neighborhood in Mexico City, using a people-centered approach while fostering a transition toward decentralized resources management, and thus aligning resilience with the increasing overall urban sustainability.

The transition from centralized to decentralized infrastructures represents a key point in building resilience. It also represents a shift in the control and management of urban resources from a central institution, to the people living in a district.

Decentralized water management systems have been recognized by different authors as an internationally relevant (Parkinson & Tayler, 2003), economically and technically efficient (Suriyachan, Nitivattananon, & Amin, 2012), and possibly community driven practice (Kyessi, 2005) that fosters urban sustainability (Sample & Heaney, 2006; Wilderer, 2001). It has been also discussed that such transition proves to be challenging in developing countries (Martinez, Escolero, & Wolf, 2011). However, the results of this paper clarify that the main barriers to the implementation of such transition are political, and not technical.

2. Methodology

Mexico City was selected as an internationally relevant case study to be discussed in this paper since, although CC affects urban environments worldwide, the most vulnerable situations are expected to be found within metropolitan areas of developing countries (Carmin, Anguelovski, & Roberts, 2012). In fact, as summarized in the latest United Nations report on World Urbanization Prospects, more than 450 urban areas worldwide (with a population of more than 1 million inhabitants per area), representing 1.4 billion people, are exposed to at least one natural hazard per year, and most of these are located in developing countries (United Nations, 2012). Therefore, water security and its sustainable management should be a top priority in the development agendas of cities, particularly in the global south.

This paper discusses different methodological applications. In the first part, quantitative and qualitative analyses provide the framework and actions adopted within the Mexico City Green Plan (Secretaría del Medio Ambiente, 2007). This innovative plan for building a sustainable Mexico City includes an integrated program composed of seven subprograms, among which are the Mexico City Climate Action Plan (MCCAP) and the Water Sustainable Management Plan. We critically review these two strategies from the point of view of sustainability and resilience, highlighting the limits of the plans' actions. In the second part of the paper, a discussion is given that demonstrates the feasibility of a more sustainability and resilience integrated approach, through a people centered and decentralized resources management transition. The proposal for the urban renewal toward a decentralized water management principles transition for the neglected neighborhood called *Valle de Chalco*, in Mexico City, is discussed in the second part of the paper. The starting basis for the exploratory research discussed in this paper was the strategic urban redevelopment plan for *Valle de Chalco*, which uses decentralized water management (DWM) as a guiding design principle (Lopez, 2011).

To address the decentralized rainwater and wastewater management, water storage strategies were quantified using data provided by Mexico National Water Commission (Spanish acronym: CONAGUA). Rainfall, storm water runoff, and wastewater were estimated for specific areas based on the same data. A land cover map, considered the basis for the calculation of roofs, sealed surfaces, and roads, was derived from Lopez (2011), together with data on population density, geology, and the existing urban water infrastructure.

3. Results

This section comprises three main parts. In the first and second parts, we illustrate the vulnerabilities and challenges of Mexico City regarding the adaptation to climate change and water related issues. A cross sector analysis of specific development plans for water and climate executed by Mexico City between 2007 and 2013 is reviewed. In the third part we present a feasibility study for an

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